The hearing will commence at 2:00 PM ET, on February 10, 2014, and it will be open to the public for in-person attendance, on the ninth floor of Madison Building East, 600 Dulany Street, Alexandria, Virginia. In-person attendance will be accommodated on a first-come, first-serve basis.

The Board will provide a court reporter for the hearing, and the reporter's transcript will constitute the official record of the hearing. Each party requests the ability to use audio-visual equipment to display demonstrative exhibits, including the use of a projector and screen for PowerPoint display. Although these requests are *granted*, the parties are reminded that the presenter must identify clearly and specifically each visual display, e.g., by slide or screen number, referenced during the oral hearing to ensure the clarity and accuracy of the reporter's transcript.

Under 37 C.F.R. § 42.70(b), demonstrative exhibits must be served at least five business days prior to the hearing. Such exhibits shall be filed at the Board at least two business days prior to the hearing, and the parties must initiate a conference call with the Board by two business days prior to the hearing to resolve any dispute over the propriety of any demonstrative exhibits. In preparing demonstrative exhibits, the parties are advised to consider guidance previously provided by the Board on the appropriate content of demonstrative exhibits at final oral hearing. *See* Order for Conduct of Proceeding in IPR2013-00033, Paper 118, 2-4.

The Board expects lead counsel for each party to be present at the hearing, although any backup counsel may make the presentation. If either lead counsel is unable to be present at the hearing, the Board shall be contacted via a joint telephone conference call no later than two business days prior to the hearing to discuss the matter.



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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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adidas AG,
Petitioner

v.

NIKE, Inc.
Patent Owner

---

Patent No. 7,347,011

*Inter Partes* Review No. 2013-00067

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**NIKE'S OPPOSITION TO PETITIONER'S MOTION TO EXCLUDE EVIDENCE**

Petitioner seeks to exclude certain testimony of its expert witness, Edward Frederick, elicited during his cross-examination deposition on the grounds that the testimony is outside the scope of his direct testimony. Petitioner's motion should be denied because (1) counsel did not object to most of the questions or testimony (objecting to only a single question), (2) the elicited testimony was directly connected to aspects of Frederick's direct testimony, (3) the testimony otherwise pertained to his credibility as an expert witness regarding the patented technology and (4) the testimony was obtained without the use of leading questions. Furthermore, contrary to Petitioner's assertion, the testimony sought to be excluded is not the sole support supplied by NIKE for the amended claims. (*See* Paper 31 (NIKE, Inc.'s Motion to Amend U.S. Patent 7,347,011) at pp. 3-6 and Paper 44 (NIKE's Reply to Petitioner's Opposition to NIKE's Motion to Amend U.S. Patent 7,347,011) at pp. 3-4). Even if Frederick's testimony is excluded, NIKE's Motion to Amend provides more than enough additional evidence to sustain NIKE's burden.

## I. This Motion is Limited to One Page of Testimony

Petitioner's Motion is limited solely to Mr. Frederick's cross-examination testimony recorded on page 116 of Ex 2009, lines 3 through 25. (See Motion at



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page 4, lines 6-8 and at page 6, lines 1-3).[1] Although Petitioner cites to other objections in the deposition transcript (see Motion at page 3, lines 3-5), Petitioner has not moved to exclude this other evidence, so the Board should disregard Petitioner's comments regarding this testimony and these objections.

## II. Governing Rules

The Federal Rules of Evidence apply during an *Inter Partes Review* trial. 37 C.F.R. 42.62. FRE 611(b) reads as follows:

> **(b) Scope of Cross-Examination.** Cross-examination should not go beyond the subject matter of the direct examination and matters affecting the witness's credibility. The court may allow inquiry into additional matters as if on direct examination.

Petitioner has provided no basis to assert that 37 C.F.R. 42.53(d)(5)(ii) somehow limits or changes the applicable Federal Rules of Evidence.

## III. Petitioner Did Not Object to Most of the Questions and Testimony

Petitioner seeks to exclude an entire page of Mr. Frederick's testimony (Ex 2009, page 116, lines 3 through 25) even though Petitioner's counsel only made a

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[1] Rule 42.22 (37 C.F.R. 42.22) requires a statement of the precise relief requested. Here, the only statements requesting any relief are found in the Motion at page 4, lines 6-8 and at page 6, lines 1-3, and are limited solely to Frederick's testimony appearing on page 116, lines 3 through 25 of Ex 2009.



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single objection to a single question at the bottom of the entire page of testimony, at page 16 , lines 21-24. Counsel did not object to the questions and testimony at page 16, lines 3 through 20. For this reason alone, Petitioner's motion should be denied as to all of the testimony other than the question and answer at page 16, lines 21-25. Petitioner's after-the-fact assertion that its single objection pertained to "the numerous questions related to the processing of the edges of the knitted material" is belied by the record and incorrect. Even if the single objection on page 116 to the question bridging lines 21-23 is sustained, there is no basis to exclude the earlier testimony.

## IV. The Questions and Testimony Were Not Beyond the Scope of the Direct Examination and Go To The Basis and Credibility of Frederick's Direct Testimony

The subject matter of direct examination is broadly construed to include all inferences and implications arising from such testimony. *United States v. Tomblin,* 46 F.3d 1369, 1386 (5th Cir. 1995), citing *United States v. Arnott*, 704 F.2d 322, 324 (6th Cir. 1983). Here, Frederick testified that he reviewed the '011 patent and specifically reviewed a knitting technology textbook. (Ex 1001, ¶7). He testified that he, as a POSITA, had "a comprehensive understanding of the range of material choices, as well as ***construction techniques and processes used to create the various parts of a shoe.***" (Ex 1001, ¶9) (emphasis added). He understood that the claimed upper incorporated "a textile element with edges" (Ex 1001, ¶19). He



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specifically testified about the embodiment of Figure 8 (Ex 1001, ¶25) and again referenced the "edges of the textile element." (Ex 1001, ¶26). He testified that the '011 patent identified several types of knitting and knitting machines and also specifically referred to the Figure 10 embodiment. (Ex 1001, ¶¶28-29).

Examining Mr. Frederick on the nature of the various forms that the edges of the textile element may exhibit was properly within the scope of Mr. Frederick's direct testimony and bore directly on whether he was qualified to testify on the subject matter of the '011 Patent. Petitioner's attempt to circumscribe the cross-examination questions to the teachings of the prior art misapprehends the nature of the cross-examination process.

Petitioner complains that Patent Owner's questions impermissibly focused on a term "flat knit edges," which Petitioner says is not in the original claims. However, even a cursory review of the deposition transcript shows that that phrase was not used in any question, anywhere in the examination. Thus, this criticism is without merit.

In any event, the entire line of questioning relates to aspects of Mr. Frederick's direct testimony and to his overall knowledge of the patented technology, a point which has a bearing on his credibility to provide expert testimony in this proceeding. Cross-examination going to the reliability of the



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direct testimony and the credibility of the witness are always permitted. (*See* FRE 611(b)).

Even if the questioning exceeded the scope of Mr. Frederick's declaration testimony, these questions are exactly the type of questioning that the Board in its discretion should permit. The question were posed in a non-leading manner and were directed to fundamental structural features of both the invention and the prior art. The testimony should not be excluded.

## V. Conclusion

NIKE respectfully requests that the Board deny or dismiss Petitioner's Motion to Exclude.

Respectfully submitted,

Dated: January 21, 2014 By: /J. Pieter van Es/

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Skechers EX1013-p. 6271
Skechers v Nike

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Attorneys for Patent Owner
NIKE, Inc.



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Skechers v Nike

## CERTIFICATE OF SERVICE

The undersigned certifies that on January 21, 2014, a copy of **NIKE'S OPPOSITION TO PETITIONER MOTION TO EXCLUDE EVIDENCE** was served on the Petitioner by emailing a copy to mstockwell@kilpatricktownsend.com, wkadaba@kilpatricktownsend.com and tiwilliams@kilpatricktownsend.com.

/H. Wayne Porter/
H. Wayne Porter
Reg. No. 42,084
Back-Up Counsel for
Patent Owner



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Skechers v Nike

Trials@uspto.gov
571-272-7822

Paper 52
Date: January 23, 2014

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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adidas AG
Petitioner

v.

NIKE, Inc.
Patent Owner

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Case IPR2013-00067
Patent 7,347,011 B2

---

Before JOSIAH C. COCKS, MICHAEL J. FITZPATRICK, and JAMES B. ARPIN, *Administrative Patent Judges.*

COCKS, *Administrative Patent Judge.*

ORDER
Conduct of Proceeding
*37 C.F.R. § 42.5*

In e-mail correspondence to the Board and opposing counsel on January 22, 2014, Petitioner, adidas AG, requested a joint conference call pursuant to the Board's Order (Paper 50) to discuss the unavailability of its lead counsel, Mitchell Stockwell, at the upcoming oral hearing on February 10, 2014. As summary of points for discussion, adidas AG indicated that due to change in another trial schedule outside Mr. Stockwell's control, Mr. Stockwell now has a conflict that overlaps with the date of the February 10, 2014 oral hearing. In lieu of Mr. Stockwell's appearance, adidas AG requested that additional back-up counsel, Theodore Brown (Registration No. 31,741), be added in this proceeding for attendance and to make the presentation at the hearing. Party adidas AG represented that Patent Owner, Nike, Inc., has no objection to the request.

The Board has determined that adidas AG has complied with the Board's Order in requesting a joint conference call, but that no conference call is necessary in this circumstance.

It is:

ORDERED that adidas AG's request to add Theodore Brown (Registration No. 31,741) as additional back-up counsel is *granted*; and

FURTHER ORDERED that adidas AG should add Theodore Brown as back-up counsel in this proceeding via the Board's Patent Review Processing System ("PRPS") prior to the February 10, 2014 oral hearing.



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PETITIONER:

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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adidas AG
Petitioner

v.

Nike, Inc.

Patent Owner

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Case IPR2013-00067

Patent No. 7,347,011

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**MANDATORY NOTICE INFORMATION**
**(ADDITION OF BACK-UP COUNSEL)**

In accordance with the Board's Order of January 23, 2014, Petitioner adidas AG has added Theodore G. Brown III as back-up counsel in this proceeding, and submits the following updated mandatory notice information in accordance with 37 CFR § 42.8(b) to reflect the addition of Mr. Brown as back-up counsel.

Real Party-In-Interest under 37 C.F.R. § 42.8(b)(1)

Petitioner, adidas AG, is the real party-in-interest for the instant petition.

Related Matters under 37 C.F.R. § 42.8(b)(2)

No related matters are currently known to the Petitioner.

Lead and Back-Up Counsel under 37 C.F.R. § 42.8(b)(3)

| | |
|---|---|
| Lead: | Mitchell G. Stockwell, Registration No. 39,389 |
| Back-up: | Vaibhav P. Kadaba, Registration No. 45,865 |
| Back-up: | Tiffany L. Williams, Registration No. 59,549 |
| Back-up: | Theodore G. Brown III, Registration No. 31,741 |

Service Information under 37 C.F.R. § 42.8(b)(4)

(i) Email: mstockwell@kilpatricktownsend.com

wkadaba@kilpatricktownsend.com

| | | |
|---|---|---|
| | | tiwilliams@kilpatricktownsend.com |
| | | tbrown@kilpatricktownsend.com |
| (ii)-(iii) | Postal and hand delivery: | (Stockwell, Kadaba, & Williams)<br>Kilpatrick Townsend and Stockton, LLP<br>1100 Peachtree Street, N.E., Suite 2800<br>Atlanta, GA 30309<br>(Brown)<br>Kilpatrick Townsend and Stockton, LLP<br>1080 Marsh Road<br>Menlo Park, CA 94025 |
| (iv) | Telephone numbers: | (404) 815-6214 (Stockwell)<br>(404) 532-6959 (Kadaba)<br>(404) 815-6608 (Williams)<br>(650) 324-6353 (Brown) |
| (v) | Facsimile numbers: | (404) 541-3403 (Stockwell)<br>(404) 541-3258 (Kadaba)<br>(404) 541-4698 (Williams)<br>(650) 618-2029 (Brown) |

Respectfully submitted,

Dated: January 28, 2014

By: *s/Vaibhav P. Kadaba*

Vaibhav P. Kadaba
Reg. No. 45,865
Back-Up Counsel for Petitioner

| Lead Counsel | Back-Up Counsel |
|---|---|
| Mitchell G. Stockwell (Reg. No. 39,389)<br>(mstockwell@kilpatricktownsend.com)<br>T: 404 815 6214; F: 404 541 3403<br><br>Postal and Hand-Delivery Address:<br>Kilpatrick Townsend & Stockton LLP<br>1100 Peachtree Street, Suite 2800<br>Atlanta, GA 30309-4528 | Vaibhav P. Kadaba (Reg. No. 45,865)<br>(wkadaba@kilpatricktownsend.com)<br>T: 404 532 6959; F: 404 541 3258<br><br>Tiffany L. Williams (Reg. No. 59,549)<br>(tiwilliams@kilpatricktownsend.com)<br>T: 404 815 6608; F: 404 541 4698<br><br>Theodore G. Brown III (Reg. No. 31,741)<br>(tbrown@kilpatricktownsend.com)<br>T: (650) 324-6353; F: (650) 618-2029<br><br>Postal and Hand-Delivery Address:<br>(Kadaba & Williams)<br>Kilpatrick Townsend & Stockton LLP<br>1100 Peachtree Street, Suite 2800<br>Atlanta, GA 30309-4528<br><br>(Brown)<br>Kilpatrick Townsend and Stockton, LLP<br>1080 Marsh Road<br>Menlo Park, CA 94025 |

## CERTIFICATE OF SERVICE

The undersigned certifies that on January 28, 2014, a complete and entire copy of this MANDATORY NOTICE INFORMATION (ADDITION OF BACK-UP COUNSEL) was served on Patent Owner Nike, Inc. by emailing a copy to counsel at the email addresses listed below:

Joseph M. Skerpon
Email: jskerpon@bannerwitcoff.com

H. Wayne Porter
Email: wporter@bannerwitcoff.com

J. Pieter van Es
Email: pvanes@bannerwitcoff.com

Thomas Pratt
Email: tpratt@bannerwitcoff.com

Dated: January 28, 2014

By: *s/Vaibhav P. Kadaba*

Vaibhav P. Kadaba
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Back-Up Counsel for Petitioner

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571-272-7822

Paper 60
Entered: April 28, 2014

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

---

adidas AG
Petitioner

v.

NIKE, Inc.
Patent Owner

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Case IPR2013-00067
Patent 7,347,011 B2

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Before JOSIAH C. COCKS, MICHAEL J. FITZPATRICK, and JAMES B. ARPIN, *Administrative Patent Judges.*

ARPIN, *Administrative Patent Judge.*

# FINAL WRITTEN DECISION

*35 U.S.C. § 318(a) and 37 C.F.R. § 42.73*

# I. INTRODUCTION

On December 10, 2012, adidas AG ("Petitioner") filed a revised petition (Paper 7) challenging claims 1-46 of Patent No. US 7,347,011 B2 (Ex. 1002, "the '011 Patent"). Petitioner relied upon the following prior art references:

| | | | |
|---|---|---|---|
| Glidden | US 2,147,197 | Feb. 14, 1939 | (Ex. 1007) |
| McDonald | US 2,314,098 | Mar. 16, 1943 | (Ex. 1008) |
| Whiting | US 2,641,004 | June 9, 1953 | (Ex. 1009) |
| Shiomura | US 4,785,558 | Nov. 22, 1988 | (Ex. 1011) |
| Curley | WO 90/03744 | Apr. 19, 1990 | (Ex. 1010) |
| Osamu | JP H06-113905 | Apr. 26, 1994 | (Ex. 1006) |
| Nishida | US 5,345,638 | Sep. 13, 1994 | (Ex. 1005) |

On February 28, 2013, Nike, Inc. ("Patent Owner") filed a patent owner preliminary response (Paper 12). In a decision to institute (Paper 18) issued May 17, 2013, we[1] instituted *inter partes* review of all of the challenged claims as to the following grounds for review:

claims 1-16, 19-34, 36, and 39-46 as anticipated by Nishida;

claims 16-18 as anticipated by Glidden;

claims 1-16 and 19-46 as obvious over Nishida; and

claims 16-18 as obvious over Glidden.

On August 18, 2013, Patent Owner filed a motion to amend (Paper 31), accompanied by certain testimony of Patent Owner's expert, Dr. Tonkel

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[1] After issuance of the decision to institute, Judge Cocks replaced Judge Tierney as the administrative patent judge managing this proceeding. Paper 30.



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(Ex. 2010), but elected not to file a patent owner response. In the scheduling order (Paper 19, 2-3), Patent Owner had been cautioned that any arguments for patentability not raised in the patent owner response are deemed waived. On November 12, 2013, Petitioner filed an opposition (Paper 37) to the motion to amend, including three additional exhibits: declaration of Sabit Adanur Ph.D. (Ex. 1016) and Patent Nos. US 2,178,941 (Ex. 1020, "Schuessler I") and US 2,150,730 (Ex. 1021, "Schuessler II"). On December 11, 2013, Patent Owner filed a reply (Paper 44) to Petitioner's opposition to the motion to amend.

On January 7, 2014, Petitioner filed a motion to exclude evidence (Paper 49). Specifically, Petitioner moved to exclude (1) certain testimony elicited on cross-examination of Petitioner's expert, Dr. Frederick (Ex. 2009 (deposition testimony of Dr. Frederick)), as allegedly beyond the scope of Dr. Frederick's direct testimony (Ex. 1001 (declaration of Dr. Frederick)); and (2) certain testimony of Patent Owner's expert, Dr. Tonkel, which allegedly relied on the challenged, cross-examination testimony of Dr. Frederick. On January 21, 2014, Patent Owner filed Patent Owner's opposition (Paper 51) to Petitioner's motion to exclude evidence; and, on January 28, 2014, Petitioner filed Petitioner's reply (Paper 54) to Patent Owner's opposition to Petitioner's motion to exclude evidence.

Both parties requested oral argument. Papers 47 and 48. In the trial hearing order (Paper 50), we gave each party thirty (30) minutes to argue its case. Because Patent Owner did not file a patent owner response, we ordered (1) that the parties would not present arguments regarding whether



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original claims 1-46 are unpatentable based on the instituted grounds and (2) that Patent Owner, rather than Petitioner, would argue first. Paper 50, 2. The oral hearing was conducted on February 10, 2014.[2]

We have jurisdiction under 35 U.S.C. § 6(c). This final written decision is entered pursuant to 35 U.S.C. § 318(a).

For the reasons that follow, the portion of Patent Owner's motion to amend requesting cancellation of claims 1-46[3] is *granted*; however, the portion of the motion requesting entry of substitute claims 47-50 is *denied*.

Petitioner's motion to exclude evidence is *dismissed* as moot.

### *A. Related Proceedings*

Petitioner does not identify related proceedings. Paper 7, 1. Patent Owner identifies three related patents, identified by Patent Nos. US 7,814,598 B2; US 8,042,288 B2, and US 8,266,749 B2; and one related U.S. patent application, identified by U.S. Patent Application No. 13/413,233. Paper 9, 2.

### *B. The '011 Patent*

The '011 Patent relates to articles of footwear having a textile "upper." Ex. 1002, col. 1, ll. 7-10. In particular, the patent describes articles of footwear having an upper incorporating a knitted textile element and having a sole structure secured to the upper. *Id.* at col. 3, ll. 20-47.

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[2] A transcript of the hearing is included in the record as Paper 59.

[3] *See* Paper 31, 1.



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Conventional articles of athletic footwear may include two primary elements: an upper and a sole structure. *Id.* at col. 1, ll. 12-15. The upper may form a void on the interior of the footwear for receiving a wearer's foot, and the upper may extend over the instep and toe areas, along the medial and lateral sides, and around the heel area of the wearer's foot. *Id.* at ll. 30-35. The upper may be formed of multiple layers of materials, which may be selected for properties of wear resistance, flexibility, and air permeability. *Id.* at ll. 43-50. Thus, different areas of the exterior layer of the upper may be formed of different materials with differing properties. *Id.* at ll. 51-60. In that regard, the '011 Patent explains that:

> A textile may be defined as any manufacture from fibers, filaments, or yarns characterized by flexibility, fineness, and a high ratio of length to thickness. *Textiles generally fall into two categories.* The first category includes textiles produced directly from webs of filaments or fibers by randomly interlocking to construct non-woven fabrics and felts. The second category includes textiles formed through a mechanical manipulation of yarn, thereby producing a woven fabric, for example.

*Id.* at col. 2, ll. 6-14 (emphasis added). Techniques for the mechanical manipulation of yarn into a textile include weaving (e.g., producing a woven material) and knitting (e.g., producing a knitted material). *Id.* at ll. 36-46. Further, textiles for uppers may be formed of weft or warp, woven or knitted materials. *Id.* at ll. 40-41; *see also id.* at col. 3, ll. 30-32 (describing weft knitted and warp knitted "textile elements").

Figure 8 of the '011 Patent is reproduced below.



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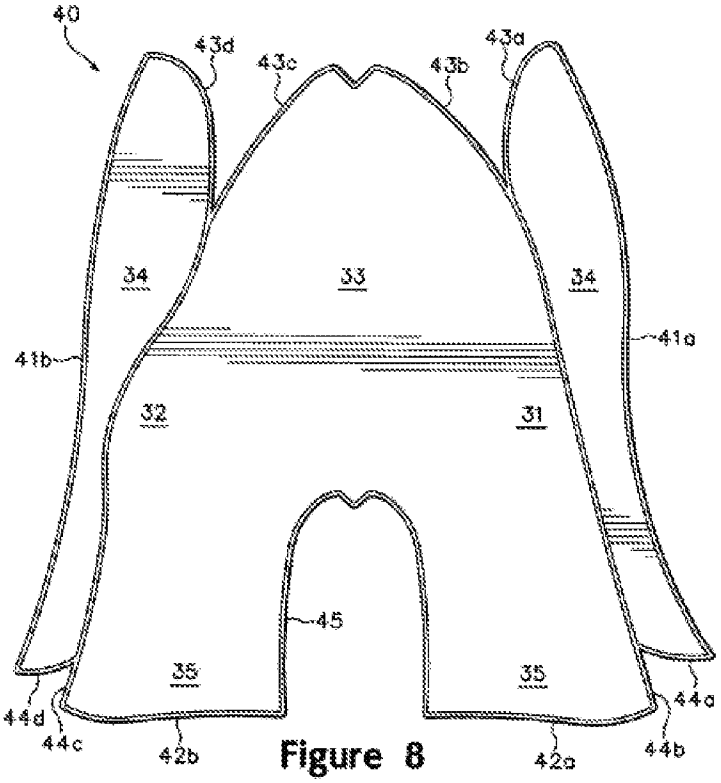



**Figure 8**

Figure 8 illustrates an embodiment of an upper according to the '011 Patent. *Id.* at col. 5, l. 58-col. 6, l. 65. Textile element 40 is a single material element with a unitary (i.e., one-piece) construction. *Id.* at col. 5, ll. 38-41; *see also id.* at figs. 10 (depicting textile element 40′) and 11 (depicting textile element 40″). Consequently, textile element 40 is configured, such that portions of the textile element are not joined together with seams or other connections. *Id.* at col. 5, ll. 38-41; col. 6, ll. 41-46. Edges 41a-44d, which are *free* in Figure 8, are joined together as shown in Figures 3-5 to form seams 51-54, thereby forming at least a portion of a void for receiving the foot. In contrast, lateral region 31, medial region 32, instep

region 33, lower regions 34, and heel regions 35 together have a unitary construction without seams (*id.* at col. 5, ll. 44-57; col. 6, ll. 47-50).

Figure 11 of the '011 Patent is reproduced below.

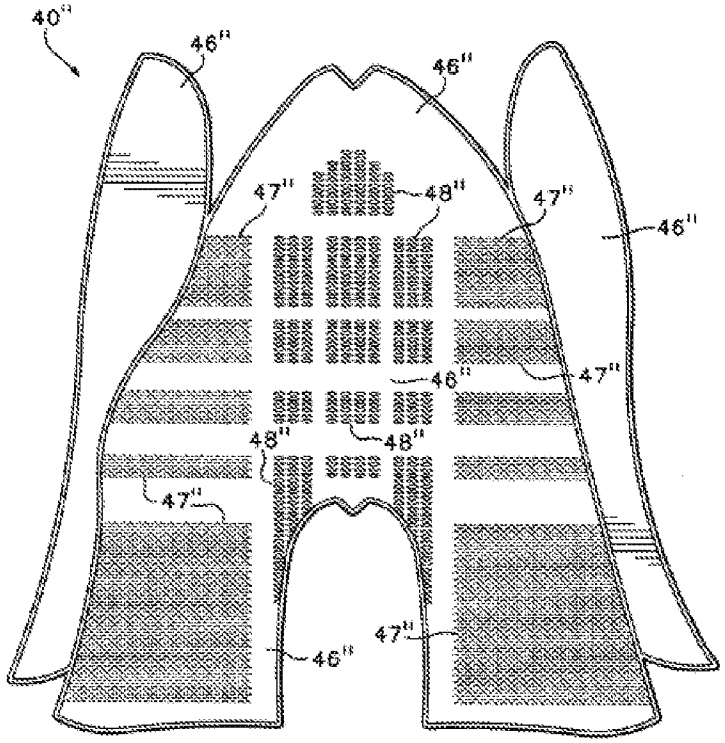



**Figure 11**

Figure 11 illustrates another embodiment of an upper according to the '011 Patent. *Id.* at col. 9, l. 36-col. 10, l. 14. Textile element 40″ includes three different areas with three different textures. *Id.* at col. 9, ll. 38-39. First texture 46″ is generally smooth and extends in strips across lateral region 31, medial region 32, and instep region 33 of the upper. *Id.* at ll. 39-42. In addition, textile element 40″ includes second texture 47″ and third texture 48″. *Id.* at ll. 42-46. Moreover, the '011 Patent describes that:

> The different textures 46″-48″ are formed *by merely varying the type of stitch formed* by the wide-tube circular knitting machine at each location of textile element 40″. Textures 46″-48″ may exhibit aesthetic differences, or the differences may be structural. *For example, the degree of stretch in areas with textures 46"-48" may be different, or the wear resistance of the areas may vary depending upon the stitch utilized.* The air-permeability of textile element 40‴ may also vary in the different areas.

*Id.* at ll. 46-54 (emphases added). Similarly, the type of yarn used in different areas may impart different properties to each area. *Id.* at col. 9, l. 65-col. 10, l. 14. Thus, the textures and properties of different areas of the upper may be varied by altering the stitching or yarn used in those areas.

*C. Status of the Claims*

Of the challenged claims, claims 1, 16, 24, 36, and 44 are independent. Independent claims 1, 24, and 36 recite similar limitations describing the formation of a void to receive the foot, and independent claims 16 and 44 recite similar limitations describing the unitary construction of the textile element. As to the dependent claims, claims 2-15 depend from claim 1, claims 17-23 depend from claim 16, claims 25-35 depend from claim 24, claims 37-43 depend from claim 36, and claims 45 and 46 depend from claim 44. In its motion to amend, Patent Owner states that "[i]ssued claims 1-46 are cancelled" (Paper 31, 1), and proposes four (4) substitute claims, claims 47-50, based on original claims 16, 19, and 20 (*id.*



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at 1-2) . The substitute claims are reproduced below:[4]

> Claim 47. (Substitute for independent claim 16) An article of footwear comprising
>
> an upper incorporating a [weft-knitted] flat knit textile element, the flat knit textile element
>
> (1) having flat knit edges free of surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed, some of the flat knit edges joined together to form an ankle opening in the upper for receiving a foot, the ankle opening having an edge comprised of one of the flat knit edges; and
>
> (2) having a first area and a second area with a unitary construction, the first area being formed of a first stitch configuration, and the second area being formed of a second stitch configuration that is different from the first stitch configuration to impart varying properties to the textile element; and
>
> a sole structure secured to the upper.
>
> Claim 48. (Substitute for dependent claim 19) The article of footwear recited in claim [16] 47, wherein at least one of the first stitch configuration and the second stitch configuration forms an aperture in the [weft-knitted] flat knit textile element and the joined edges shape the flat knit textile element to form a lateral region, a medial region, an instep region and a heel region of the upper.
>
> Claim 49. (Second substitute for dependent claim 19) The article of footwear recited in claim [16] 47, wherein at least one of the first stitch configuration and the second stitch configuration forms [an aperture] a plurality of apertures in the

[4] Subject matter deleted from original claims 16, 19, and 20 is enclosed by brackets; subject matter added to those claims is underlined.



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> [weft-knitted] flat knit textile element, the apertures formed by omitting stitches in the flat knit textile element and positioned in the upper for receiving laces.
>
> Claim 50. (Substitute for dependent claim 20) The article of footwear recited in claim [16] 47, wherein the [weft-knitted] flat knit textile element is one of an exterior layer, an intermediate layer, and an interior layer of the upper, and the joined edges shape the flat knit textile element to form a lateral region, a medial region, an instep region and a heel region of the upper.

Paper 31, 1-2. Thus, Patent Owner proposes amending original claim 16 to recite one of two sub-types of a *weft-knitted* textile element, namely a *flat knit* textile element. Paper 31, 1. Further, substitute claim 47 recites a negative limitation regarding the flat knit edges in terms of their method of manufacture. *See* Paper 37, 4; Paper 59, 20-21 and 23-25. Specifically, the "flat knit edges" are themselves flat knit and *not* cut from a flat knit textile. Paper 37, 9. Thus, the upper is recited as "having flat knit edges *free of surrounding textile structure* such that the flat knit edges *are not surrounded by textile structure* from which the textile element must be removed" (emphases added). Finally, some of the "flat knit edges" of the upper are joined to form an ankle opening. *Id.* at 10.

## II. DISCUSSION

Because Patent Owner did not file a response to the petition, we focus our discussion on Patent Owner's motion to amend. As noted above, in the motion to amend, Patent Owner requests the cancellation of claims 1-46 and



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the entry of one independent substitute claim, claim 47, and three dependent substitute claims, claims 48-50. Paper 31, 1-2. In support of its motion, Patent Owner filed a declaration of Dr. Tonkel (Ex. 2010).

An *inter partes* review is more adjudicatory than examinational, in nature. *See Abbott Labs. v. Cordis Corp.*, 710 F.3d 1318, 1326 (Fed. Cir. 2013). A *motion* to amend in an *inter partes* review is not itself an amendment. As the moving party, Patent Owner bears the burden of establishing that it is entitled to the relief requested. 37 C.F.R. § 42.20(c). Thus, Patent Owner's proposed substitute claims are not entered automatically, but may be entered upon Patent Owner's having demonstrated the patentability of the substitute claims.

*A. Claim Construction*

Claim construction is an important step in a patentability determination. *Medichem, S.A. v. Rolabo, S.L.*, 353 F.3d 928, 933 (Fed. Cir. 2003) ("Both anticipation under § 102 and obviousness under § 103 are two-step inquiries. The first step in both analyses is a proper construction of the claims. . . . The second step in the analyses requires a comparison of the properly construed claim to the prior art." (internal citations omitted)). Thus, a motion to amend must identify how the proposed substitute claims are to be construed, especially when the proposed substitute claims introduce new claim terms or features. *See Research in Motion Corp. v. MobileMedia Ideas LLC*, IPR2013-00016, Paper 32, 6. The motion to amend also must explain how the construed claim is distinguishable over the art.



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Neither Patent Owner nor Petitioner challenges our interpretation of certain terms of claim 16, as set forth in the decision to institute, which terms also appear in substitute claims 47-50. Paper 18, 10-17. The interpretations of those terms are adopted for purposes of this final decision. In particular, in the decision to institute, we construed expressly the claim terms: a "weft-knitted textile element," a "flat-knitted textile element," and "unitary construction." Paper 18, 11-15. Although the original claims are no longer at issue, the interpretation of terms in the decision to institute is relevant to the interpretation of those terms in the substitute claims.

*1. A Single Type of Textile*

Independent claims 1, 24, and 36 recite that a textile element incorporates "a single type of textile." In its petition, Petitioner pointed out that "[t]extile element 40 is primarily formed from one or more yarns that are mechanically-manipulated through either an interweaving, intertwining and twisting, or interlooping process." Paper 7, 10 (quoting '011 Patent, col. 6, ll. 51-54). "A single type of textile" is not defined expressly in the Specification of the '011 Patent. Nevertheless, we noted that a pertinent definition of the term "textile" is "any cloth or goods produced by weaving, knitting, or felting." RANDOM HOUSE WEBSTER'S COLLEGE DICTIONARY 1351 (2nd Random House ed. 1996) (Ex. 3001); *cf.* Ex. 1002, col. 2, ll. 6-14 (defining "textiles"). In addition, the term "textile" is defined more broadly as "[a] material made of natural or artificial fibers and used for the manufacture of items such as clothing or furniture fittings." MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS 1911 (4th ed. 1989)



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(Ex. 3002). As noted above, the '011 Patent states that textiles generally fall into two categories: fabrics formed of randomly locked filaments or fibers, such as felts; and fabrics formed of mechanically manipulated yarn, such as woven or knitted fabrics. Ex. 1002, col. 2, ll. 9-14.

The '011 Patent describes various techniques for mechanically manipulating yarn into woven fabrics or textiles, including interweaving (e.g., weaving), intertwining and twisting (e.g., braiding and knotting), and interlooping (e.g., knitting). *Id.* at ll. 36-46. In the decision to institute, we noted that claim 16 recites that the "textile element" is "knitted" and, in particular, "weft-knitted." Paper 18, 11-13.

*2. Weft-Knitted Textile Element and Flat-Knitted Textile Element*

According to Patent Owner, substitute claim 47 incorporates the limitations of challenged, independent claim 16. Paper 31, 1. In its petition, Petitioner argued that the terms "weft-knitted" and "flat-knitted" are well-known in the art. Paper 7, 10. We agreed.

As noted above, the Specification of the '011 Patent describes that various textile types (e.g., weft knitting textiles) and sub-types (e.g., circular and flat knitted) may be used to manufacture textile elements for incorporation into the uppers of the claimed articles of footwear. Ex. 1002, col. 6, l. 66-col. 7, l. 10. In the "Detailed Description of the Invention" portion of the Specification, the '011 Patent further describes that:

> A variety of mechanical processes have been developed to manufacture a textile. *In general, the mechanical processes may be classified as either warp knitting or weft knitting.* With regard to warp knitting, various specific *sub-types* that may be



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> utilized to manufacture a textile include tricot, raschel, and double needle-bar raschel (which further includes jacquard double needle-bar raschel). *With regard to weft knitting, various specific sub-types that may be utilized to manufacture a textile include circular knitting and flat knitting.* Various types of circular knitting include sock knitting (narrow tube), body garment (seamless or wide tube), and jacquard.

*Id.* at col. 6, l. 66-col. 7, l. 10 (emphases added).

Although the '011 Patent does not include a definition of either the term "weft knitting" or "warp knitting," a pertinent definition of "weft knitting" is "[a] knitting process in which *a continuous yarn* is carried *in crosswise rows*." MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS at 2054 (Ex. 3002; emphases added); *see also* Ex. 1001 ¶ 56 (reproducing H. Eberle et al., CLOTHING TECHNOLOGY, Sec. 3.3.1 (3rd English ed. 2002) (weft knitted fabric "[m]ay be made from a single yarn")). By comparison, a pertinent definition of the term "warp knitting" is "[a] knitting process in which *a group of yarns form rows running lengthwise* by an interlocking process." MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS at 2045 (Ex. 3002; emphasis added). Similarly, flat knitting is described in the '011 Patent as a sub-type of weft knitting, in which the textile is knit as a sheet or flat piece of textile (Ex. 1002, col. 7, ll. 5-8), in contrast to, for example, circular knitting, which is another sub-type of weft knitting (*see* Ex. 1002, fig. 9).

In its opposition to the motion to amend, Petitioner argues that, although flat knitting may be a sub-type of weft knitting, flat knitting is broader than that and describes any "knitted textile that is knit in a flat



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form," and necessarily includes other types of knitted textiles, including warp knit textiles. Paper 37, 1-2. In the context of this Specification, we are not persuaded that flat knitting should be construed so broadly.

In construing the term "flat knitting," we apply the broadest reasonable interpretation of the words in their ordinary usage, as those words would be understood by one of ordinary skill in the art, taking into account any definitions supplied by the Specification. *See In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997). The Specification of the '011 Patent expressly describes flat knitting as a *sub-type* of weft knitting. Ex. 1002, col. 7, ll. 5-8. Ultimately, "[t]he construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be . . . the correct construction." *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998).

Further, Patent Owner presents evidence that a person of ordinary skill in the art would understand flat knitting to describe a sub-type of weft knitting. Paper 44, 1 (quoting a textile dictionary (Ex. 2011, 6) to state that "the trade uses the term flat knit fabric to refer to weft knit fabrics made on a flat machine, rather than warp-knit fabrics"); *see also* Ex 2017, 5; Ex. 2018, 6. Despite its argument, Petitioner identifies no portion of the Specification of the '011 Patent that describes flat knitting with respect to warp knitting or any other type of knitting, beyond weft-knitting. *See* Paper 37, 2-3. In addition, *before* the filing date of the motion to amend, Dr. Frederick, Petitioner's expert, testified that "[f]lat knitting would be another type of weft knitting that would involve an end result that was . . . on a curved



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surface, but more or less flat." Ex. 2009, 89, ll. 6-11. Therefore, we determine that the term "weft knitting" describes a type of knitting in which a continuous yarn is carried in crosswise rows, and we construe the term "flat knit" to recite a sub-type of weft knitting, in which the weft knit textile is produced as a sheet of more or less flat material.[5]

*3. The Textile Element Having First and Second Areas*

In its petition, Petitioner argued that the phrase "the textile element *having a first area and a second area* with a unitary construction" in original claim 16 should be construed to require a textile element (1) having a unitary construction *and* (2) having a first area and a second area, each area having stitching that imparts different properties to its area. Paper 7, 11-12 (emphasis added). Thus, Petitioner argued that the textile element has a *single* unitary construction containing different areas. Petitioner also argued, however, that separate unitary constructions in *different* areas of the textile element would be inconsistent with the invention, as described in the Specification. *Id.* at 12.

The '011 Patent expressly defines the term "unitary construction." Ex. 1002, col. 6, ll. 41-46. The '011 Patent states that, "[*a*]*s defined for purposes of the present invention*, unitary construction is intended to express a configuration wherein portions of a textile element are not joined together

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[5] Although not dispositive for purposes of our construction of this term, we are mindful that Patent Owner proposed the replacement of "weft-knitted" with "flat knit" in original claim 16 in order to narrow the scope of substitute claim 47 in a manner consistent with the language of the Specification.



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by seams or other connections, *as depicted with textile element 40 in FIG. 8*." *Id.* (emphases added); *see* Paper 18, 10-11 (citing *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994)). Consequently, we construe the phrase "the textile element having a first area and a second area with a unitary construction" to require a textile element having a unitary construction *and* having a first area and a second area.

4. *Flat Knit Edges Free Of Surrounding Textile Structure Such That The Flat Knit Edges Are Not Surrounded By Textile Structure From Which The Textile Element Must Be Removed*

Patent Owner proposes adding these limitations to original claim 16 in substitute claim 47 in order to distinguish the substitute claims over the references cited by Petitioner in its petition and over other references known to Patent Owner. Paper 31, 3. The Specification of the '011 Patent describes a textile element with "edges" (*e.g.*, Ex. 1002, Abstract; col. 6, ll. 47-50 (describing edges 41a-44d of textile element 40)), and such edges were recited in the challenged claims (*see id.* at Claims 1, 3, 4, 6, 24, 36, and 39-41). In substitute claim 47, however, Patent Owner proposes to limit further those edges as (1) "flat knit" edges and (2) edges "free of surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed." We address the construction of each of these limitations in turn.



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*a. Flat Knit Edges*

Patent Owner argues that "flat knit edges" are edges that are themselves "flat knit," as opposed to edges that are formed by cutting a textile element from a textile structure that has been created by flat knitting. Paper 31, 7-8. In particular, Patent Owner argues that cutting a textile element from a larger textile structure, such as is taught by Nishida (*see* Ex. 1005, col. 2, ll. 1-10), requires that the stitches at the textile element edges are broken, e.g., by a knife, die cutter, or other cutting technique, in order to separate the textile element from the surrounding textile structure. Paper 31, 7-8 (citing Ex. 2010 ¶¶ 101-105). Moreover, Patent Owner argues that, if untreated, such cut edges are subject to fraying or unraveling. *Id.; see also* Ex. 2010 ¶ 46 (citing Ex. 1007, 2, col. 1, ll. 56-63; Ex. 1009, col. 3, l. 68-col. 4, l. 16). Conversely, if the edges, like the textile of the flat knit textile element, are flat knit, Patent Owner argues that such edges inherently have a stable configuration in which the yarn of stitches at the edges of the textile element is unbroken and joined from one row to the next row. *Id.* at 8 (citing Ex. 2010 ¶ 105); *see also* McGraw-Hill Dictionary of Scientific and Technical Terms at 2054 (Ex. 3002); Ex. 1001 ¶ 56. Thus, Patent Owner argues that the yarns forming the flat knit edges of the flat knit textile element, as recited in substitute claim 47, retain their integrity, e.g., are unbroken and remain joined between rows. *See* Ex. 2010 ¶ 105. Therefore, according to Patent Owner, a *flat knit* edge of a flat knit textile element is structurally different from a *cut* edge of a flat knit textile element.



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Petitioner contends that the term "flat knit edges" has two plausible meanings. First, flat knit edges may be edges created when a textile element is cut from a larger flat knit textile structure. Second, flat knit edges may be edges created when a flat knit textile element is knit to shape. In an absolute sense, we agree. Nevertheless, we must determine what the term means in the context of *this* claim (including surrounding claim language) and in the context of the Specification of *this* patent. Here, we construe a flat knit edge to be an edge of a flat knit textile element, which is itself flat knit, e.g., which is not formed by cutting from a flat knit textile element.

*b. Edges Free Of Surrounding Textile Structure Such That The Flat Knit Edges Are Not Surrounded By Textile Structure From Which The Textile Element Must Be Removed*

Figures 8, 10, and 11 of the Specification of the '011 Patent depict textile elements 40, 40′, and 40″, respectively, without any textile structure surrounding the textile elements. Patent Owner argues that these figures depict a flat knit textile element with flat knit edges and without any textile structure surrounding the textile elements, as recited in substitute claim 47. Paper 31, 3-4; *see, e.g.*, Ex. 1002, col. 6, ll. 41-50 (describing the unitary construction of textile element 40). In contrast, Figure 9 of the Specification depicts an embodiment of the disclosed invention in which a plurality of textile elements 40 is cut from a *circular knit* textile structure 60. Ex. 1002, col. 7, ll. 41-48. Thus, as noted above, Patent Owner argues that, unlike the cut out textile elements depicted in Figure 9, flat knit textile elements having



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flat knit edges are depicted in and disclosed by Figures 8, 10, and 11. Paper 31, 4 (citing Ex. 2010 ¶¶ 36, 37, 40-41, and 62-67).

Petitioner argues that this limitation of substitute claim 47 properly is construed as a negative limitation and that the negative limitation lacks sufficient written description. Paper 37, 4. As the U.S. Court of Appeals for the Federal Circuit explained,

> [t]he test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter, *rather than the presence or absence of literal support in the specification for the claim language* . . . The content of the drawings may also be considered in determining compliance with the written description requirement.

*In re Kaslow*, 707 F.2d 1366, 1375 (Fed. Cir. 1983) (emphasis added; citations omitted). To the extent that the language of substitute claim 47 recites a negative limitation, we conclude that this negative limitation is supported by the positive disclosure of the various forms of the textile element, including a flat knit textile element, with "edges free of surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed," in Figures 8, 10, and 11 of the '011 Patent. *See Santarus, Inc. v. Par Pharm., Inc.*, 694 F.3d 1344, 1351 (2012) ("it is possible for the patentee to support both the inclusion and exclusion of the same material."). In view of the positive disclosure of this feature, the Specification need not disclose a reason to exclude. *Ex Parte Lazaridis and Brown*, Appeal No. 2010-



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005137, 2013 WL 1331529 (2013) (discussing an alternative basis for excluding a limitation in the absence of a positive recitation). Thus, we are persuaded that the Specification discloses flat knit edges free of surrounding material, as recited in substitute claim 47.

The language added to substitute claim 47 arguably recites the claimed invention in terms of the manner in which it is made, i.e., as a product-by-process limitation. During the oral hearing, the parties disagreed as to whether the added language is a product-by-process limitation. Paper 59, 10-11 and 20. We determined above that the process of creating a flat knit textile element with flat knit edges having no surrounding material creates an edge that is *structurally* different from a cut edge. Therefore, because the described process imparts structural differences to the textile element and, hence, to the claimed article of footwear, this limitation may be used to distinguish substitute claim 47 over the prior art. *See Greenliant Sys., Inc. v. Xicor LLC*, 692 F.3d 1261, 1265 (2012) ("[T]he process limitations in product-by-process claims . . . cannot be used to distinguish prior art *unless the process imparts structural differences to the product*." (emphasis added)).

As noted above, we construe the claims in view of the Specification. The Specification need not present every embodiment or permutation of the invention, and the claims are not limited to a preferred embodiment of the invention. *See Comark Commc'ns, Inc. v. Harris Corp.*, 156 F.3d 1182, 1186 (Fed. Cir. 1998). The claims, however, may not enlarge the scope of what is patented beyond what the inventor has described as the invention.



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Claim construction is the judicial statement of what is and is not covered by the technical terms and other words of the claims. *See United States Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997). Here, the Specification broadly discloses the structure of the textile elements, e.g., textile elements 40, 40′, and 40″, from which a shoe upper may be formed. Moreover, the Specification describes an embodiment of a method for cutting a plurality of textile elements from a *weft* knit, and, in particular, a *circular* knit, textile structure (*see* Ex. 1002, fig. 9), but the disclosed invention is not limited to textile elements manufactured according to this embodiment. The Specification teaches that textile structure 60, from which textile elements 40, 40′, or 40″ may be cut, "may be formed" according to the embodiment depicted in Figure 9, but we conclude that those textile elements also may be made according to other embodiments. Ex. 1002, col. 8, ll. 1-14.

For example, Patent Owner's expert, Mr. Tonkel, testifies that, based on his reading of the Specification, textile elements 40, 40′, and 40″ may be made by the flat knitting of yarn by the known process of "knit[ting] to shape." Ex 2010 ¶¶ 36, 37, 40-42, and 62-67. Petitioner's expert does not disagree. Ex. 1001 ¶ 28 ("The '011 Patent describes that the textile element may be formed *any number of ways* with one or more yarns that are mechanically manipulated *using a variety of existing processes* . . ." (emphases added)); *see also* Ex. 1001 ¶ 53 ("Significantly, the '011 Patent states that the textile element may be formed *through any of the mechanical processes discussed in the specification*." (emphasis added)). Thus, we



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conclude that this language of substitute claim 47 is construed properly to describe a knit to shape textile element formed by flat knitting, having flat knit edges. Such flat knit edges are knit, such that the yarns and fibers forming the flat knit edges of the flat knit textile element, as recited in substitute claim 47, are unbroken and remain joined between rows forming the edges.

*5. Remaining Claim Terms or Phrases*

All remaining claim terms and phrases recited in substitute claims 47-50 are given their ordinary and customary meaning, consistent with the Specification, as would be understood by one with ordinary skill in the art.

*B. A Reasonable Number Of Substitute Claims*

Under 35 U.S.C. § 316(d)(1), a patent owner may, for each challenged claim, propose a reasonable number of substitute claims in a motion to amend. Each proposed claim should be traceable to an original, challenged claim as a proposed substitute claim for that challenged claim. Absent special circumstances, a challenged claim can be replaced by only one claim. The presumption is that only one substitute claim would be needed to replace each challenged claim, although the presumption may be rebutted by a demonstration of need. 37 C.F.R. § 42.121(a)(3).

In its motion to amend, Patent Owner proposes substitute, independent claim 47 for original, independent claim 16; *two,* substitute, dependent claims, claims 48 and 49, for original, dependent claim 19; and substitute, dependent claim 50 for original, dependent claim 20. Paper 31, 2.



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Thus, Patent Owner has proposed more than one substitute claim for original claim 19.

In the order acknowledging that Patent Owner complied with the requirement of 37 C.F.R. § 42.121(a) to confer with us prior to filing a motion to amend, we noted that, if more than one substitute claim is proposed for a challenged claim, for each proposed substitute claim, the patent owner is expected to make a showing of patentable distinction over all other proposed substitute claims for the same challenged claim. Paper 29, 2-3 (quoting *Idle Free Sys., Inc. v. Bergstrom, Inc.*, IPR2012-00027, Paper 26, 8-9 (emphasis added)).

If more than one substitute claim is proposed for the same challenged claim, the motion to amend must show that these multiple substitute claims are patentably distinct from each other. If shown to be patentably distinct from each other, the multiple claims are likely not unreasonable in number. Paper 29, 2-3. If, however, no such patentable distinction is shown in the motion, then we, in our discretion, may deny entry of the excess claims *or* group the multiple substitute claims together for common treatment over the prior art. *Id.* at 3.

Patent Owner argues that dependent claims 48 and 49, each of which is a substitute for claim 19, are patentably distinct from each other. Paper 31, 15 (citing Ex. 2010 ¶¶ 169-176). According to Patent Owner, "[c]laim 49 does not teach or suggest 'joined edges [that] shape the flat knit textile element to form a lateral region, a medial region, an instep region and a heel region of the upper,'" as recited in claim 48. Paper 31, 15 (citing Ex. 2010



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¶ 174). Similarly, Patent Owner argues that "[c]laim 48 does not teach or suggest 'apertures formed by omitting stitches in the flat knit textile element and positioned in the upper for receiving laces,'" as recited in claim 49. *Id.* (citing Ex. 2010 ¶176).

Initially, we note that each of claims 48 and 49 depends directly from independent claim 47 and incorporates the limitations of claim 47 and original claim 19. With respect to the additional limitations of claim 48, Nishida describes joining the edges of the layout to form various portions of the upper, as recited. Ex. 1002, col. 2, ll. 6-10; col. 3, ll. 27-42; fig. 3; *see also* Paper 18, 20-25 (discussing original claims 3, 4, 6, 24, 39-41); Paper 37, 14-15 (claim chart for claim 48). With respect to the additional limitations of claim 49, Nishida describes forming lacing areas by knitting. Ex. 1002, col. 3, l. 66-col. 4, l. 5; *see also* Paper 18, 24-25 (discussing original claim 26); Paper 37, 15 (claim chart for claim 49). Further, the Specification of the '011 Patent describes the omission of stitches, as recited in claim 49, to provide air permeability to the upper. Ex. 1002, col. 9, ll. 57-62; *cf.* Ex. 1005, col. 3, ll. 43-52 ("This type of production can, additionally, insure that the toe area 14 has a good air exchange capability. For example, this can be achieved by a net-like woven or knitted structure.").

In view of limitations of claim 47 and original claim 19 *shared* by claims 48 and 49 and the teachings of Nishida, Patent Owner has not shown that claims 48 and 49 would not be obvious over each other, and Patent Owner does not persuade us that claims 48 and 49 are patentably distinct



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from each other. Thus, Patent Owner has failed to demonstrate that it proposes a reasonable number of substitute claims for original claim 19 in accordance with 37 C.F.R. § 42.121(a)(3). Nevertheless, in our discretion, we do not deny entry of claims 48 and 49 on this basis, but instead group claim 49 with claim 48, for patentability purposes. Further, we determine that Patent Owner does not argue separately that the limitations of claims 48 and 50 render them patentable over the prior art. *See* Paper 31, 6-10. Consequently, we group claims 48-50 with claim 47 for purposes of considering their patentability over prior art.

*C. Scope of Motion to Amend*

Pursuant to 37 C.F.R. § 42.121(a)(2), a motion to amend may be denied if: (1) the amendments seek to enlarge the scope of the original claims; (2) the amendments introduce new subject matter; or (3) the amendments do not respond to a ground of unpatentability, upon which trial was instituted. For the reasons discussed below, we determine that the substitute claims presented in Patent Owner's motion to amend are definite and narrow the scope of the original claims and do not introduce new subject matter. Further, we conclude that the substitute claims presented in Patent Owner's motion to amend respond to grounds of unpatentability, upon which trial was instituted, especially, anticipation by and obviousness over Nishida. *See* Paper 18, 37. Nevertheless, because, as set forth below, we deny Patent Owner's motion to amend for other reasons, we do not discuss further Patent Owner's arguments regarding the patentability of the



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substitute claims over Nishida alone or Petitioner's opposition to those arguments. *See* Paper 31, 6-10; Paper 37, 8-10.

*1. Narrowing Amendments*

With respect to substitute claim 47, Patent Owner proposes to replace the term "weft knit" with the term "flat knit" in original claim 16 and to add certain additional limitations to original claim 16. Paper 31, 1. Specifically, Patent Owner argues that "flat knitting" is a sub-type of "weft knitting." *Id.* at 3; Paper 44, 1-2. As noted above, we construe the term "flat knit textile element" in substitute claim 47 to mean a "flat *weft* knit textile element." Hence, it is narrower than the corresponding limitation of claim 16. Further, the additional limitations of substitute claim 47, reciting (1) "flat knit edges" and (2) the manner in which such edges are *not* formed, together provide structural limitations that were not present in original claim 16.

For the foregoing reasons, we determine that Patent Owner's proposed substitute claims 47-50 comply with 37 C.F.R. § 42.121(a)(2).

*2. Written Description for Substitute Claims*

The purpose of the written description requirement is to convey with reasonable clarity to those skilled in the art that, as of the filing date sought, applicant was in possession of the invention as now claimed. *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64 (Fed. Cir. 1991). We note that "the written description requirement is satisfied by the patentee's disclosure of 'such descriptive means as words, structures, figures, diagrams, formulas, etc., that fully set forth the claimed invention.'" *Enzo Biochem, Inc. v. Gen-*



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*Probe Inc.*, 323 F.3d 956, 969 (Fed. Cir. 2002) (quoting *Lockwood v. American Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997)). Patent Owner argues that the additional limitations of substitute claim 47 are supported by the disclosure of the patent application, U.S. Patent Application No. 10/791,289 ("the '289 Application"), from which the '011 Patent issued. Paper 31, 3-4 (citing Ex. 1003, 168-9, 173-5, 179, 181, and 184). We agree.

*a. Flat Knit Textile Element*

Patent Owner argues that, as with the '011 Patent, the '289 Application discloses that "weft knitting . . . include[s] circular knitting and flat knitting." *Id.* at 3 (citing Ex. 1003, 168); *cf.* Ex. 1002, col. 7, ll. 5-8. Further, claim 65 of the '289 Application recites that "an upper incorporating a textile element [is] formed through a *flat knitting* process" (emphasis added). *Id.* (citing Ex. 1003, 184); *see also* Ex. 1003, 179, 181 (claims 19 and 38 of the '289 Application recite "flat knitting"). It is well established that subject matter recited in a claim and embraced in an application, as originally filed, is itself a part of the disclosure, even though it may not be defined in the specification. *Application of Frey*, 166 F.2d 572, 575 (CCPA 1948).

Petitioner contends that "[t]he Board has yet to provide a construction of 'flat knitting,' and [that] the Board's construction of 'weft knitting' and 'warp knitting' does not indicate that 'flat knit' is *exclusively* a sub-type of 'weft knitting.'" Paper 37, 2 (emphasis added). Initially, we note that we provide a construction of the term "flat knitting" above. Specifically, in the



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context of this Specification, flat knitting is a sub-type of weft knitting, in which the textile is weft knit as a sheet or flat piece of textile. Ex. 1002, col. 7, ll. 5-8; *see also* Ex. 2010 ¶ 60 ("[I]n flat knitting a fabric is produced on a machine in generally flat form, with yarn alternating back and forth across the fabric. [*E.g.*, Ex. 2011, 8.] Moreover, a flat knit fabric is a fabric that has been knit on a flat knitting machine. [*E.g.*, *id.* at 6.]"); Ex. 1001 ¶ 56 ("weft knits may be made with flat *or* circular machines" (emphasis added)). Therefore, we conclude that Patent Owner has demonstrated support for the term "flat knit textile element" in the application from which the '011 Patent claims benefit, and that, as both Patent Owner's and Petitioner's experts agree, the meaning of flat knitting, as construed herein, was well-known at the time of the invention. *See* Ex. 2010 ¶¶ 49-50; Ex. 1001 ¶ 54.

*b. Edges Free Of Surrounding Textile Structure Such That The Flat Knit Edges Are Not Surrounded By Textile Structure From Which The Textile Element Must Be Removed*

Patent Owner argues that, as with the '011 Patent, the '289 Application discloses that "flat knit edges [are] free of surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed." Paper 31, 4. In particular, Patent Owner argues that Figures 8, 10, and 11 depict textile elements 40, 40′, and 40″, respectively, "free of surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed." *Id.* In contrast, Patent Owner



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argues that Figure 9 depicts a different embodiment of the invention than that recited in the substitute claims. *Id.*

Figure 9 depicts "a perspective view of a textile structure that incorporates two of the textile elements." Ex. 1003, 164 ('289 Application ¶ 24). In particular, the Specification of the '289 Application describes that:

> *An example of a textile structure 60 that may be formed with a wide-tube circular knitting machine is depicted in Figure 9.* Textile structure 60 has a generally cylindrical configuration, and the types of stitches vary throughout textile structure 60 so that a pattern is formed with the outline of textile element 40. That is, differences in the stitches within textile structure 60 form an outline with the shape and proportions of textile element 40.

*Id.* at 169 ('289 Application ¶ 45 (emphasis added)). Thus, Patent Owner argues that the embodiment depicted in Figure 9 does not limit the textile elements depicted in Figures 8, 10, and 11 to those manufactured according to the process of Figure 9 and that a textile element may or may not be formed by removing it from a larger textile structure, such as textile structure 60. Paper 31, 4. Further, referring to Figures 8, 10, and 11, Dr. Tonkel opines that the '289 Application "illustrates multiple examples in which the textile element is shown in its final shape and is not described as being formed as part of a larger textile structure from which it must be removed." Ex. 2010 ¶ 63; *see also* Ex. 2010 ¶ 37. Moreover, Dr. Tonkel asserts that his opinions are from the perspective of a person of ordinary skill in the art. Ex. 2010 ¶¶ 52-53.



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Petitioner disagrees and argues that Patent Owner's contention that this limitation is described sufficiently in the '289 Application rests on a single phrase, and, perhaps, on a single word in that phrase, that textile element 40 "*may* be formed as a part of a larger textile element." Paper 37, 3-4 (citing Paper 31, 4; Ex. 2010 ¶ 63 (emphasis added)). According to Petitioner, Patent Owner argues that, based on this disclosure, textile element 40 may be formed as part of a larger textile structure *or* may be knit to shape. *Id.* In view of the depiction of the textile element, without surrounding material, in Figures 8, 10, and 11 of the '289 Application and the non-limiting language used with respect to the embodiment, with surrounding material, depicted in Figure 9, we are persuaded that the Specification of the '289 Application adequately supports the language added to original claim 16 in substitute claim 47.

*3. Definiteness of Substitute Claims*

Petitioner argues that the substitute claims are indefinite. Paper 37, 6-8. The test for definiteness under 35 U.S.C. § 112, ¶ 2, is whether "those skilled in the art would understand what is claimed when the claim is read in light of the specification." *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1576 (Fed. Cir. 1986) (citations omitted). More specifically, "if a claim is amenable to two or more plausible claim constructions, the USPTO is justified in requiring the applicant to more precisely define the metes and bounds of the claimed invention by holding the claim unpatentable under 35 U.S.C. § 112, [¶ 2], as indefinite." *Ex parte Miyazaki*, 89 USPQ2d 1207, 1211 (BPAI 2008) (precedential). Citing



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*Miyazaki*, Petitioner contends that the substitute claims, in particular, substitute claim 47, are "amenable to two or more plausible claim constructions." Paper 37, 6-8. We disagree.

Petitioner contends that the limitations added to original claim 16 reciting that "flat knit edges free of surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed" have two plausible claim constructions. *Id.* at 6. First, Petitioner contends that this language may be construed to recite a flat knit textile element having flat knit edges, which has been removed from a surrounding textile structure. *Id.* Second, Petitioner contends that this language may be construed to recite a flat knit textile element having flat knit edges, which has been knit to shape. *Id.* at 6-7; *see also* Ex. 1015, 68-98 (transcript of deposition of Dr. Tonkel).

Petitioner contends that only the first construction is supported by the disclosure of the Specification of the '011 Patent. *Id.* at 6. We disagree, and, for the reasons set forth above, we determine that the second construction is supported. Figure 9 of the '011 Patent depicts a single embodiment of a process for forming textile elements, in which a pair of textile elements 40 is cut from *circular* knit textile structure 60. *See* Ex. 1002, col. 7, ll. 41-48. Although circular knitting, like flat knitting, is a type of weft knitting, circular knitting is not the same as flat knitting. Moreover, as depicted in Figure 9, the process is intended to produce multiple textile elements from a single textile structure. *Id.* at ll. 56-58. Petitioner fails to identify any disclosure in the Specification of the '011 Patent that would



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limit the formation of textile elements 40, 40′, and 40″ of Figures 8, 10, and 11, respectively, solely to the process of Figure 9. Although the substitute claims are interpreted in light of the Specification, limitations from the Specification are not read into the substitute claims. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993). Thus, we are not persuaded that the disclosure of the textile elements of Figures 8, 10, and 11 should be limited by the process embodiment depicted in Figure 9.

Petitioner notes that its textile expert, Dr. Adanur, opines that a person of ordinary skill in the art at the time of the priority date of the '011 Patent would understand that, under the broadest reasonable interpretation, "flat knit edges" means "edges of a knitted textile that are knit in flat form," whether or not knit to shape. Paper 37, 7-8 (citing Ex. 1016 ¶ 38). This also does not demonstrate that the claim language of the substitute claims may be construed to recite *both* that the textile element is removed from a larger textile structure and that the textile element is knit to shape. Therefore, construing the language of the substitute claims in accordance with the disclosure of the Specification, we determine that the substitute claims recite a flat knit textile element having flat knit edges, which has been knit to shape, and that the substitute claims are not susceptible to two plausible constructions. Thus, the substitute claims are not indefinite for the reasons proposed by Petitioner.



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*D. Patentability over Prior Art*

An *inter partes* review is neither a patent examination proceeding nor a patent reexamination proceeding. The substitute claims proposed in a motion to amend are not entered automatically and then subjected to examination. Rather, the proposed substitute claims will be added directly to the patent, without examination, *if* the patent owner's motion to amend claims is granted. In a motion to amend, the patent owner is not rebutting a rejection in an office action, as though this proceeding were a patent examination or a reexamination. Instead, the patent owner, as the movant, bears the burden of establishing the patentability of the proposed substitute claims over the prior art of record and also other prior art known to Patent Owner. We deny the motion to amend because (1) Patent Owner has not met this burden and (2) Petitioner has shown that the substitute claims would have been rendered obvious over the combination of the teachings of Nishida and Schuessler I and II.

*1. Patentability Over Other Art Known To Patent Owner*

In the motion to amend, Patent Owner states that:

> The proposed claims are patentable over the prior art, including prior art identified by the Board in its Decision on whether to institute a trial *and other prior art known to NIKE.*

Paper 31, 3 (emphasis added). Such a conclusory statement that the proposed claims are patentable over "other prior art known to [Patent Owner]" is facially inadequate. Patent Owner's motion does not discuss (1) the level of ordinary skill in the art, explaining the basic knowledge and skill set already possessed by one of ordinary skill in the art, with respect to the



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new claim features or (2) the other known prior art. Moreover, failing to identify the "other prior art" and limiting the discussion to the references relied upon in the petition or raised in Petitioner's opposition to the motion to amend does not provide a meaningful analysis of such art.

In a prior order (Paper 22), we directed Patent Owner to *Idle Free*, IPR2012-00027, Paper 26, dated June 11, 2013, as providing guidance on motions to amend. Paper 22, 2-3. In *Idle Free*, the Board advised the patent owner that, in a motion to amend:

> A patent owner should identify specifically the feature or features added to each substitute claim, as compared to the challenged claim it replaces, and come forward with technical facts and reasoning about those feature(s), including construction of new claim terms, sufficient to persuade the Board that the proposed substitute claim is patentable over the prior art of record, *and over prior art not of record but known to the patent owner*. The burden is not on the petitioner to show unpatentability, but on the patent owner to show patentable distinction over the prior art of record and also prior art known to the patent owner. Some representation should be made about the specific technical disclosure of the closest prior art known to the patent owner, and not just a conclusory remark that no prior art known to the patent owner renders obvious the proposed substitute claims.
>
> A showing of patentable distinction can rely on declaration testimony of a technical expert about the significance and usefulness of the feature(s) added by the proposed substitute claim, from the perspective of one with ordinary skill in the art, and also on the level of ordinary skill, in terms of ordinary creativity and the basic skill set. *A mere conclusory statement by counsel, in the motion to amend, to the effect that one or more added features are not described in any prior art, and would not have been suggested or rendered*



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*obvious by prior art, is on its face inadequate.*

*Idle Free,* IPR2012-00027, Paper 26, 7-8 (emphasis added); *see also Idle Free,* IPR2012-00027, Paper 66, 33-38 (denying motion to amend in final written decision). Yet, in its motion to amend, Patent Owner addresses only the references asserted in the petition and in the opposition to the motion to amend. Paper 31, 6-15; *see also* Paper 44, 4-5. As the Board explained, "[d]istinguishing the proposed substitute claims only from the prior art references applied to the original patent claims, however, is insufficient to demonstrate general patentability over prior art." *Idle Free,* IPR2012-00027, Paper 66, 33. Consequently, the portion of Patent Owner's motion to amend requesting entry of substitute claims 47-50 is *denied.*

*2. Obviousness over Nishida and Schuessler I and II*

For the reasons below, we also are not persuaded that Patent Owner has demonstrated the patentability of the proposed substitute claims over a ground of unpatentability presented by Petitioner, in particular, the ground involving Nishida and Schuessler I and II. As noted above, we instituted *inter partes* review of claims 16, 19, and 20 because we determined that Petitioner had demonstrated a reasonable likelihood of showing that these claims were rendered obvious by Nishida. Paper 18, 31. Petitioner now argues that substitute claims 47-50 are unpatentable as rendered obvious by Nishida in view of the additional teachings of Schuessler I and II. Paper 37, 10-11. Moreover, because Patent Owner did not file a patent owner response to the petition, in this final decision, we accept as unchallenged that Nishida teaches or suggests all of the limitations of original claims 16, 19,



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and 20. *See* Paper 19, 2-3 ("The patent owner is cautioned that any arguments for patentability not raised in the response will be deemed waived."). Thus, we now consider only whether Schuessler I and II teach or suggest the limitations added in substitute claims 47-50 and whether Petitioner has shown some reasoning supported by a rational underpinning for combining the teachings of Nishida with those of Schuessler I and II to achieve the invention recited in the substitute claims. For the reasons set forth below, we are persuaded that Nishida and Schuessler I and II render substitute claims 47-50 obvious.

Petitioner argues that Schuessler I and II teach or suggest "flat knit edges free of surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed." Paper 37, 11. In particular, Schuessler I teaches a method of producing a knitted helmet, e.g., a knitted cap. Ex. 1020, col. 1, ll. 15-22. The knitted helmet may be formed from a swatch knit on a flat knitting machine, such as that described in Schuessler II (Ex. 1021, col. 1, ll. 39-42), "as knitted *without requiring cutting*" (Ex. 1020, col. 1, ll. 25-26 (emphasis added); *see also* Ex. 1020, col. 1, ll. 17-18). *See* Paper 37, 10. The swatch is a two-dimensional shape the edges of which may be joined to form a three-dimensional shape, including an opening to receive the helmet wearer's head. Paper 37, 10-11 (citing Ex. 1020, col. 2, ll. 41-45); *see also* Ex. 1020, col. 1, ll. 32-36; fig. 2 (depicting a finished helmet). Thus, Schuessler I teaches or suggests knitting the swatch to shape. Ex. 1020, col. 1, l. 48-col. 2, l. 2.

Petitioner contends that Nishida and Schuessler I are in similar fields and address the same problem, namely the formation of two-dimensional textile elements having edges that are joined to form three-dimensional, wearable items. Paper 37, 11; *cf.* Ex. 1005, figs. 1 (two-dimensional layout 2) and 3 (three-dimensional, shoe upper 3); Ex. 1020, figs. 1 (two-dimensional helmet swatch) and 2 (three-dimensional helmet). Further, Schuessler II teaches that the two-dimensional helmet swatch of Figure 1 of Schuessler I may be knit to shape on a flat knitting machine. Paper 37, 11 (citing Ex. 1023 ¶ 15). Petitioner contends, therefore, that a person of ordinary skill in the art would have reason to combine the teachings of these three references to achieve the invention recited in substitute claim 47. *Id.*

Patent Owner does not argue Petitioner's assessment of the teachings of these references. Patent Owner also does not dispute that all of the limitations of the claims are taught in the prior art. Instead, Patent Owner argues that Petitioner's contention that a person of ordinary skill in the art would combine Nishida's teaching regarding the reduction of waste by placing layouts in adjoining positions and Schuessler I's teaching regarding knitting textile elements to shape is illogical. Paper 44, 5. Specifically, Patent Owner argues that Petitioner's reason for combining these teachings is somehow flawed because "*after* they are combined the elements of each reference serve the same purpose." *Id.* As the U.S. Supreme Court explained, however, "if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious



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unless its actual application is beyond his or her skill." *KSR Int'l Co. v. Teleflex Inc.*, 555 U.S. 398, 417 (2007). In this case, that the elements of the prior art references would "serve the same purpose" when combined is a factor in favor of an obviousness determination, and not a suggestion of non-obviousness, as urged by Patent Owner.

Because we are persuaded that Petitioner has demonstrated that the teachings of Nishida and Schuessler I and II teach or suggest all of the limitations of substitute claim 47 and that a person of ordinary skill in the art would have had reason to combine the teachings of these references to achieve the recited article of footwear, we determine that Patent Owner fails to meet its burden of showing that it is entitled to the relief requested in its motion to amend. Because we group substitute claims 48-50 with claim 47 for purposes of assessing patentability, we also determine that Patent Owner fails to meet its burden of showing that it is entitled to the relief requested in its motion to amend with respect to substitute claims 48-50. Consequently, the portion of Patent Owner's motion to amend requesting entry of substitute claims 47-50 also is *denied* for failing to demonstrate that the substitute claims are patentable over Nishida and Schuessler I and II.

### *E. Petitioner's Motion to Exclude*

Petitioner has filed a motion seeking to exclude the following evidence: (1) certain portions of the transcript of the cross-examination of Dr. Frederick (Ex. 2009, pg. 116, ll. 3-25); and (2) references to this testimony by Patent Owner's expert, Dr. Tonkel (Ex. 2010 ¶ 65). Paper 44, 3-5. As



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the movant, Petitioner has the burden of establishing that it is entitled to the requested relief. 37 C.F.R. § 42.20(c).

Petitioner seeks to exclude certain portions of the testimonial evidence obtained by Patent Owner during the cross-examination of Petitioner's expert, Dr. Frederick. Paper 49, 1. In particular, Petitioner argues that, contrary to the requirements of 37 C.F.R. § 42.53(d)(5)(ii), Patent Owner's cross-examination of Dr. Frederick exceeded the scope of Dr. Frederick's direct testimony (Ex. 1001), which was limited to the construction of terms of original claims 1-46 and to the unpatentability of those original claims in view of grounds identified by Petitioner. Paper 49, 1. Petitioner argues that Patent Owner questioned Dr. Frederick regarding "flat knit edges," a term that did not appear in original claims 1-46, but which Patent Owner included in the substitute claims of its motion to amend. *Id.*; *see also* Paper 54, 3-4.

Although Petitioner argues that Patent Owner's questioning of Dr. Frederick exceeded the scope of his direct testimony, Petitioner only objected to one of several questions in the testimony that it seeks to exclude, and Petitioner stated an "*[o]bjection to form*" with respect to that question, not an objection that the question or any of the preceding questions sought testimony that was *beyond the scope* of the Dr. Frederick's direct testimony. Ex. 2009, pg. 116, l. 24 (emphasis added); *see* Paper 54, 2-3.

Moreover, Petitioner requests that we grant its motion to exclude the portions of the transcript of the cross-examination of Dr. Frederick *preceding* the question that was the subject of Petitioner's objection. *Id.* at 5-6 (citing Ex. 2009, pg. 116, ll. 3-25). As a result of the grant of this



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motion, references to this challenged testimony by Patent Owner's expert, Dr. Tonkel, (Ex. 2010 ¶ 65) also presumably would be excluded.

Patent Owner opposes Petitioner's motion to exclude. In particular, Parent Owner argues that: (1) Petitioner did not object to most of the questions or testimony that it now seeks to exclude, objecting only to a single question; (2) the elicited testimony related to aspects of Dr. Frederick's direct testimony; (3) the elicited testimony pertained to Dr. Frederick's credibility as an expert witness regarding the patented technology; and (4) Patent Owner elicited the testimony without the use of leading questions, i.e., in the proper form. Paper 51, 1.

The current situation does not require us to assess the merits of Petitioner's motion to exclude. As discussed above, even without relying upon the aforementioned portions of the cross-examination testimony of Dr. Frederick, we have concluded that Patent Owner has demonstrated that the term "flat knit edges" of substitute claims 47-50 is supported by the disclosure of the '289 Application. Accordingly, Petitioner's motion to exclude evidence is *dismissed* as moot.

## III. CONCLUSION

For the reasons set forth above, we grant the portion of Patent Owner's motion to amend requesting cancellation of claims 1-46 of the '011 Patent. In its motion to amend, Patent Owner has not met its burden of establishing the patentability of substitute claims 47-50. Therefore, we deny



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the portion of Patent Owner's motion to amend requesting entry of substitute claims 47-50.

This is a final decision. Parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

## IV. ORDER

In consideration of the foregoing, it is

ORDERED that the portion of Patent Owner's motion to amend requesting cancellation of claims 1-46 of the '011 Patent is *granted*;

FURTHER ORDERED that the portion of Patent Owner's motion to amend requesting entry of substitute claims 47-50 is *denied*; and

FURTHER ORDERED that Petitioner's motion to exclude evidence is *dismissed* as moot.



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RAYMOND TONKEL

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

| | | |
|---|---|---|
| ADIDAS AG, | ) | |
| PETITIONER, | ) | Case No. |
| vs. | ) | IPR 2013-00067 |
| NIKE, INC., | ) | |
| Patent Owner. | ) | |

DEPOSITION OF RAYMOND TONKEL

Chicago, Illinois

November 5, 2013

JOB NO: 67597A

REPORTED BY: Tina Alfaro, RPR, CRR, RMR, CLR

RAYMOND TONKEL

November 5, 2013

8:35 a.m.

The videotaped deposition of RAYMOND TONKEL, held at the offices of Banner & Witcoff, 10 South Wacker Drive, Chicago, Illinois, pursuant to agreement before Tina M. Alfaro, a Registered Professional Reporter of the State of Illinois.



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RAYMOND TONKEL

A P P E A R A N C E S:

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On behalf of the Petitioner;

BANNER & WITCOFF
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Ten South Wacker Drive
Chicago, Illinois 60606
On behalf of the Patent Owner.

ALSO PRESENT: Allan Schrock (Nike)
Eric Campbell (Videographer)

RAYMOND TONKEL

I N D E X

EXAMINATION


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RAYMOND TONKEL

THE VIDEOGRAPHER: This is the start of media labeled No. 1 of the video deposition of Raymond Tonkel in the matter of Adidas AG versus Nike, Incorporated. This deposition is being held at 10 South Wacker Drive in Chicago, Illinois on November 5, 2013 at approximately 8:35 p.m.

My name is Eric Campbell representing TSG Incorporated, and I am the legal video specialist. The court reporter is Tina Alfaro, also in association with TSG Reporting.

Will counsel please state their names for the record.

MR. STOCKWELL: Mitchell Stockwell and Tiffany Williams for Petitioner Adidas.

MR. PRATT: Tom Pratt for patent owner Nike and on the phone is Peter Van Nes for patent owner Nike as well. And with me also is Alan Schrock from Nike.

THE VIDEOGRAPHER: Thank you, counsel.

Will the court reporter please now swear in the witness.

(Witness sworn.)


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RAYMOND TONKEL

WHEREUPON:

RAYMOND TONKEL,

called as a witness herein, having been first duly sworn, was examined and testified as follows:

EXAMINATION

BY MR. STOCKWELL:

Q. Mr. Tonkel, good morning. I'm Mitchell Stockwell. We met --

A. Good morning.

Q. -- before. I understand you were hired as an expert by Nike in this inter partes review proceeding; is that correct?

A. That is correct.

Q. Okay. You've had your deposition taken before?

A. No, I haven't.

Q. You have not? Okay.

A. No.

Q. Let me go through a couple ground rules.

A. Okay.

Q. So even though we have a video, you need to answer orally so the court reporter can take down your testimony.

A. Okay.

Q. So if you -- you can't shake your head or just say uh-huh. You'll have to answer orally. I'll try to remember to prompt you.

A. Okay.

Q. Okay. Second, sometimes we can start stepping on each other's sentences and questions. The court reporter will slow us down when we do that, but try to be mindful of that.

A. Okay.

Q. Third, if I ask a question and you don't understand it, let me know and I'll try to rephrase --

A. Okay.

Q. -- in a way that we're connecting and everybody understands so we have a clear record.

If you need to take a break, let us know. I'm going to want to finish what the question is or the line of questions --

A. Okay.

Q. -- and then we'll take the break.

Is there any reason you can't testify fully and completely today, any medication, medical conditions, anything like that?

A. No.



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Q. Okay.

Okay. So let me -- let me start by just saying in your own words, knowing the issues in this case, what is it that you're an expert in that you believe you can bring to bear that expertise as to the issues in the case?

A. I've been in the footwear industry for over 30 years, always in the product design and development side of the business. So this being a product -- footwear product construction matter, I think I'm well-qualifed to discuss the issues.

Q. How much manufacturing expertise do you have?

A. In the course of my career I've probably had a -- most manufacturing in the footwear industry is done overseas, and I've probably had a hundred trips at least overseas where I've been in manufacturing facilities in the Far East, in Europe, and Brazil.

Q. And when was your last trip overseas to a manufacturing facility?

A. Give or take, approximately three years to the Far East.

Q. Okay. And what is your expertise with



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respect to warp versus weft knitting and sort of the details of the textile part of the shoe manufacturing process?

A. I guess the best way to put that is I have knitting expertise within footwear as I do expertise in other areas and other componentry and processes that make up a shoe.

Q. And I'm not sure I understand that. So sort of separate and apart from shoes, would you hold yourself out as a textile expert?

A. Outside of footwear?

Q. Yeah, outside of footwear.

A. No.

Q. Okay. Within the category of shoes, what is your expertise within the textile area?

A. In ordinary shoe making there's a lot of componentry that makes up footwear, rubber and leather and textiles. So within that context I've had experience with designing textiles, sourcing textiles, been involved in the costing process with textiles. So I have knowledge of textiles as they're applied to footwear and footwear construction.

Q. Okay. And when you say "designing



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textiles," is that the appearance of the textile?

A. There could be a number of -- when I say design, I should clarify that. Design as it pertains to -- aesthetics is one consideration, performance factors. There's a host of performance factors that one might consider when designing a textile in terms of, you know, breathability, flexibility, strength, stretch, number of other factors, but those are some of them.

Q. And what is your -- so what I'm trying to -- let me see if I can distinguish between just the pure manufacturing process --

A. Okay.

Q. -- like this flat knitting versus some of the other techniques for making the textile.

A. Okay.

Q. As opposed to the broader specifying performance characteristics or the appearance.

A. Okay.

Q. With respect to the manufacturing of textiles, where -- what is your expertise there?

A. I'd say I understand manufacturing techniques for footwear, and I understand how some of those textiles might be manufactured for use in



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footwear. So I think I have a good basic understanding and material knowledge. I wouldn't hold myself out as a pure textile expert, but as it relates to footwear, I think I have a good handle on footwear -- textile usage within footwear.

Q. Are the textiles that are used in footwear only used for those particular articles of clothing and no other articles?

A. I think you have to take that, honestly, on a case-by-case basis. Could be, but it could also be used in other industries possibly.

Q. So sometimes the fabrics and textiles from, you know, some other article of clothing can move over into footwear and vice versa?

A. I'll tell you, in my experience generally footwear materials are materials sourced specifically for footwear from specific suppliers, but I assume there's no reason to think that certain materials couldn't be somewhat interchangeable.

Q. I'll just give you an example. I'm wearing a pair of Johnston and Murphy shoes --

A. Okay.

Q. -- which are made out of leather --

A. Right.



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Q. -- and I'm wearing a leather belt.

A. Okay.

Q. Is that what you mean sometimes these materials may interchange?

MR. PRATT: Objection to form.

BY MR. STOCKWELL:

Q. If you don't understand the question I can rephrase it.

A. Why don't you rephrase it, if you don't mind.

Q. I've got a pair of shoes made out of leather and I've got a leather belt.

A. Uh-huh.

Q. Is that an example of materials being used in different articles of clothing?

A. It could be, but let me just state that leather isn't the best example in terms of -- leather possibly, but not necessarily a textile, not necessarily a fabric. And even within those leathers you'd have different parameters, a leather used for footwear as opposed to a leather used for a belt.

Q. Okay. You may have different grades, you mean.



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A. Different thicknesses --

Q. Right.

A. -- different grades, different finishes, those type of things.

Q. So is it your testimony that there is no transfer of textiles between footwear articles and other articles of clothing or applications of textile?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I think it is -- it really needs to be handled on case-by-case basis. I can't make a blanket statement that there is absolutely none and it would happen in every case because I know it wouldn't.

Q. And what would you -- I'm not sure what you mean by a "case-by-case basis." What do you mean by that?

A. I'm not an apparel expert by any means, but there are different parameters that are needed for footwear, the actual end use product of those manufacturing as well as, I'm assuming with apparel.

Q. And when you say you would want to look at



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it on a case-by-case basis, I take it you would want to look at the performance characteristics of the footwear textile and the performance characteristics of the, you know, piece of clothing textile; is that what you're referring to?

A. That's probably one -- one factor, but again, I have really no apparel expertise. So I don't really feel qualified to answer that that well. It's kind of theory when I'm talking about apparel.

Q. Are you aware, just from your general experience, of situations where you've either sourced for footwear components that are utilized in other textile applications or articles of clothing?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. No, I'm not.

Q. Before this case had you had any experience with flat knitting?

A. I've designed footwear that incorporated textiles that had been flat knit.

Q. Can you give me an example?

A. As example might be without thinking of --



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I don't know if I recall a specific shoe, but generally shoes are made up of a number of components, and a quarter, which is a side piece of the -- side piece of a shoe, might be made out of a fabric and the rest of the shoe is leather. So when it came to that fabric-specific portion of the shoe, it's just determining what characteristics were needed in that piece of material esthetically and functionally, which I mentioned earlier, and how that would be incorporated into the shoe.

Q. And are you saying you selected that component because it was flat knitted or you selected that component given its performance characteristics and it happened to be flat knitted?

A. I'd say both depending on the circumstance.

Q. Okay. What about warp knitted, did you have experience with warp knitting before this case?

A. Could you just clarify "experience," if you wouldn't mind.

Q. Have you designed or sourced or manufactured shoes that used warp-knitted fabrics or textiles?

A. The fact that -- the fact that I've done so



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many shoes over the course of 30 years, I'm sure I have at some point.

Q. You just can't recall anything specific today?

A. Not a specific instance.

Q. Was that -- and since you can't recall, I understand you may be going on sort of what your practice would have been, from your practice would you have specified components that were warp knitted because they were warp knitted or because they had performance characteristics and happened to be warp knitted?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I'm not sure on that.

Q. You don't understand the question?

A. No, I understand what you're saying, but I can't recall.

Q. Okay. Fair enough.

Just generally when you're selecting textile materials for shoes, do you consider the type of knit in selecting those materials in all cases?

A. Not all cases.



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Q. In some cases you do?

A. Yes.

Q. Do you consider the performance characteristics of the textiles in all cases?

A. I think that's totally dependent upon the shoe that you're designing the textile for or that the textile would be incorporated in, the shoe that the textile would be incorporated in.

Q. Are you aware of any performance differences between warp knitted versus weft knitted textile components?

A. Yeah. As I think about it, yeah, I'd say so.

Q. And what -- just what are some of those?

A. I'm trying to think some of the materials that might be warp knitted, like a Tricot and some of the characteristics of that material versus something weft knitted. I think a lot of it has to do with the particular yarn and the particular stitching that you would be using within the warp or the weft knitting.

Q. So is that more of a --

A. So you could alter --

Q. Sorry.



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A. No. I was going to say you could alter the characteristics of the textile to a degree depending on some of those choices.

Q. Okay. Are you aware of any performance differences between flat knitted versus circular knitted textile materials?

A. It depends on -- yeah, I'd say more the -- again, I would go back and say depending on the yarn you would use and a particular stitch you would use, you could change some of those characteristics, but primary difference is I'd use something that might be circular knit if I was trying to create more of a -- the process of circular knitting more of a tube-like element as opposed to something that was more of a flat surface with flat knitting.

Q. Are there particular kinds of footwear in which the type of knitting of the textile materials is important to the performance of footwear?

A. Yes.

Q. And can you elaborate on that and give us some examples?

A. Yes. Depending what characteristics, as I think I mentioned before you were trying to achieve within the footwear, you might want something that



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is circular knit if you needed more of a tube-type shape versus something that's flat knit. Traditionally if you were going to utilize a flat knit component it might be, let's say, more of a area -- like a quarter area or an area with a cut piece.

Q. So maybe on the -- sort of a forefoot front part of the foot you can use something more flat there, but on the heel you might want something more circular; is that what you're saying?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. No.

Q. I'm not sure I understand -- under what circumstances would you need something tubular for footwear versus flat?

A. If you were going to create more of a -- like a sock-like shape within the footwear.

Q. That's when you would want something tubular?

A. I would think so.

Q. Okay. Can you give us any examples of a particular type of shoe --

A. Uh-huh.



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Q. -- not component of a shoe, but shoe in which the selection of a flat-knitted versus circular-knitted versus warp-knitted component matters to the performance of the shoe?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. Nothing I can think of right now.

Q. So I have your declaration, and it's Exhibit -- it's Nike's Exhibit 210 in the record. Obviously in preparing that, you looked at the patent, correct?

A. I reviewed the '011 Patent, yes.

Q. All right.

COURT REPORTER: I'm sorry. The --

THE WITNESS: You want the exact number? It's U.S. Patent No. 7,347,011 B2.

BY MR. STOCKWELL:

Q. Okay. '011 Patent okay to refer to that?

A. Okay.

Q. So you looked at the '011 Patent?

A. Correct.

Q. The file history?

A. Correct.

Q. You obviously looked at Adidas's petition



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and papers and Mr. Frederic's material, right?

A. Yes. That's all listed in the report specifically what I looked at.

Q. Okay. And did you also talk to any of the Nike inventors?

A. Never.

Q. Did you talk to anyone else other than -- excluding the lawyers --

A. Okay.

Q. -- Nike's lawyers. I'm, not -- I don't want to get communications between you and Nike's counsel.

A. Okay.

Q. But other than the lawyers, did you talk to anyone else in forming your opinions and expressing them in your declaration?

A. Specifically in this case is what we're talking about?

Q. Yes.

A. No, no one else.

Q. So you didn't rely on anyone else for your testimony that's offered here?

A. No.

Q. Okay. Let me ask you to pick up the



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patent, the '011 Patent.

A. Okay.

MR. STOCKWELL: I have an extra copy.

MR. PRATT: I've got it. Thank you.

Do you need one? Okay.

BY MR. STOCKWELL:

Q. So if you turn to figure 8, so what are the -- you talk about something in your declaration called the flat knit edges?

A. Yes.

Q. I'd like you to show me what are the flat knit edges -- well, before I ask that question, actually, figure 8, how would you describe this component that figure 8 is showing? What do you call that?

A. I think as per the ruling from the Patent Office, it is a unitary construction.

Q. And I'm not -- I assume this is some portion of a shoe that has a name and a trade?

A. Yeah. I call it a -- more than likely a upper for a shoe, an unformed --

COURT REPORTER: I'm sorry?

BY THE WITNESS:

A. An upper, U-P-P-E-R, for a shoe, unformed.



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Q. Unformed. Okay.

So we have this middle portion of the upper 33 and then we've got these two, what I think of, as wings 34, right?

A. Uh-huh.

COURT REPORTER: Yes?

THE WITNESS: Yes. Yes. I'm sorry.

BY MR. STOCKWELL:

Q. And this is -- this is a flat piece, but when you actually form the upper, do those wings 34 kind of fold up or down to form the upper?

MR. PRATT: Objection to form.

BY MR. STOCKWELL:

Q. Let me strike that and ask a different question.

Figure 8 shows a flat unformed upper, correct?

A. That is correct.

Q. Okay. If you would, just how do you -- how do you take the flat unformed upper to form the upper?

A. You would have to join particular edges.

Q. Okay. And which ones are those?

A. Do you want to whole process basically of



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forming the upper or just the particular area?

Q. What I'm -- all I'm trying to get at is essentially do you sort of kind of fold those flaps 34 down and join it looks like at least 43-A and B and 43-C and 43-D edges together? Is that part of the process?

A. I mean, within this patent '011, there's a specific process that I could take you through that explains how these edges are seamed, joined together to form a three-dimensional upper.

Q. And I'm not -- I'm not -- I'm not as interested in the specific process --

A. Okay.

Q. -- as I am in the fact that you start with something flat --

A. Yes.

COURT REPORTER: You got to -- go ahead.

BY MR. STOCKWELL:

Q. You start with something flat and you kind of manipulate it into a three-dimensional object, right?

A. Yes.

Q. And you join some of those edges in doing so?



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A. Yes.

Q. Okay. So what are the edges that are going to be joined in order to form the formed upper?

A. Okay. So may I just ask you to clarify. Are we talking about if this upper was circular knit or if this upper was flat knit?

Q. Well, does it make a difference?

A. It could.

Q. Okay. Ask the patent --

A. The process -- I'm sorry. The process of joining -- the step before I would be joining those edges would be different depending on if the item was either circular knit or flat knit.

Q. Okay. Well, let's just stick with flat knit.

A. Okay.

Q. Because that's what I understand the --

A. Okay.

Q. -- proposed substitute claim limits itself to.

A. Okay. And then I would just ask, if you don't mind, if I could just clarify, are we talking if this was flat knit from a bigger form and then cut out or flat knit to shape, knit to shape



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specifically?

Q. Well, let me make sure I understand your question.

A. Okay.

Q. Because I understood the testimony in your declaration to be that one of skill in the art reading this patent and looking at figure 8 would understand that this unformed upper was not cut from a larger piece of material. Was that not your testimony?

A. No. My testimony is that this is flat knit to shape, not cut from a larger --

Q. Okay.

A. -- piece of material.

Q. So let's go with your testimony.

A. Okay. Great.

Q. All right. With that in mind --

A. With that in mind.

COURT REPORTER: Okay. We've got to go one at a time.

BY MR. STOCKWELL:

Q. Yeah.

With that in mind, which edges are going to be joined in joining the unformed upper into a



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formed upper?

A. Okay. So one would join edges 41A to edge 41B. And then one would join edge 42-A to 42-B. And then one would join 43-B to 43-A. And then you would join 43-D to 43-C. And then you would join 44-B to 44-A and join 44-D to 44-C.

Q. Thank you.

Are all of the edges you just enumerated flat knit edges in your view?

A. If this was flat knit to shape, yes.

Q. Is 45 also a flat knit edge?

A. Yes.

Q. So do you see -- I'm going to have to reach over and indicate because there's not an easy number here. Do you see this edge 44-C --

MR. STOCKWELL: Counsel, if you want to come up here.

MR. PRATT: Okay.

BY MR. STOCKWELL:

Q. -- starting here and coming up to this Y shape between 43-D and 43-A and it kind of flows between 34 and 32?

A. Uh-huh.

Q. I'm going to call what I just described as



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32-A just so we have a handle for it. Let me make a clearer record here. So 32-A is from the vertex of 44-D and 44-C up to the vertex of 43-C and 43-D. Do you understand what I mean by 32-A?

A. Yes.

Q. What is 32-A?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. It's a part of the flat knit upper.

Q. Is 32-A a flat knit edge?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I don't know.

Q. When you -- you would agree that when you fold those 34 flaps, 32-A will form an edge, right?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I don't know.

Q. Okay. Well, if we look at figure 8 --

A. Uh-huh.

Q. -- what we -- what we're calling 32-A -- this unformed upper, it's flat on the table, right?

A. Yes.

Q. Is 32-A going to appear to be -- if you



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were looking at it in the real world, would you see some kind of stitching or something else to be able to follow that line?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I don't know.

Q. Do you know if -- well, let me -- let me -- let me -- let me do this. When you join the edges, you had gone through the edges that you would join to form an upper.

A. Okay.

Q. Is the 32-A line then going to be an edge of that three-dimensional object once you've joined the other edges?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I don't know.

Q. I'm a little puzzled as to what is it that would help you answer that question?

A. I guess to be able to see an actual representation of what that might look like three-dimensionally.

Q. There's no such representation in the patent, the '011 Patent?



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A. I don't think so.

Q. Do you think someone of skill in the art would understand that 32-A is a flat knitted edge -- or a flat knit edge? Excuse me.

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I don't know.

(Petitioner Exhibit 1014 was marked as requested.)

BY MR. STOCKWELL:

Q. Well, let me go ahead and mark this so that -- the record's fairly clear on what we've been talking about here. I'm going to mark this Petitioner Exhibit 1002 with a Petitioner Exhibit 1014 sticker and I'm going to go ahead and label this line that we were talking about as 32-A, and it was from the vertex of 44-C and D to the vertex of 43-C and D. And I'm just going to draw and label that.

You would agree what I've marked as 32-A is the line we were talking about before?

MR. PRATT: Objection to form.

MR. STOCKWELL: Can you specify your objection?

MR. PRATT: "Line we were talking about



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before"?

BY MR. STOCKWELL:

Q. Do you agree that this area where I've marked 32-A is the line from the vertex of 44-C and 44-D up to the vertex of 43-C and 43-D?

MR. PRATT: Objection to form.

MR. STOCKWELL: Counsel, do you have another way you would like to mark this for the record?

MR. PRATT: Yeah. "Line in the drawing"?

MR. STOCKWELL: Yes. I mean, this is what we've been talking about. So I want to make sure -- I'm just trying to make sure the record is clear so we look at the paper. So how else would you like to mark that?

MR. PRATT: Line in the drawing. You just said line.

MR. STOCKWELL: Line in the drawing.

BY MR. STOCKWELL:

Q. Okay. With that clarification, would you agree that the 32-A I've marked is this line in the drawing that we've been talking about?

A. Yes.

Q. Okay. And would you agree there is a corresponding line 31 -- what I'm going to designate

31-A from vertex 44 -- the vertex of 44-A and 44-B up to the vertex of 43-A and 43-B, this line in the drawing right here (indicating)?

A. Yes, although they're different shapes.

Q. Different shapes. Sure. Fair enough. I'm going to designate that as 31-A.

I have generally the same questions I have about 31-A that I had about 32-A. First, is 32-A a flat knit edge? Sorry. 31-A, is that a flat knit edge?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I don't know.

Q. And is that for the same reasons we discussed --

A. Yes.

Q. Is that for the same reasons we discussed for 32-A?

A. Yes.

Q. Okay. Thank you.

You had mentioned that the upper -- sorry. You can take that back.

A. Thank you.

MR. PRATT: What was that marked?



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THE WITNESS: The exhibit number.

MR. STOCKWELL: 1014 hopefully. Did I get the right number?

THE WITNESS: Yes.

MR. STOCKWELL: Thank you.

BY MR. STOCKWELL:

Q. You had mentioned that the upper of figure 8 is flat knit?

A. In the context of what we were discussing, I said it is -- I believe I said it was flat knit to shape as we were discussing it. It could be other, but flat knit to shape, yes.

Q. And what's your understanding of what a flat knit fabric is?

A. It is -- at its most basic, a fabric created on a flat knitting machine.

Q. How do the threads in that fabric compare to the threads in a nonflat knitted textile fabric?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I don't know.

Q. How did you reach your understanding as to what a flat knit fabric is?

A. From my experience of seeing flat knit



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machines in process and also understanding the definition in the patent of flat knitting.

Q. What is the definition in the patent?

A. Excuse me one moment.

(Witness viewing document.)

BY THE WITNESS:

A. I'm sorry. I meant flat knit textile element, not flat knit specifically. So I'm relying on in terms of flat knit is an ordinary term used in the footwear industry for a textile that's been flat knit.

Q. Okay. Yeah. I wasn't aware there was a definition in the patent of flat knit itself. Is that -- is that your understanding as well?

A. Of flat knit specifically? Yeah. It's a term used in flat knitting. So it's an ordinary term.

Q. Okay. But the patent itself doesn't set out a definition of flat knit textile?

A. The patent -- give me one moment, please.

Q. Sure.

(Witness viewing document.)

BY THE WITNESS:

A. I think the patent does state -- the patent



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talks about weft knitting, and it states right here -- I could read you from my report. "Weft knitting is a type of knitting where the continuous thread runs cross-wise across the machine direction and the fabric forms loops in the row (or course)."

And then it refers to Exhibit 2011 at 8. "This definition is consistent with the definition of weft knitting cited in the board's decision, a knitting process in which a continuous yarn is carried in cross-wise rows" --

Q. You need to slow down when you're reading.

A. I'm sorry.

"Weft knitting includes circular knitting and flat knitting."

So there's a definition of weft knitting of which flat knitting is one type of weft knit fabric.

Q. Okay. And I appreciate that explanation, but does the patent define flat knitting?

A. The patent defines flat knitting in its usage within -- within the claims, I believe.

Q. Let me go back -- where were you referring to in your declaration?

A. The top of page 23.



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Q. And that section referred to something called Exhibit 2011, which I've placed in front of you, correct?

A. This -- yes, I believe so.

Q. Okay. So if you'd turn to page -- it says page 8, but I actually think it's page -- okay. So on page 8 there's this definition of flat knitting?

A. Yes.

Q. If you back up to page 6, there's a definition of flat knit fabric; do you see that?

A. Yes. At the bottom of column 1 -- or 61?

Q. Yeah. It kind of bleeds over on to page 50 -- on to page 7 of the exhibit.

A. Okay.

Q. And those definitions of flat knit fabric, do you -- do you have any -- do you take issue with those at all?

A. Can I just refresh my memory and read them a second?

MR. PRATT: Objection, form.

BY MR. STOCKWELL:

Q. Sure.

(Witness viewing document.)

BY THE WITNESS:



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A. While I read through everything here previously, I really need to take some time and better analyze these as relation to what we're now speaking of.

Q. Understood, but we don't have unlimited time today. So I'm only asking what you can testify to as you sit here. If you come up with something else, we'll deal with it then and the chips will fall where they may.

So as you sit here, do you take issue with the definition of flat fabric on page 6 of Exhibit 2011?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I'm just not prepared to -- to make that decision right now.

Q. So you have no opinion?

A. No opinion specifically on what you're referring to here.

Q. And you understand that it will be our contention that the fact you have no opinion bears on your credibility as an expert before the board?

MR. PRATT: Objection, form.

BY THE WITNESS:



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A. Yeah. I'm not prepared to give an opinion on this now.

Q. Okay. Fair enough.

If we go back to page 8, which you did give an opinion on, have you ever seen -- if you look at the top part of that knitting definition under "Warp knitting," there's some Milanese Rachelle. Did I pronounce that correctly?

A. It's good I think.

Q. And Tricot knitting, do you see those references?

A. Yes. Tricot.

Q. Tricot. Sorry.

Have you seen machines that do that kind of knitting?

A. I'm sure I have at one point. I'm not totally positive, but I've seen many machines. I've never spent a lot of time at them -- with them, but I've been in a lot of factories. So I never spent time watching necessarily the fabric being produced, but I've probably seen a machine for this type of knitting.

Q. The distinction between the warp knitting and the weft knitting is generally the way in which


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the yarns run?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I'm not sure.

Q. What is the date of Exhibit 2011? Sorry. Let me strike that.

What is the latest date on Exhibit 2011?

A. I'm sorry. Are you asking me?

Q. Yes.

A. You know, within -- oh, I'm sorry. Printed July -- January 1985.

Q. Did the footwear art change between January of 1985 and March of 2004?

A. When you say the art of shoe making?

MR. PRATT: Objection, form.

BY MR. STOCKWELL:

Q. Is this -- was this definition "state of the art" -- Strike that.

Was the definition in Exhibit 2011 state of the art for the footwear art as of March 3, 2004?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I don't know.

Q. When did you start your career in footwear?



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A. 1980.

Q. 1980. I assume the art changed and advanced from 1980 to 2004?

MR. PRATT: Objection, form.

BY MR. STOCKWELL:

Q. Would you agree with that?

A. Some things.

Q. Okay. Did the textile aspects of the art change in advance from 1985 to 2004?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. That's very general. I don't know.

Q. You don't know?

A. No.

Q. You don't know whether the textile arts as related to footwear changed and advanced from 1985 to 2004; is that your testimony?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I don't know.

Q. Did you find any more definitions for knitting types closer in time to 2004 than Exhibit 2011?

A. I never looked.



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Q. How did you come across Exhibit 2011? Well, strike that. I don't -- I'll withdraw that.

Do you know whether it's possible to produce a warp knit fabric knitted in flat form?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I don't know.

Q. Do you know whether Tricot machines would produce a warp knit fabric knitted in flat form?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I don't know that.

Q. Would Milanese machines produce a warp knit fabric knitted in flat form?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I don't know.

MR. STOCKWELL: Do you want to specify your objection, Counsel?

MR. PRATT: I think it's vague.

MR. STOCKWELL: Do you want to specify how it's vague?

MR. PRATT: Yeah. Knitted in flat form.

BY MR. STOCKWELL:



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Q. Do you understand my question?

A. Could you just rephrase your last one?

Q. Yeah.

A. Just ask it --

Q. We were talking about Tricot machines. Tricot?

A. Tricot.

Q. Sorry. Tricot machines.

Do you know if Tricot machines would produce a warp knit fabric?

A. Yes.

Q. Do you know if the warp knit fabric produced by Tricot machines could be knitted in flat form?

A. I don't know that.

Q. Do you know if Milanese machines could produce a warp knit fabric?

A. I think so.

Q. Do you know if Milanese machines produced in a warp knit fabric could produce that fabric knitted in flat form?

A. That, I don't know.

Q. Go back to Exhibit 2011 on page 8 -- or sorry, page 6. Do you see it says, "The flat knit



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fabric," and then there's an item 1 and there's an item 2. The item 2 says "A term used in the underwear trade for plain stitch fabrics made on a circular knitting machine. These fabrics have a flat surface and are often called flat knit fabrics to differentiate them from rib knit or Swiss rib fabrics. In this case the term refers to the texture, not the type of machine on which the fabric was knit." Do you see that?

A. Yes.

Q. Okay. So does that mean the fabric that's being described in item 2 was a warp fabric that was also flat knit?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I have no experience in the underwear trade.

Q. Do you know if there's any footwear components that can be produced on a warp-type machine but would still be a flat knit fabric?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I don't know that.

Q. Do you know of any instances where the term



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"flat knit fabric" or "flat knit" refers to warp knit fabrics made in a flat form?

A. I don't know.

Q. Are flat knit fabrics in your view only fabrics that are made on weft-type machines?

A. My knowledge -- or my experience with flat knit fabrics are those made on weft-type machines.

Q. Do you -- are you able to say that there are no flat knit fabrics ever made on warp-type machines?

A. I honestly don't know.

Q. Is the -- is the main -- well, let me just ask this. Do you know what the main difference between warp- and weft-type fabrics are?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I'm not sure.

Q. Does the specification of the '011 Patent state that flat knit exclusively refers to weft knitted fabrics?

A. Can I just spend one moment?

Q. Absolutely. Take your time. I think you were referring to a page in your report earlier.

A. Okay.



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RAYMOND TONKEL

(Witness viewing document.)

BY THE WITNESS:

A. So could you just -- it's been a minute. Ask me the question again.

MR. STOCKWELL: She'll have the question.

THE WITNESS: Okay.

(Record read as requested.)

BY THE WITNESS:

A. I'm not sure.

Q. Let me direct you to column 7 of the '011 Patent.

A. Okay.

Q. And I want to ask you some questions about lines 1 through 10. So just take a -- you don't have to read it out loud.

A. Okay.

Q. If you'd just take a minute to read that.

(Witness viewing document.)

BY THE WITNESS:

A. Okay.

Q. Does this statement in the specification at all limit flat knit fabrics to those that are weft knitted?

MR. PRATT: Objection, form.



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BY THE WITNESS:

A. Well, I could read you the line.

Q. I'm sorry. I couldn't heard what you said.

A. I could read you the line and what it says specifically about weft knitting. What it says is "With regard to weft knitting, various specific subtypes that may be utilized to manufacture a textile includes circular knitting and flat knitting."

Q. And I understand -- I mean, I can read the patent. I understand that. My question's a little different. You're at least one of skill in this art. Do you think someone of skill in this art reading that passage would believe that the specification and the invention is restricted to only flat knit fabrics that are weft knitted?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I don't know that.

Q. Could -- do you think one of skill in the art would view a flat knit fabric that is warp knitted to be within the '011 Patent?

MR. PRATT: Objection, form.

BY THE WITNESS:



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A. I -- I don't -- I don't know.

Q. So if you go back to 2000- -- Exhibit 2011.

A. Uh-huh.

Q. On page 6, this is the definition of flat knit fabric, item 1. The second sentence says "While Tricot and Milanese warp knit fabrics nonrun are knit in flat form, the trade uses the term 'flat knit fabric' to refer to weft knit fabrics made on a flat machine rather than warp knit fabrics." Do you see that statement?

A. Yes.

Q. So would you think one of skill in the art would understand "flat knit" or "flat knit fabric" or "flat knit textile" to include Tricot and Milanese warp knit fabrics knit in flat form?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. My experience has always shown weft knitting when talking about the flat knitting process, but I'm not sure on -- to answer your question directly I'm not positive.

Q. Yeah. I understand that's your experience. I'm just wondering would they -- would one of skill in the art -- beyond you, would one of skill in the



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art understand that a flat knit fabric could be a warp knit fabric in flat form?

A. I would think they would think it a weft knit fabric in flat form. Those are the associations I put together and I think one skilled in the art would put together.

Q. So they would conclude that a warp knit fabric in flat form is not the same as a flat knit fabric?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I think it depends on the yarns used, depends on the stitch used. So there's many variables.

Q. So fair to say that in some of those variables, one of skill in the art would view a warp knit fabric in flat form to be a flat knit fabric, and in other of those variables, they would view it not to be a flat knit fabric?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I don't know.

Q. Well, you referenced variables. So I don't really understand if -- why would variables matter



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unless in some instances skilled persons would view warp knit fabric in flat form to be or not to be a flat knit fabric?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I don't know.

Q. Why were you referencing variables?

A. Could you just repeat the question again if you don't mind?

Q. Earlier in your testimony -- and I'm --

A. Yeah.

Q. -- just trying to step back to --

A. Okay.

Q. I'm trying to pick up on your testimony.

A. Okay.

Q. Earlier in your testimony when I was asking these questions, you said it may depend on stitch and yarn. My question is, if you want to look at those variables, stitch and yarn and the other things you mentioned, I don't remember what they are, why does that matter unless in some instances a warp knit fabric in flat form could be a flat knit textile fabric?

A. I guess all of my experience as one skilled



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in the art having to deal with flat knit textile fabric has been with weft knitting. So that's why when you're mentioning warp knitting, I'm not sure of the possibilities.

Q. Fair to say that's beyond your expertise?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I'd say within my experience in shoe making I haven't encountered that, and I wouldn't think one skilled in the art would have encountered that.

Q. So if you go to your substitute claim 47, which is in your report -- sorry, your declaration, Exhibit 2010, at -- I'm not sure what page it is.

A. It's page 25.

Q. You've got it. Thank you. Page 25.

Would this -- so if we go back to the situation where there is a warp knit fabric in flat form, okay, if there was an article of footwear that had as the textile element a warp knit fabric in flat form and everything else in claim 47 was present, would that article of footwear infringe?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I'm not familiar with warp knit fabrics in



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flat form.

Q. Does that mean you can't answer the question or it doesn't infringe or it does infringe?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I don't know.

Q. Do you have any opinion as to whether an article of footwear with an upper incorporating a warp knit fabric in flat form would meet the element of a flat knit textile element that's on the second line of substitute claim 47?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. There's a lot of words in that -- in that line. I can't break it -- I need to look at all those words in its entirety.

Q. And I'm not asking you to look at all those words. I'm narrowing my question down to focus just on an article of footwear that incorporates a flat knit textile element. Okay. I'm focusing on this flat knit textile element.

Do you have an opinion as to whether a textile element that is warp knitted in flat form would meet that language "a flat knit textile



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element"?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I don't know.

Q. You don't know if you have an opinion or you don't know how to answer the question?

A. I don't know if a warp knit material can be made necessarily in flat form.

Q. Do you know -- the machines that we were referencing in that 2011 Exhibit, have you encountered components of shoe footwear that were made on a Tricot machine or a Milanese machine?

A. I assume I have. I've dealt with so many materials over the years. Tricot is a fairly common material in the footwear industry. Whether or not Tricot's made on this particular machine, I'm not positive on that, but the term I know and the type of material I'm somewhat familiar with the material.

MR. STOCKWELL: You guys ready for a break?

MR. PRATT: Thank you, Counsel.

THE VIDEOGRAPHER: Going off the record. Time now is 9:45 a.m.

(A short break was had.)



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RAYMOND TONKEL

THE VIDEOGRAPHER: We're back on the record. Time now is 10:06 a.m.

BY THE WITNESS:

A. Counsel, before you start there's one thing I thought of a minute ago. Would you mind if I just bring it up --

Q. Did you need to correct some testimony?

COURT REPORTER: You need to put your mic on.

BY THE WITNESS:

A. I'd like to add something if I could to the testimony.

Q. Before you do that can I ask -- let me ask a few foundational questions while you put your mic on.

A. Sure.

Q. Is this based on your discussion with Nike or Nike's counsel during the break?

A. Not at all.

Q. Did you have a discussion with Nike and Nike's counsel during the break?

A. I just asked what they thought of the football game last night, the Packers and Bears' game.

Q. You be didn't have any discussion with them

about your testimony?

A. None at all.

Q. They didn't make any comments on your testimony?

A. None at all.

Q. The only conversation you had was about the Bears and the Packers' game?

A. Basically chit-chat like that, yes.

Q. They didn't show you any papers?

A. Nothing.

Q. They didn't point anything to you?

A. Nothing.

Q. Okay. Now, what do you need to correct for your testimony?

A. I just wanted to -- the illustration you had of I think it was figure 8 and you were drawing those edges or lines, however you referred to them, as they -- is that in my report? One of us had the marked exhibit.

Q. Yeah. So let me -- just for the record so you can find it, it's Exhibit 2014, which is the patent.

A. Okay.

Q. If you -- it's to your left. And if you

flip to figure 8, are you talking about lines 31-A and 32-A?

A. Yes.

Q. Okay. So what did you want to add to that?

A. The only thing I was going to mention is that there's a -- you had me describe earlier the way of constructing the shoe, which was folding. There is another reason that I thought of that these -- I think you termed them "wings," these wings were added.

So basically if you remove that wing and this wing labeled 41-B and 41-A, then these -- this edge that's created which starts at approximately 43-B and goes down to 44-B on one side and it would be the same on the other side, it's another way of producing that upper. So once the other folding process, joining process happens, those edges that I just mentioned are actually at the last line, the feather line, the bottom of the last and they could be stitched on to a -- what we call a strobel board. It's another type of footwear construction.

So I'm only pointing out that the reason what you labeled in here which starts at 43-B and



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goes to 44-B could be for a strobel construction. It's another way of putting that upper together. So I just wanted to point that out.

Q. What you're saying is that -- when you point to that line, that's the line 32-A we were with discussing?

A. Yes.

Q. Okay. And if I understand your testimony correctly, are you saying that in some embodiments you would create the unformed last of figure 8 without either of the wings?

A. I don't know if you meant last. You meant the --

Q. Sorry. The unformed upper.

A. You would create that -- you can create that with the wings as another embodiment and as another way of finishing the bottom of the shoe. So I just wanted to make that clear.

Q. And when you create it without wings --

A. Yes.

Q. -- in that instance --

A. Uh-huh.

Q. -- would 31-A and 32-A constitute flat knit edges?



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A. They would be -- I just need to clarify. We're talking about if this item was knit to shape without those -- without those wings?

Q. Well, I don't know. That raises a different question.

A. Okay.

Q. Let me strike my question and ask a new one.

Okay. So going back to this other embodiment --

A. Yes --

Q. -- in which you're manufacturing the upper without what we call -- we're calling the wings, 41-A and 41-B. Okay?

A. Yes.

Q. Would that be manufactured by cutting along lines 31-A and 32-A?

A. Not if it was a flat knit upper to shape. If it was knit to shape specifically by flat knitting, there would be no need to cut those edges.

Q. Okay. Let me -- let me just ask -- let me ask it this way. Could you make an item 33 --

A. Uh-huh.

Q. -- just as in figure 8, then cut along



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lines 31-A and 32-A? Is that feasible for one of skill in the art?

A. I don't know why you would do it, if it was knit to shape, but you could do it, you could cut it.

Q. Okay. So I'm going to ask you a hypothetical.

A. Okay.

Q. So assuming that was done --

A. Yes.

Q. -- and you cut 31-A and line 32-A and then you proceeded with your procedure to form the unformed upper into a formed upper, okay, in that instance would lines 31-A and 32-A be knit edges in your view?

MR. PRATT: Object to form.

BY THE WITNESS:

A. They would be flat knit edges.

Q. Would they be flat knit edges in your view?

MR. PRATT: Object to form.

BY THE WITNESS:

A. In that instance -- you're saying if they were -- just to clarify for me. If they were cut, so they would actually be physically cut through?



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Q. Correct.

A. Then they would be cut edges.

Q. They would not be flat knit edges?

A. Not once they're cut.

Q. Okay. However would 43-B, 43-C, 42-A, 42-B, 45, 44-B, and 44-C still be flat knit edges?

A. It's --

MR. PRATT: Object to form.

BY THE WITNESS:

A. It depends how it's cut, exactly where it's being cut.

Q. Well, I'm -- let's assume that you're only cutting what we've marked as 31-A and 32-A, which is from those vertext ease. Okay?

A. Yep.

Q. So with that assumption in mind, would the unformed upper then have flat knit edges 42-A, B, 43-B, C, 44-B, C, and 45?

A. Okay. So everything outside of what you drew is 32-A and 31-A?

Q. That's a good way of putting it. Thank you.

A. Okay. So those would all still be flat knit edges.



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Q. Okay. And if you actually formed an article of footwear from this article that was a combination of flat knit edges and cut edges, would you be practicing substitute claim 47?

MR. PRATT: Object to form.

BY THE WITNESS:

A. I would have to take some time and relate this back to the patent and figure this out.

Q. Well, let's -- let's go to page 25 in your report while you've got that drawing in front of you.

A. Okay.

Q. So you would agree with me that in this hypothetical formed upper that we've been discussing you would still have flat knit edges free of surrounding textile structure as recited in this element 1 in substitute claim 47?

MR. PRATT: Object to form.

BY THE WITNESS:

A. Can I just point out one thing that I was trying to -- and maybe I didn't convey it properly when I came back in the room.

Q. Let's ask -- let me get you to ask --

A. Okay.



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Q. -- answer the question on the table --

A. Okay.

Q. -- because I'll forget otherwise.

A. Okay.

Q. And then you can add what you need here. Can you answer the question?

A. Oh, I'm sorry. Just restate it one more time, if you would, please.

Q. Okay.

A. I'm sorry. I was waiting.

Q. Sorry. So we were talking about this figure 8 where you cut along lines 31-A and 32-A, but we agreed we had flat knit edges everywhere else. Okay? You would agree that that construction would have, as recited in claim 47, flat knit edges free of surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed?

MR. PRATT: Object to form.

BY THE WITNESS:

A. You know, I don't know why one would do that, but if one were to do that and what we just talked about was flat knit to shape and those two



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areas only were cut and the other edges are flat knit to shape, I think that figure 8 in that description falls under the embodiment of these revised claims.

Q. Thank you.

You needed to add something else?

A. I just wanted to clarify. I don't know if I said it, but I did not intend to say that these wings, the 41 -- excuse me, 34 on either side were to be cut off. I believe I said that they were -- another embodiment might be with those wings not there or removed. So if the edge itself, what looks like 31 and 32, were the outside edge knit to shape, that's how I was explaining how that would be constructed.

Q. And I under- -- I understood that.

A. Okay.

Q. I mean, essentially you're saying -- you're saying there's a couple of ways you could make that. One is you could cut along lines 31-A and 32-A, and the other is you could just form it all as one flat knit edge to piece; is that fair?

MR. PRATT: Object to form.

BY THE WITNESS:



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A. You wouldn't cut it. You would knit it to shape.

Q. Well, there's nothing that would keep you from making the larger element and then cutting the wings off, right? That's something someone of skill in the art could do?

A. They could do that, but I'm just clarifying my description is if those were not there, you could strobel knit a flat knit element knit to shape without cutting specifically.

Q. Thank you.

Okay. So if we go -- go to page 33 in your declaration, Exhibit 2010, and if you would open it up. I've got it -- you've got it nicely open so you can see 33 and 34. I want you to read paragraph 68 to yourself which has your proper construction of the phrase "Flat knit textile element," et cetera --

A. Okay.

Q. -- and then I want to ask you a question about paragraph 70 and figure 4.

A. So the paragraph number is 68 --

Q. Yes.

A. -- you asked me? Okay.

(Witness viewing document.)



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BY THE WITNESS:

A. Okay.

Q. So do you see the seam 52? In paragraph 70 you say "The ankle opening 36 and the seam 52 formed by joining edges 42-A and 42-B are illustrated below in figure 4"; do you see that?

A. Yes.

Q. Those edges 42-A and 42-B, at least before they're joined, are flat knit edges, correct?

A. Let me just refer back to the illustration that better shows 42-A and 42-B.

Q. Sure.

(Witness viewing document.)

BY THE WITNESS:

A. Yes, those two edges are flat knit edges.

Q. Okay. And it says you join them. How -- how do you physically -- how would one of skill in the art understand they can be joined?

A. There's numerous ways of joining a textile.

Q. Well, let me stop you for a minute. Let me rephrase the question slightly.

The substitute claim talks about some of the flat knit edges joined together to form an ankle opening in the upper for receiving a foot.



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A. In which claim is that?

Q. 47.

A. Okay. Okay.

Q. What I would like you to do is explain all the ways of joining the flat knit edges 42-A and 42-B into the seam 52 that would still be within the scope of that claim language.

A. As long as those edges -- the edges are not broken, cut for any reason, those edges, No. 42-B and 42-A, they could be cemented, they could be stitched, they could be taped. There might -- those, I guess, are the three main ways I would think of joining them. They might be joined as a butt seam, they might be overlapped. In general that's how one might join those edges.

Q. Are the flat knit edges sufficiently strong that you could stitch them to seam them together and that would be sufficient?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I would think that all depends on the particular material you were using. I mean, flat knit to shape's very broad. That includes how you would you run the stitches and the yarns and the



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various properties within that material. So as long as that material in that area was sufficiently strong enough, I would see no reason you couldn't stitch those together.

Q. Okay. So once you have joined the flat knit edges 42-A to 42-B and formed the seam 52, do the edges 42-A and 42-B remain flat knit edges?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I don't know. I have not looked at that.

Q. Well, let's look at your definition in paragraph 68, and you say sort of in the middle "This phrase should be construed as requiring the edges of the textile element have flat knit edges without surrounding textile structure."

So if I simply took 42-A and 42-B and I overlapped them and I stitched them, I would still have edges, correct?

A. Yes.

Q. Let's just assume 42-A's on the top and 42-B's on the bottom. There would then be surrounding textile around both of those edges, correct?

MR. PRATT: Objection, form.



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BY THE WITNESS:

A. No.

Q. Why not?

A. Because the way it is described in the claim, I believe that to be within the scope of the claims.

Q. And explain that. Why is that within the scope of the claim?

A. Let me just look at the claim again.

(Witness viewing document.)

BY THE WITNESS:

A. The term "free of surrounding textile structure" means in the knitting process that element -- or figure 8 here would be free of any surrounding textile structure, and the edges of figure 8 would be free of surrounding textile structure specifically.

And it -- may I continue? It also goes on to say that those edges are not surrounded by textile structure from which the textile element must be removed, which means obviously from a broader piece of textile when it is manufactured.

Q. Anything else?

A. No.



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Q. So let's just take that language. You said free of textile structure" -- and I'm going to paraphrase. So correct me if I'm wrong. I made a note to try to be accurate -- means free of structure in the textile knitting process, something along those lines. Is that -- is that fair?

A. Yes. So when that textile structure is removed from the knitting machine, there would be no further structure around that from which it would be -- need to be removed. So what I term too is it would be knit to shape. There would be no structure around what was necessary to form -- later on with the other steps form the shoe upper.

Q. Okay. Let's go to page 25 where your substitute claim is -- claim 47 is. The claim language says "Flat knit edges free of surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed."

What about that claim language signals that you're talking about the textile structure at the point where you're knitting it and before it's removed from the machine?

A. I did not consider that. My consideration



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was for specifically what the claims state, which was when the textile element was being removed specifically from the knitting machine, it would follow this form.

Q. And I understood that. I'm just saying where -- from the language in the claim, where are you getting that timing constraint that you're looking at, at the textile element, before it's removed from the machine?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. I would say I hadn't thought of that because I was thinking of a final piece, but I would think when everything was complete, ready to be removed from the machine, when this figure 8 as an example would be flat knit to shape ready to be removed from the machine.

Q. So if you look at figure 9 --

A. Yes.

Q. -- so obviously there's a bigger piece and then you cut out the shape 40 from the bigger piece, right?

A. That is correct.

Q. Can you explain why the language in



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claim 47 -- ignoring the flat knit edges point for a moment, but the other language that talks about the edges being not surrounded by textile structure from which the textile element must be removed, doesn't that language describe the item 40 after it's been cut out -- cut away from the bigger piece?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I don't think I can -- that's speculation. I've always considered this as a flat knit, knit to shape item.

Q. Okay. Why? What about the claim language makes you feel this is always a flat knit to shape item?

A. Well, for one thing, it would be free of surrounding textile structure.

Q. Okay. So free of surrounding textile structure. Anything else?

A. Just -- please just ask me the specific question.

Q. Yeah. Why did you always view claim 47 as being focused on -- I think you called it a flat knit to shape item?

A. Yes.



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Q. What is the specific -- what are the specific words you're focusing on there?

A. I think every word is important within -- every underlined word as part of this new claim that I was asked to look at is important in looking at the totality of the claim.

Q. Okay. So the totality of the claim. Any other specific words?

A. I mean, I could break this whole thing down for you as I interpreted what I think it to mean if you like if that would help.

Q. Okay. If that's helpful, but remember, the context here is my question, which is you said you view claim 47 as being limited to a knit to shape textile element sort of before you take it off the machine. Fair enough?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. No. I considered it after it's been removed from the machine.

Q. After it's been removed from the machine?

A. Yes.

Q. Okay. If it's after it's been removed from the machine, why doesn't that language read on



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item 40 of figure 9?

A. Because item 40 of figure 9, the only way to get it out of that broader element, I think indicated by No. 60, is to cut it out of that element, in which case it no longer meets the criteria of having -- number one, this appears to me to be a circular knit object. Number two is that the only way to remove what's indicated as textile portion 60 from figure 9 is to cut it. So once it's cut, it doesn't match up with claim 47. Those are all cut edges.

Q. And they're no longer flat knit edges?

A. They're no -- well, it was never flat knit. I was circular knit.

Q. Okay. Let me -- that's a good point. Let me change this a little bit so we're -- let's just assume that the item in figure 9 was not circular knit but it was weft knitted as a single flat knit element and then you cut it out. Okay?

A. Okay. Although I do believe earlier I said I wasn't sure if -- okay. I misspoke. I misspoke. Go ahead.

Q. Okay. So with that in mind, what would be the difference between that process and structure



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and substitute claim 47?

MR. PRATT: Object to form.

BY THE WITNESS:

A. So I just want to be clear. So if this object, No. 40, was sitting on this table today --

Q. Uh-huh.

A. -- and it was made through flat knitting and --

Q. Uh-huh.

A. -- was it flat knit to shape or removed?

Q. No. It was made as a big flat knit square panel.

A. Okay.

Q. And then you cut out the shape.

A. So once you've cut through those edges, if you're cutting through all those edges to remove it, it no longer meets the criteria as shown in -- in the claims.

Q. Okay. Which criteria?

A. In particular it would no longer have flat knit edges.

Q. Anything else?

A. No longer have -- let me just read through it.



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RAYMOND TONKEL

(Witness viewing document.)

BY THE WITNESS:

A. Well, it's very hypothetical because once it's -- you've already -- forgetting the edges completely, you've removed it from the textile structure. So once you've removed it from the textile structure I can't analyze that in a vacuum. It cannot be removed from a broader, bigger textile structure.

And looking at it further, it's virtually everything I've underlined here. Some of the flat -- or everything that, was, excuse me, given to me in this claim that was underlined. Some of those -- excuse me one minute. Let me just make sure I get this right.

You couldn't join the flat knit edges together to form an ankle opening because they would no longer be flat knit.

Q. Okay.

A. It would be cut edges for an ankle opening and the upper for receiving the foot, the ankle opening having an edge comprised of one of the flat knit edges, and, again, you wouldn't have flat knit edges.

Q. Okay. So I want you to -- I want you to do something for me, and if you need a pen to keep up with this or something, I'm happy to give you that.

A. Okay.

Q. If you struck through the words "Flat knit," okay, that appear everywhere in that claim, what would be the difference between the hypothetical you flat knit a big square piece and then cut out the shape as in figure 9 and claim 47?

MR. PRATT: Object to form.

BY THE WITNESS:

A. So you're saying if figure 9 was flat knit, so not circular knit, but if you cut out that same item 40 from a flat knit piece of material, what the difference would be?

Q. Right. And claim 47 did not have the words "Flat knit," in it --

A. Okay.

Q. -- what is the difference?

A. That was an analysis I was never asked to -- to provide. I always looked at this specifically the claim and the prior art.

Q. So let me -- let me change the question. You're familiar with this Nishida patent which has



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been previously marked as Petitioner's Exhibit 1005, correct?

A. Yes.

Q. So let's turn to figure 4. So I want you to assume that -- figure 4 shows that overall square piece of textile fabric. I want you to assume that it was flat knitted, okay?

A. Uh-huh.

Q. And I want you to assume that you then cut out all of that material.

A. Okay.

Q. Do you have that in mind?

A. Yes.

Q. Okay. What would be the difference between that structure and process for creating the structure and a claim 47 that did not have the words "Flat knit"?

A. Okay.

MR. PRATT: Objection to form.

BY THE WITNESS:

A. You know, I really don't think I can answer that because I don't -- I would need to better understand the teaching of what edges were put together to form the upper. Let me see if there's



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anything else I can, you know.

(Witness viewing document.)

BY THE WITNESS:

A. I think with the words you're asking me to take out which is basically "Flat knit edges" or "Flat knit" anywhere in there and you're also asking me to take out "Free of surrounding textile structures" --

Q. Wait a minute. Let me make sure you understand the question. I was not asking you to take that out.

A. Okay.

Q. Let me limit the question a little bit --

A. Okay.

Q. -- so you're not having to do too much at once.

So this item 2 in the claim, so all this from item 2 to the end, let's ignore that part of the claim.

A. Okay.

Q. Okay?

A. Yes.

Q. So all I'm asking you to do is to strike the words "Flat knit" that appear in the first half



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of claim 47 and tell me the difference between that claim without the words "Flat knit," that portion of the claim without the words "Flat knit," and cutting this shape out of figure 4, the broader textile fabric?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I just think by doing that it changes the whole context of -- of the claim. I don't think we're comparing claim 47 in that case to the prior art that I was comparing it to, to try to make a ruling on whether claim 47 and these other claims were, in fact, patentable.

Q. So you can't answer the question as phrased?

A. Not as phrased.

Q. Okay. So let me -- let me change the question. Okay.

Focusing just of the first half of claim 47, let's ignore the part from "And" -- item 2 down to the "And." Okay?

Exactly as phrased, what's the difference between that portion of the claim and the Nishida patent, Exhibit 1005?



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A. Okay. So just so I'm clear, so the Nishida patent as exists, not removed all the other things that you're --

Q. Whatever you want to say about it.

A. I think the main difference with Nishida is I think Nishida talks a conventional knitting, which I'm not sure. It doesn't say flat knitting. It doesn't say specifically the type of knitting process. I think a big difference is that the Nishida patent calls for the textile element I think indicated -- I don't know if it's No. 30, but the main body -- or 30 or 31, the main body of this textile element to be -- it has to -- it needs to be removed from a broader piece of material.

A big part of the Nishida patent had to do with -- Nishida was improvement over an earlier patent, I believe a German patent. The German patent talked about I think it was three strips of material, each with different properties. So what Nishida did 10 or 20 years later after that German patent was to try to do a similar process but use less expensive scrap material, so the material around the form of the Nishida upper would be less costly.



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So Nishida, what they were trying to do was basically reduce costs comparatively to an earlier -- earlier patent, but you would still have the issue of cutting out of a larger web with Nishida. And once you cut the edges in Nishida or any upper, once you cut it out, a fabric upper, you need to stabilize those edges before you could then finish the shoe upper.

Q. Okay. Anything else?

A. Just give me a moment, if you would, please.

Q. Uh-huh.

(Witness viewing document.)

BY THE WITNESS:

A. No. So I think the main differences, just to summarize, are this is formed from a bigger, larger piece of textile material from which the upper would need to be removed. I don't know if it's -- it's conventional knit, whatever that specifically means, and then, of course, the joining process, I'm not sure how Nishida intended to join edges. One patent the amended claims are very specific in terms of how edges need to be joined together.



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So Nishida doesn't -- doesn't cover quite a few of the claims, if any of the claims, in the '011. Amended claims, I should say.

Q. So let me -- let me kind of probe each one of those reasons.

A. Okay.

Q. The first one you gave me was conventional knitting. Does that correlate to the claim language in substitute 47 where the upper has to incorporate a flat knit textile element?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I'm just saying that Nishida says conventional knitting. I don't know what that refers to, but if you're asking --

Q. Let me rephrase the question.

A. Okay.

Q. So you mentioned conventional knitting as a difference between claim 47 and Nishida, right?

A. Well, I'm saying claim 47 specifically calls for flat knitting. Nishida says conventional knitting. I don't know exactly what he was intending.

Q. Okay. So let me break that down. When you



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say claim 47 calls for flat knitting, is that the language in upper incorporating a flat knit textile element?

A. Let me just get to that.

MR. PRATT: Object to the form.

BY THE WITNESS:

A. I think it's anywhere through those revised claims that calls for flat knitting.

Q. Okay. I understand that, sir, but let me -- let me try to be specific here. What I'm trying to understand is the claim language in 47 that differentiates over Nishida, not oh, well, Nishida's conventional knitting, blah-blah-blah. I want to know what words are different between claim 47 and Nishida. That's where this line --

A. Okay.

Q. -- of questioning is getting at. That's a comment, not to -- not a question.

A. Okay.

Q. So with that comment in mind, what are the words in claim 47 that relate to this conventional knitting point that you're using to distinguish Nishida?

MR. PRATT: Objection, form.



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BY THE WITNESS:

A. Again, I'm just having a hard time trying to -- I see where you're going with the question. I have a hard time just saying flat knitting because flat knitting is essential for all four of these amended claims. At its simplest I could say the only thing that Nishida has in common with these -- that I could definitely state to with these four claims is the first four words here, which Nishida is an article of footwear.

Q. I'm not asking what it has in common. I'm actually focusing on the differences. So let's go with the flat knitting for a moment.

A. Okay.

Q. So you say Nishida does disclose conventional knitting --

A. Conventional knitting.

Q. -- and that's circa 1994 when Nishida issued it as a patent, correct?

A. Yes.

Q. Was flat knitting known in 1994?

A. Yes.

Q. Was it used in the footwear industry?

A. Yes.



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Q. Okay.

So then the second point was this broader piece of material point, and I take it generally -- and you may come back and want to point out other claim language later --

A. Okay.

Q. -- and that's fine, but generally does that correlate to this language about the flat knit edges free of surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed? Is that fair?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I think it applies to anywhere you see "Flat knit" in the --

Q. Okay. But is it --

A. So that's one of the places, but there's many other places that it needs to be in order for the claim to be properly understood.

Q. Okay. So -- and I -- that's a -- that's a good point. So I get that. Let's just focus just for a moment on this removal language.

A. Okay.



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Q. So once Nishida cuts the piece that you want out of the broader section of fabric --

A. Yes.

Q. -- so from that point in time forward, okay?

A. Okay.

Q. You have a piece in the shape you want and you're not going to have to make further cuts and remove further textile material, right?

MR. PRATT: Objection to the form.

BY THE WITNESS:

A. It depends how those edges are cut.

Q. I'm not sure I understand that.

A. Once you cut through the edges of the Nishida patent, you would need to stabilize those edges before shoe making because those edges could have numerous loose threads, which if you -- you know, dependent upon the knit fabric you use, those threads would need to be processed before shoe making. So they might need to be cemented or they might need to be bound, they might need to be stitched through. There's -- there's numerous processes that could take place in order for that to -- to come about, but the edges generally would



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need to be stabilized.

Q. Okay. This is where I'm not tracking. How does stabilizing the edges relate to having edges free of surrounding textile structure such that the edges are not surrounded by textile structure from which the textile element must be removed?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I'm only pointing out that you can't separate the two because, in my opinion, once you've cut through those edges, you need to stabilize those edges. So once this element is removed, the Nishida element is removed from the broader piece of textile, there's another step before you achieve an upper for shoe making.

Q. Okay. I understand there's another step, I get that, but is that step removing the piece you cut out from a broader textile piece?

A. Not the bigger piece, but it could remove a smaller edge as that needs to be removed as part of the edge cutting or sealing process.

Q. Okay. Okay. So let's assume just for a moment that the cut piece from Nishida was cut perfectly to size, there's no dangly threads, you



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may come back and heat treat it or something --

A. Okay.

Q. -- but there's no other textile structure that in a second step you remove.

Would you agree that in that instance there's no difference between that later in time already cut piece from Nishida and this removal language?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. There's still a difference.

Q. And what's the difference?

A. Primarily the edges.

Q. That they're not flat knit?

A. They're cut.

Q. Right. Okay. Okay.

So let's go to flat knit for a minute. Where does the term "flat knit edges" appear within the '011 Patent?

A. The '011 Patent teaches flat knitting throughout the patent and refers to flat knitting throughout the patent. So it's understood by looking at figures 8, figures 10, figures 11, that if those representations or illustrations could be



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flat knit, the edges would, in fact -- flat knit to shape, the edges would be flat knit.

Q. Does the term "flat knit edges" appear within the '011 Patent?

A. Just give me one moment, if you would, please.

(Witness viewing document.)

BY THE WITNESS:

A. I don't think the term "Flat knit edges" specifically appears, but "Flat knitting" appears numerous times through the patent, and one skilled in the art would understand that if figures 8, 10, and 11 were knit to shape, they would have flat knit edges.

Q. Where does the term "Knit to shape" appear in the '011 Patent?

A. It appears in the three drawings, 8, 10 and 11 as examples.

Q. It appears in the drawings? Can you give me an example?

A. In the patent I'm on page 8 of the '011 Patent, figure 8 is an example of a -- or can be an example of a knit to shape flat knit representation. Turning to figure 10 on page 10 is



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another possible example of a flat knit to shape element to be formed into a shoe upper. And figure 11 is the same thing.

Q. Okay. I must have asked the question the wrong way. Where do the words "Flat knit to shape" appear in the '011 Patent?

A. Within the '011 Patent there are many references to flat knitting, and one skilled in the art -- I take that back. There are numerous references to flat knitting in the '011 Patent, which I could point some of those out if you like, and if one looked at the three drawings that I mentioned, one would understand that those edges would be flat knit edges and knit to shape specifically in this -- in this case.

Q. Does the phrase "Knit to shape" appear anywhere in the written part of the description of the '011 Patent?

A. The phrase itself I don't believe it does, but it's taught through the '011 Patent.

Q. Would you agree that one of skill in the art looking at figure 8, figure 10, or figure 11 would view those uppers as being produced either through what you call this knit to shape process or



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through a cutting process; is that fair?

MR. PRATT: Object to form.

BY THE WITNESS:

A. They could be flat knit to shape or -- I don't want to say a cutting process, but what's shown in figure 9 could also be represented by figure 8 once it's removed. However, the edges would obviously be very different.

Q. Right. Okay. So what is it -- and this is where I want you to be specific and I want you to show me some language in the patent. What is it in the patent that suggests to you that figure 8, figure 10, or figure 11, any one of those figures, okay, was produced through this knit to shape process and not through the sort of cutting out, removal, and then it's being shown on its own? So show me the language you're relying on there.

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I think the patent talks to -- in the verbiage of patent to manufacturing and -- I believe it was manufacturing. Let me get the exact words for you.

Q. And just to be clear, if you want to -- you



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don't have to tell me what the language says. Just --

A. Just point it out?

Q. Just point it out. I mean, I'm interested in where this is in the patent.

(Witness viewing document.)

BY THE WITNESS:

A. Paragraph 11, line --

Q. I'm sorry. When you say paragraph 11, what are you -- okay. Column 11?

A. Column 11. I'm sorry about that. Column 11, page 20, we talk about -- or the patent talks about inefficient practice. It's line 14. Inefficient practice talks about -- or could be utili- -- they state right here "Utilizing multiple materials to impart different properties," and then it goes on to say "By forming a textile element to be a single unitary element of material increases -- efficiency is increased in that upper and may include a single textile element rather than numerous joined elements."

And to me that teaching to one skilled in the art reading this patent would mean the fewer materials you would have within making the upper,



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the simpler the manufacturing process would be. So taking that to the -- what we just talked about which would be you'd eliminate that removal of materials. So I think that is talked through in here. That's one example.

Q. Anything else?

A. Just give me a minute, if you would, please. I think that's my main point.

Q. Once the upper has been cut free from surrounding material and ignoring for a moment your definition of flat knit edges, would claim 47 cover that embodiment of the '011 Patent?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. Please just restate it again so I get it exactly.

Q. Once the upper -- we were talking about figures 8, 10, and 11.

A. Okay.

Q. And you said those could be knit to shape, in your view, or they could be cut free from surrounding material, right?

A. As defined in illustration 9.

Q. Right. So I'm focusing on that latter



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embodiment, they're cut free from surrounding material. Once they've been cut free, would they meet proposed substitute claim 47 except for the term "flat knit edges"?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I don't think you could separate the two. I just can't separate because flat knit edges is so -- and flat knitting is integral to the claim that I can't answer that question hypothetically.

Q. Does the term "flat knit edges" have an ordinary and customary meaning to those of skill in the art?

A. It would -- they would be edges that were formed as part of the flat knitting process.

Q. Do you -- do you have any references or treatises or other materials that support that definition?

A. I would have to look through some -- you mean actually a written description?

Q. Yeah. Yeah. Let me state it a little differently. I mean, I looked in your declaration to see whether you cited anything like that.

A. Okay.



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Q. I didn't see anything for, you know, the notion that the term "flat knit edges" means X, Y, and Z to people skilled in the art. Are you aware of anything, publications, articles, or whatnot that talk about flat knit edges and what they mean to people skilled in this field?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. Not specifically.

Q. Well, generally what -- what would you rely on, other than what's in your declaration? I mean, I have those materials obviously.

A. I would think --

MR. PRATT: Objection to form.

BY THE WITNESS:

A. Are you asking if it was me personally or one skilled in the art?

Q. Yeah. I mean, just what is it that you rely on for your understanding that flat knit edges are edges that have to be completely formed in the flat knitting process?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. In the context of this particular patent



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and these four substitute claims, that is my understanding.

Q. Okay. So it's fair to say it's largely the context of the patent from which you derive that as well as your general experience?

A. My industry knowledge.

Q. Would you agree that the patent itself doesn't have an express definition of what flat knit edges are?

A. It might not specifically say what flat knit edges are, but I think one skilled in the art reading the patent references to flat knitting, the discussion about manufacturing deficiencies or inefficiencies would understand that if you knit to shape, you would have a superior upper with less waste than if you had to cut through those edges.

Q. And just in your view, if I flat knit something, you know, a big square piece and then I cut out a shape around that, those cut edges are not flat knit edges?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. They're cut edges.

Q. They're cut edges even though they're edges



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of a piece of fabric that's been flat knit?

A. I would call the piece of fabric the flat knit piece of fabric with cut edges.

Q. Okay. But within the context of claim 47, the structure where you have a broader textile piece that's flat knit and you cut something out of it, that's not going to fit within the scope of claim 47?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. Well, I just can't remove it from all the other criteria within that claim. I need to look at everything within that claim. There's other things that talk about joining and forming an ankle opening.

Q. That's fair. I'm just focused on the flat knit edges part. Okay.

A. Well if you --

Q. So, again, if I have a structure and, you know, it's the embodiment in the '011 Patent, I have a flat knit fabric, I cut the upper out, okay, and then I go ahead and build the article of footwear just like the '011 Patent says. Okay? The resulting article of footwear, in your view, is not



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going to be covered by claim 47 because there were no flat knit edges, there were only cut edges?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. If every one of those edges were cut out in its entirety, every one in that shape you mentioned, then it would not meet this criteria.

Q. Okay. Fair enough.

Now, what if -- what if some is cut out and some is flat knit?

MR. PRATT: Objection to form.

BY MR. STOCKWELL:

Q. Same hypothetical.

A. If some are flat knit to shape?

Q. Yes, let's use your flat knit to shape.

A. So you had half an upper that was flat knit to shape as an example and half you cut through the edges?

Q. Correct.

A. It's all dependent on the specific edges we're talking about.

Q. Okay. So you'd have to make sure the edges matched up that were flat knit to shape, in your words, you'd have to make sure that they matched up



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with the claim language?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. They would have to specifically match -- some of those flat knit edges would specifically have to match certain locations within the -- within the claim.

Q. Yeah. Okay.

MR. STOCKWELL: Let's take a break. I don't think I have a whole lot more, but I wanted to go through some notes.

MR. PRATT: Okay.

THE VIDEOGRAPHER: Going off the record. Time now is 11:12 a.m.

(A short break was had.)

THE VIDEOGRAPHER: We're back on the record. Time now is 11:26 a.m.

BY MR. STOCKWELL:

Q. Mr. Tonkel, you had mentioned earlier that you had been overseas for manufacturing trips about a hundred times?

A. In total, yes, probably, give or take.

Q. When you started your career in footwear, were footwear articles manufactured in the United



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States?

A. Yes, they were.

Q. Over time the manufacturing has moved overseas?

MR. PRATT: Objection, form.

BY MR. STOCKWELL:

Q. Generally.

A. Generally, footwear manufacturing.

Q. Footwear manufacturing.

Is cost of material or cost of labor a larger component for footwear manufacturing?

MR. PRATT: Objection to form.

BY MR. STOCKWELL:

Q. Generally.

A. Larger compared to --

Q. Well, you have --

A. -- other industries?

Q. No. So you have a bill of cost for a piece of footwear, right?

A. Yes.

Q. And you'll have something called cost of goods sold. Do you know what COGS are?

A. Yes.

Q. What are COGS? What is cost of goods sold?



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What does that refer to?

A. Give me your -- just define it for me.

Q. I'm wondering what you know about it. So what do you know -- what do you understand cost of goods sold?

A. Just the factory costs is how I'd interpret it, FOB.

Q. And factory cost is a component of materials costs?

A. Amongst other things.

Q. And labor?

A. Profit margin for the factory.

Q. So as between -- for your costs of goods sold as between the factory labor versus the cost of materials, what's the larger cost for articles of footwear?

MR. PRATT: Objection, form.

BY THE WITNESS:

A. That's honestly not my area of specialty in terms of the specific people that kind of handle the costing when it comes to footwear.

Q. You don't know generally whether your cost of material is higher or lower than your cost of labor for making shoes?



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A. I think it totally depends on the materials used in a specific shoe, you know, the amount of materials, the construction. There's so many -- so many variables. So someone else might have a better focus on that than --

Q. Would you -- would you disagree with the proposition that manufacturing moved away from the United States in large part because of cost of labor, not cost of material?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. It's one reason. There's other reasons.

Q. So if you go back to figure 8. If you knit to shape figure 8, you're going to have to create multiple sizes of that upper for the different sizes of shoes that a footwear company would manufacture, correct?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. It will be the same basic shape, but they might be graded for sizing. You know, obviously a large size 15 is going to be a little different -- or different than, you know, a smaller size. So I think that's a fair assessment.



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Q. So what are -- what are the standard shoe sizes?

A. Are you talking about men's shoes?

Q. Yeah, let's just pick men's.

A. You know, probably starting at a men's size 6 to maybe like a 13, 14, but, you know, they go a lot bigger.

Q. I've seen some of those basketball shoes.

A. Yeah. I mean, average is probably a size 9 or 10 is industry standard generally.

Q. Would you have to create a different size upper for each of the standard men's size shoes?

A. Are you talking about following figure 8 in manufacturing or in general?

Q. Yes. So like figure 8, if you -- if you were going to shape knit figure 8, would you have to do a different size for each of the men's shoe sizes?

A. More than likely. However you might encompass like a whole and a half size. So you might be able to get a size 9 and a size 9.5 out of one blank or one pattern.

Q. Okay.

And when you -- when you knit to shape



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figure 8, what is the -- what is the machine that's done on?

A. Figure 8 as described in the claims, claim -- or as described in the patent?

Q. Yeah.

A. I mean, if it was -- I couldn't tell you the exact name of the machine. I would just call it a flat knitting machine.

Q. And do you have to -- nowadays are those essentially programmed to create these knit to shape shapes?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I think they can be. I think there's different ways. You know, I'm not -- I think there's different ways of knitting, you know, some that require more operator involvement than others.

Q. How much programming time and expense would be incurred in knitting to shape the size ranges of uppers you would need for a particular line of shoes over the required men's size ranges?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. It's totally out of my area of expertise.



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Q. Okay.

Do you know whether -- one of the -- one of the benefits of the '011 Patent you identified over Nishida is material cost savings, right?

A. Amongst other things, yes.

Q. Amongst other things.

Do you know whether the labor costs of configuring machinery to knit to shape would be more or less than the claimed material cost savings over Nishida if you implemented the '011 Patent?

MR. PRATT: Object to form.

BY THE WITNESS:

A. It would be just speculation on my part. I'm not comfortable answering that. It's just honestly not my area of expertise.

Q. You do know that -- I mean, footwear manufacturers do pay the factories for things like machine setup time and programming time, correct?

A. I'm assuming they do. In my experience that's built into the cost of goods in terms of the cost of the final shoe that you'd be purchasing. So it's built in somewhere, I'm sure, all those costs.

Q. The factory may not itemize it. They just



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may include it as part of the overall cost of what they're delivering to the --

A. In my experience.

Q. Okay. Do you know whether Nike is using the process -- well, do you know whether Nike is practicing claim -- substitute claim 47?

A. I have no idea.

Q. Do you know anything about how Nike's operations are conducted as it relates to the '011 Patent?

A. I have no idea. No one's ever said anything about it to me. I've never asked.

Q. Do you know whether any manufacturers are using the -- or are practicing substitute claim 47?

A. So you're saying the commercial embodiment?

Q. Yes.

A. I don't know.

Q. You say you made your last manufacturing trip three years ago?

A. Approximately, yes.

Q. And how many trips had you made from 2008 until roughly 2010?

A. When you say that, you're talking about trips to manufacturing sources where shoes would be



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made?

Q. Right.

A. And the date's 2008 to 2010?

Q. Right.

A. Probably none specifically to footwear factories. Trade shows, but not footwear manufacturing factories.

Q. So the -- so the only footwear manufacturing trip you've had has been the one about three years ago in the last five or six years?

A. Yes.

Q. And did you see -- how many factories did you visit there?

A. Give or take, I'd say three.

Q. Did you see any of those factories implementing the subject matter of the '011 Patent?

A. No.

Q. What countries were those factories in?

A. I was in Korea and China. South Korea.

Q. Who -- you said you're not really familiar with sort of the costing decisions for footwear. Who's -- within the trade, who is responsible for that?

A. You know, it's dependent upon the company,



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but the companies that I've had experience with, the bigger sport shoe companies, generally there's a costing department that specifically are the ones that negotiate pricing and are responsible for those type of financial decisions having to do with the cost of goods.

Q. What happens when the designers want to do one thing and the cost guys want to do something else because it's too expensive? How do they resolve that?

A. It really depends on the specific company. Some companies are much more product driven and, you know, the best product gets on the table and then they'll worry about the cost. Other companies are much more cost sensitive and, you know, they're appealing to more a -- as example, a Payless-type consumer and everything -- you want to have a nice design, but it needs to meet certain costs. A bigger brand that does their own marketing might be very different. So it really varies by the -- by the particular company.

Q. Have you ever seen situations where new technical innovations in the footwear area of design or performance were not implemented because of cost



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issues?

A. Let me just think. Maybe cost issues amongst other factors. You know, there might be other technologies they're not ready to introduce one because of the other. Cost might be one of those components, but there's generally a number of factors involved. But cost could be one of them. I can't particularly recall an incident, but it could have happened.

Q. Is manufacturing lead time a consideration as well?

MR. PRATT: Objection to form.

BY MR. STOCKWELL:

Q. Let me rephrase the question.

Do you know whether the footwear industry has sort of a seasonal sales cycle?

A. Yes. I mean, there's certain selling seasons that are key seasons. Kind of back to school is always a big one, you know, August, September, and kind of the spring selling shoe, but that's really dependent on the type of footwear we're talking about.

Q. Sure.

A. You know, boots -- a winter boot example



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has a specific selling season. Sandals are a very specific selling season. Even athletic footwear there's specific seasons depending on the shoe.

Q. And in trying to match manufacturing to those selling seasons you have to be aware how long it will take to manufacture the volume you want, right?

A. Yes.

Q. Do you know how long it would take to knit a knit to fit upper in figure 8 for a particular size of production run?

MR. PRATT: Objection to form.

BY THE WITNESS:

A. I haven't thought of it.

Q. Well, stated differently, do you know what the volume output of the machines that are capable of doing the knit to shape of figure 8 -- sorry. That's garbled.

Do you know the capacity of machines capable of creating a figure 8 knit to shape upper?

MR. PRATT: Object to form.

BY THE WITNESS:

A. It's not my area of expertise.

MR. STOCKWELL: I'll pass the witness.



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RAYMOND TONKEL

MR. PRATT: If we could take a quick break, Counsel.

MR. STOCKWELL: Sure.

THE VIDEOGRAPHER: Going off the record. Time now is 11:41 a.m.

(A short break was had.)

THE VIDEOGRAPHER: We're back on the record. Time now is 11:55 a.m.

EXAMINATION

BY MR. PRATT:

Q. Mr. Tonkel, I just have a few questions.

This morning you were asked about some definitions in your report, and I want to ask you some questions about one of those definitions. I want you to refer you to Nike Exhibit 2010, your declaration, and if you could turn to paragraph 50 in that exhibit.

A. Okay.

Q. In paragraph 50 I want you to refer you to the third sentence, and I'll read it. It says "A flat knit fabric is a fabric that has been knit on a flat knitting machine." Do you see that?

A. Yes, I do.

Q. Do you agree with that definition in your


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declaration?

A. Yes.

Q. And after that definition you cite to Exhibit 2011; do you see that?

A. Yes, I do.

Q. On page 6?

A. Yes.

Q. I'd like you to turn -- you have 200- -- Exhibit 2011 in front of you, if you could turn to page 6 of that exhibit.

A. Okay.

Q. And at the bottom of the page do you see definitions for flat knit fabric?

A. Yes.

Q. I want to refer you to the first definition there, and I'll read the first part of that. It says "A fabric" -- "Flat knit fabric: A fabric made on a flat knitting machine."

Do you agree with that definition?

A. Yes, same as in my report.

MR. PRATT: I have no further questions.

MR. STOCKWELL: Thank you.

THE VIDEOGRAPHER: Going off the record. Time now is 11:57 a.m. This is the end of media No. 2.



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RAYMOND TONKEL

(Whereupon, at 11:57 a.m., the signature of the witness having been reserved, the witness being present and consenting thereto, the taking of the instant deposition ceased.)


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C E R T I F I C A T E

STATE OF ILLONIS )

: ss.

COUNTY OF COOK )

I, TINA ALFARO, a Notary Public within and for the State of Illinois, do hereby certify:

That RAYMOND TONKEL, the witness whose deposition is hereinbefore set forth, was duly sworn by me on November 5, 2013 at 8:35 a.m.

I further certify that I am not related to any of the parties to this action by blood or marriage, and that I am in no way interested in the outcome of this matter.

I further certify that counsel for the adverse party, Thomas Pratt, was present at this deposition.

I further certify that the court reporter has not been disqualified pursuant to Federal Rule of Civil Procedure 28.

IN WITNESS WHEREOF, I have hereunto set my hand this 5th day of November, 2013.

_____

TINAL ALFARO



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ERRATA SHEET

CASE NAME:

DATE:

WITNESS:

PAGE LINE

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# DECLARATION OF SABIT ADANUR

## I. Background and Qualifications

1. My professional background and qualifications are set forth in my Curriculum Vitae, a copy of which is attached. I provide a summary of my background and qualifications below.

2. I have extensive experience in knitting and knitted fabrics. My family had a knitting business in Istanbul, Turkey, where we had circular knitting machines; we also had a hand operated flat knitting machine to make knitted goods. I worked in that business during summer vacations before I came to the U.S.

3. I have a B.S. in Mechanical Engineering, an M.S. in Textile Engineering and Science, and a Ph.D. in Fiber and Polymer Science. During my M.S. and Ph.D. studies at North Carolina State University, I took several courses and lab sessions in fabric formation including knitting.

4. I have been teaching knitting technology and structure of knitted fabrics since I joined Auburn University in 1992. I have taught the following courses which include knitting technology and knitted fabric structures:

- PFEN 2270 Introduction to Engineered Fibrous Materials
- PFEN 3300 Fibrous Product Testing and Instrumentation
- PFEN 4300 Engineered Fibrous Structures
- PFEN 6250 Advanced Engineering Fibrous Structures
- PFEN 7210 Fabric Formation and Properties



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- TE 225 Fabric Design and Manufacturing
- TE 460 Mechanics of Textile Manufacturing Processes and Systems
- TXTN 3450 Technical Textiles

5. Some of these courses involved laboratory sessions in which we used both circular and flat warp and weft knitting machines to teach the students. For example, in the Fall 2013 semester, I am teaching PFEN 2270 which includes a chapter in knitting technology and knitted fabrics.

6. One of my Ph.D. students did his dissertation on a patented hybrid weaving/knitting machine to produce woven/knitted fabrics. We published the following articles as a result of that work:

- Adanur, S., and Onal, L., "Analysis of a Novel 3D Hybrid Woven/Knitted Fabric Structure, Part II: Mechanical Model to Predict Modulus and Extension", Textile Research Journal, 74(10), 865-871, October 2004.
- Onal, L., and Adanur, S., "Analysis of a Novel 3D Hybrid Woven/Knitted Fabric Structure, Part I: Geometric Model and Verification", Textile Research Journal, 74(9), 827-832, September 2004.

7. We made the following presentations about this project:

- Onal, L., and Adanur, S., "A Novel 3D Structure, 3D Hybrid Woven/Knitted Fabric", Proceedings of The Fiber Society 2003 Spring Symposium, "Advanced Flexible Materials and Structures: Engineering with Fibers", June 30-July 2, 2003, Loughborough, England.
- Adanur, S., and Onal, L., "Design Characterization of a Novel 3D Hybrid Knitted/Woven Fibrous Structure for Composites", Proceedings of the 2003 NSF Design, Service and Manufacturing Grantees and Research Conference, January 6-9, 2003, Birmingham, AL.



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- Adanur, S., Gumusel., L. and Bas, H., "A Novel 3D Woven-Knit Hybrid Fabric for Composites", Techtextil North America Symposium, April 1-3, 2008, Atlanta, GA.

8. My book entitled "Wellington Sears Handbook of Industrial Textiles" (Technomic/CRC Press, 1995) includes a chapter on knitting technology and knitted fabrics. I am currently in the process of updating this handbook.

9. I have attended many ATME-I (American Textile Machinery Exhibition-International) textile machinery shows in the USA, ITMA machinery shows (International Textile Machinery Association) in Europe (Milan, Paris, Birmingham, Munich), and TechTextil show in China. In these shows, I kept myself up to date with the latest developments in textile machinery and fabrics, including knitting machinery and knitted fabrics. As a result, I have a large collection of knitting machine brochures and knitted fabric samples, which I use in my classes.

10. Between 2008-2011, I was retained as an expert witness by a textile company in a case involving knitted fabric structures. Earlier, I did consulting work for Eaton Corp., Milwaukee in woven and knit reinforcements for composites. I also did consulting work for Hoechst Celanese, Spartanburg, SC in developing a warp knitted structure using elastomeric monofilament fiber.

11. I am being compensated at my normal consulting rate of $220 per hour for my time spent in preparing this declaration. I am being separately



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reimbursed for any out-of-pocket expenses. My compensation does not depend in any way on the outcome of this proceeding or the nature of my opinions.

12. I have been retained on behalf of Petitioner, adidas AG ("adidas"), in connection with the Petition for *Inter Partes Review* of U.S. Patent No. 7,347,011 (the '011 patent").

13. I understand that at the same time adidas is submitting this Declaration, it is also filing an Opposition to Patent Owner's Motion to Amend the '011 patent. I also understand that Patent Owner's Motion to Amend seeks to cancel claims 1-46, and proposes substitute claims 47-50. I have been asked to offer an opinion regarding the broadest reasonable interpretation of the terms "flat knit textile element" and "flat knit edges" that is consistent with the '011 patent specification to a person of ordinary skill in the relevant art at the time the '011 patent was filed.

## II. Materials Reviewed

14. In forming my opinions, I have reviewed the following materials:

- The '011 patent, Exhibit 1002.
- The '011 patent file history, Exhibit 1003.
- May 17, 2013, Decision (Institution of Inter Partes Review 37 C.F.R. § 42.108) in IPR2013-00067, Paper 18.
- Nike, Inc.'s Motion to Amend U.S. Patent No. 7,347,011 in IPR2013-00067, Paper 31.
- Declaration of Raymond F. Tonkel, Exhibit 2010.



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- Excerpts from "Man-Made Fiber and Textile Dictionary" (4th Ed. 1985), Exhibit 2011.
- Copy of transcript of November 5, 2013, cross-examination deposition of Raymond F. Tonkel, Exhibit 1015.
- Knitted Fabrics, Manufacture and Processing, Ciba-Geigy, 1976, Exhibit 1017.
- Gajjar, B. J., Warp Knit Fabrics Technologies, Emerald Ink Publishing, 2007, Exhibit 1018.
- Spencer, D. J., Knitting Technology, Woodhead Publishing Limited, 1989.
- Adanur, S., Wellington Sears Handbook of Industrial Textiles, Technomic Publishing Co., (CRC Press), 1995.
- Man-made fiber and Textile Dictionary, Celanese Corporation, 1981, 1985.
- Dictionary of Fiber and Textile Technology, Hoechst Celanese, 1990.
- Technical Fabric Structures - 2. Knitted Fabrics by Subhash C. Anand.
- Weft Knitting Technology (1 page)
- U.S. Patent No. 6,984,596
- U.S. Patent No. 2,042,146
- U.S. Patent No. 5,345,638, Exhibit 1005.
- U.S. Patent No. 2,178,941, Exhibit 1020.
- U.S. Patent No. 2,150,730, Exhibit 1021.
- The Milanese Machine, Textiles, December 1921, Exhibit 1019.
- European Patent Application, EP 1 091 033 A2, Circular knitted fabric and method for forming article from the same
- Adanur, S., Knitting Fundamentals, Class Notes for PFEN 2270 Introduction to Engineered Fibrous Materials.
- Various knitting machine manufacturers brochures including Karl Mayer
- Various warp and weft knitted fabric sample structures from different manufacturers



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15. In addition to the materials I have referenced, I discussed with Dr. Edward Frederick the standard of a person of ordinary skill in the art at the time the '011 patent was filed, the proposed constructions of certain claim terms discussed in my declaration, as well as the motivation that such a person would have to modify flat knit textiles that are formed as part of a larger structure to include "knit to shape" flat knit textiles.

## III. Person of Ordinary Skill in the Art

16. It is my opinion that the person of ordinary skill in the art at the time of the invention for the '011 patent would have at least several years' experience with all aspects of shoemaking from the conceptual stage through design, development, commercialization, and manufacturing, including basic knowledge of the functional requirements of footwear and a comprehensive understanding of the range of material choices, as well as construction techniques and processes used to create the various types of a shoe and to assemble them in a proper manner. For example, such a person would have the skills and capabilities to identify knitting machines, knitted fabric structures and their major properties. I have assumed that the time of invention is around the filing date of the '011 patent, March 2004.



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17. I have an understanding of the capabilities of the skilled person in this field, which I have confirmed through my discussion with Dr. Frederick, and my comments and opinions are provided from the perspective of such a person.

## IV. Principles of Claim Construction, Anticipation, and Obviousness

18. I have been informed that in an *inter partes* review, claim terms are given their broadest reasonable interpretation that is consistent with the patent specification in which they appear. I also understand that limitations from the specification are not to be read into the claims.

19. I understand that a patent claim is invalid as anticipated under 35 U.S.C. § 102 if every element of a claim is found expressly, implicitly, or inherently in a reference.

20. I also understand that a patent claim may not be obtained though the invention is not identically disclosed or described in a reference, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious under 35 U.S.C. § 103(a) at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

21. I understand that there should be some articulated reasoning with some rational underpinning as to why the prior art references render the patent



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claim obvious, and that a number of rationales support a reason to modify or combine prior art references.

22. Examples of rationales that may support a conclusion of obviousness include: (A) Combining prior art elements according to known methods to yield predictable results; (B) simple substitution of one known element for another to obtain predictable results; (C) Use of known technique to improve similar devices (methods, or products) in the same way; (D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (E) "Obvious to try" – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; (F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art; (G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention. I understand that these factors are identified in the U.S. Supreme Court's decision in *KSR v. Teleflex*.

23. Counsel for adidas has informed me that the Patent Office follows its published guidelines for determining whether a patent claim would have been obvious at the time the invention was made to a person of ordinary skill in the art.



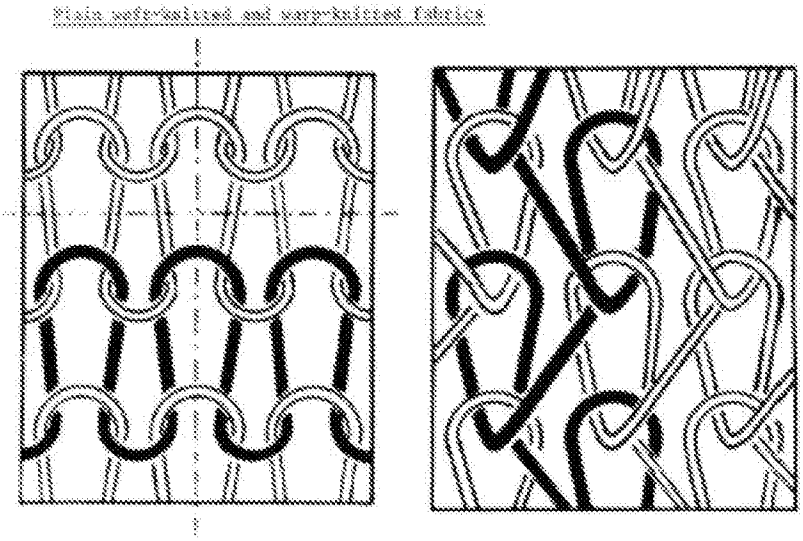
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Those guidelines are available in the Patent Office's "Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*" (http://www.uspto.gov/web/offices/pac/mpep/s2141.html), and I have read those guidelines and applied them below when I analyze whether it would have been obvious to combine prior art references.

## V. Explanation of Knitting Technology

24. Knitted textiles are generally divided into warp-knitted and weft-knitted on the basis of fundamental differences in the construction of two groups. Generally speaking, in weft-knitted textiles, the yarn being kinked into loops runs horizontally across the textile, whereas in warp-knitted textiles, the yarn being kinked into loops runs vertically along the textile (Ex. 1017, p. 55.)



(Ex. 1017, p. 55.)



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25. In addition to warp knit and weft knit, milanese is another type of knitted textile in which the yarn is oriented diagonally across the textile. (Ex. 1018, p. 10.) Milanese has been a well-known form of knitting since at least 1921. (Ex. 1019, p. 3.) The image below illustrates the distinctions between milanese stitches over those of traditional warp (tricot) and weft stitches.

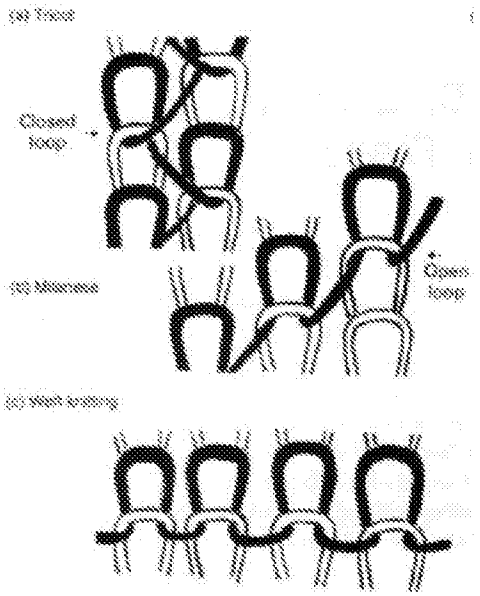


Figure 19.1
Loop diagram of Milanese fabric, compared with tricot and weft knitting

(Ex. 1018, p. 10.)

26. As the figure indicates, the loops in the milanese knitted fabric are similar to the loops in the weft knitted structure except the directionality; on the other hand, in some literature, milanese knitting is considered to be part of warp knitting (Exhibit 1018, pp. 3, 4).



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27. The manner in which loops are formed differentiates the knitting machines. Regarding the knit fabric structures, it is hardly possible to state with certainty the type of knitting machine on which the fabric was knitted. There are flat and circular warp and weft knitting machines. (Ex. 1017, pp. 9, 11, 12; Ex. 1018, p. 9.) Both flat knitting machines and circular knitting machines may be used to produce warp-knitted and weft-knitted textiles, as shown in Table 1. (Ex. 1017, p. 11; Ex. 1018, p. 9.)

Table 1 Classification of knits

| | | Arrangement of Needles in the Knitting Machine | |
|---|---|---|---|
| | | In one line (flat) | In a circle (circular) |
| Direction of thread | Lengthwise in the fabric (warp) | Flat warp knit fabric | Circular warp knit fabric |
| | Crosswise in the fabric (weft) | Flat weft knit fabric | Circular weft knit fabric |

28. Likewise, milanese fabrics are produced on milanese knitting machines, which may also be flat or circular. (Ex. 1018, p. 10.) A milanese knitting machine uses spools instead of a straight bar or warp beam (Exhibit 1018, p. 4) (so milanese knitting machines are similar to weft knitting machines in that sense), but the stitch formation is also similar to tricot stitch formation (Ex. 1018, pp. 4, 9-10.)



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29. While warp, milanese and weft knitted textiles are generally produced on flat or circular knitting machines, these types of textile structures may also be knitted by hand.

30. Warp knitting and weft knitting are independent of the yarns used. Similar yarns can be used in warp knitting and weft knitting machines to produce warp knitted structures and weft knitted structures, respectively.

31. Flat warp knitting machines are also referred to as "straight-bar" warp knitting machines, which are often sub-categorized as tricot machines, raschel machines, and crochet machines. (Ex. 1017, p. 11.; Ex. 1018, pp. 4, 23-25.) These machines produce warp knitted fabrics in flat form. It is well-known that warp knit fabrics produced by tricot machines are knit in flat form. During his deposition, Patent Owner's declarant (Mr. Tonkel) agreed that tricot is a fairly common material in the footwear industry. (Tonkel Dep. Tr., Ex. 1015, p. 52.)

32. However, there are circular warp knitting machines as well, in which needles move individually. (Ex. 1017, p. 11.) The Man-Made Fiber and Textile Dictionary (a reference book that I have in my office and also submitted as an exhibit by Patent Owner) defines flat-knit fabric as "a fabric made on a flat-knitting machine, as distinguished from tubular fabrics made on a circular-knitting machine." (Ex. 2011, p. 6.) While the reference states that the term flat-knit fabric may be used in the trade to refer to weft-knit fabrics, this reference also supports



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the industry understanding that tricot and milanese warp-knit fabrics are knit in flat form. (Ex. 2011, p. 6.)

33. Warp Knit Fabrics Technologies, a reference book written in 2007 and which is contemporaneous with the '011 patent, states that "[i]n the industry, some people refer to weft knitting machines as flat machines and warp knit machines as circular machines, but in reality there are flat and circular warp as well as weft knit machines." (Ex. 1018, p. 9.)

34. U.S. Patent No. 6,984,596, which is also contemporaneous with the '011 patent, includes a similar definition of "flat knit" (i.e., "a knitted fabric made on a flatbed-knitting frame as distinguished from tubular fabric made on a circular frame") to describe a warp knit construction produced on a conventional flat knitting machine. (Ex. 1022, 2:57-3:7.)

## VI. Proposed Constructions of "Flat Knit Textile Element" and "Flat Knit Edges"

35. Substitute claim 47 recites an article of footwear that comprises "an upper incorporating a flat knit textile element." Although the '011 patent describes flat knitting as a sub-type of weft knitting, the specification does not define "flat knit," "flat knit textile," or "flat knitting," or otherwise state that flat knitting is exclusively a sub-type of weft knitting. (Ex. 1015, pp. 34-36.)



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36. Because it is well-known in the knitting industry that other types of knit structures (such as tricot and milanese) may be knit in flat form (whether by a flat knitting machine or by hand), when the term "flat knit textile element" is given its broadest reasonable interpretation that is consistent with the '011 patent specification, the term "flat knit textile element" means "a knitted textile that is knit in flat form." This proposed construction is consistent with the plain and ordinary meaning, and also does not introduce any particular method of production into the claim since the claim itself does not recite that the flat knit textile element be produced in any specific way.

37. In summary, I have prepared Table 2, which shows the types of knitted materials that a skilled person at the time the '011 patent was filed would understand to be included within the term "weft knitted textile element" under its broadest reasonable interpretation that is consistent with the '011 patent specification (as indicated with vertical lines), and shows the types of knitted materials that a skilled person would understand to be included within the term "flat knit textile element" under its broadest reasonable interpretation that is consistent with the '011 patent specification (as indicated with horizontal lines). The checkered pattern indicates types of knitted materials that a skilled person would understand to be included within both terms under the broadest reasonable interpretation that is consistent with the '011 patent specification.



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Table 2 Comparison of claim term constructions

| | | Arrangement of Needles in the Knitting Machine | |
|---|---|---|---|
| | | In one line (flat) | In a circle (circular) |
| Direction of thread | Lengthwise in the fabric (warp) | | |
| | Diagonal in the fabric (milanese) | | |
| | Crosswise in the fabric (weft) | | |

- Vertical lines illustrate materials encompassed by broadest reasonable interpretation of "weft knitted textile element."
- Horizontal lines illustrate materials encompassed by broadest reasonable interpretation of "flat knit textile element."
- Checkered pattern illustrate materials encompassed by broadest reasonable interpretation of both terms.

38. Substitute claim 47 also recites that the flat knit textile element has "flat knit edges." The '011 patent does not define "flat knit edges." (Tonkel Dep. Tr., Ex. 1015, p. 95.) As described above, when "flat knit" is given its broadest reasonable interpretation that is consistent with the '011 patent specification, "flat knit" means "knit in flat form." Therefore, "flat knit edges," when given its broadest reasonable interpretation that is consistent with the '011 patent specification, means "edges of a knitted textile that are knit in flat form." This proposed construction is also consistent with the plain and ordinary meaning, and also does not introduce any particular method of production of the edge into the



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claim since the claim itself does not recite that the flat knit edge be produced in any specific way.

## VII. Conclusion

39. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested 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.

40. I reserve the right to supplement my opinions in the future to respond to any arguments raised by the owner of the '011 patent and to take into account new information as it becomes available to me.

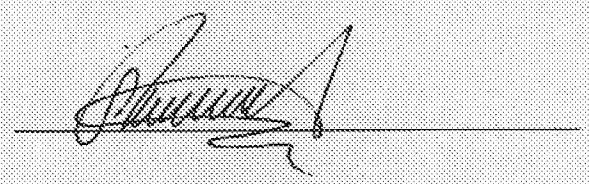
41. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.



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Dated: 11/12/2013





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**SABIT ADANUR**
Professor
Auburn University, Department of Polymer and Fiber Engineering, Auburn, AL 36849
Phone: (334) 844-5497, Fax: (334) 844-4068
e-mail: adanusa@ eng.auburn.edu, http://www.eng.auburn.edu/~adanusa

## 1. EDUCATION

| | |
|---|---|
| June 1989 | Ph.D. in Fiber and Polymer Science<br>North Carolina State University, Raleigh, North Carolina. |
| Dec. 1985 | M.S. in Textile Engineering and Science<br>North Carolina State University, Raleigh, North Carolina. |
| July 1982 | B.S. in Mechanical Engineering<br>Istanbul Technical University, Istanbul, Turkey. |

## PROFESSIONAL EXPERIENCE

| | |
|---|---|
| Oct. '00 – Present | Professor<br>Auburn University, Polymer and Fiber Engineering Department, Auburn, Alabama. |
| Oct. '96 – Sept. '00 | Associate Professor<br>Auburn University, Textile Engineering Department, Auburn, Alabama. |
| Sep. '92 - Sep. '96 | Assistant Professor<br>Auburn University, Textile Engineering Department, Auburn, Alabama. |
| Nov. '89-Aug '92 | Product and Process Development Manager<br>Asten Forming Fabrics, Inc., Appleton, Wisconsin. |
| July '89-Oct. '89 | Process Development Engineer<br>Asten Forming Fabrics, Inc., Appleton, Wisconsin. |
| Aug. '83-Jun. '89 | Research/Teaching Assistant<br>North Carolina State University, Raleigh, North Carolina. |

## Litigation Support Experience

1) I gave a deposition in a case involved Asten Forming Fabrics and their competitor regarding a patent infringement case regarding a forming fabric design, Opelika, AL, mid 1990s.

2) I was retained by Sulzer Textile as an expert in a lawsuit with Picanol in a patent infringement case involving air-jet weaving machine operations, 2000-2001. There was a jury trial of more than a week in September 2001 in Tyler, Texas.



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3) I was retained as an expert by Southern Mills against Polartec in a patent infringement case regarding fire resistant fleece knit fabric and garment, Atlanta, GA, 2008.

## Professional Development Activities

- Attended the Biggio Seminar "Engaging Students in Active Learning", 14 February 2013, Biggio Center, Auburn University.
- Attended the tutorial "Canvas Orientation", Sept. 20, 2011, Auburn University.
- Attended the workshop "Introduction to Performance Tasks", by [Cla]ssroom Academy, 15-16 August, 2011, Auburn, AL.
- Completed the Alabama Ethics Law Training, March 31, 2011.
- Developing Online Courses (July 14, 2010)
- Teaching with Powerpoint 2007 (July 13, 2010)
- Attended the Biggio Seminar, "Writing to Learn and Learning to Write", by Alyson Whyte, 13 Nov. 2008
- Attended the Biggio Seminar,"Nurturing the Expectancy Effect", March 11, 2008.

## 2. ASSIGNED DUTIES FOR THE PAST FIVE YEARS (average)

| Quarter | Teaching (%) | Research (%) | Extension/Service (%) |
|---|---|---|---|
| Summers | 0 | 92 | 8 |
| Academic | 63 | 32 | 5 |

## 3. HONORS AND AWARDS

- Our Poster entitled "Activated carbon fiber filter media for proton exchange membrane fuel cell cathode" by Liu, W. and Adanur, S., won the best poster award at the Fiber Society Meeting in Shanghai, China, June 2009.
- My graduate student Mr. Erdem Selver was chosen as one of the ten Outstanding Master's Students at Auburn University for 2008-2009 by the AU Graduate Council.
- Outstanding Faculty Award, Department of Polymer and Fiber Engineering, 2008-2009
- Best poster presentation for the NSF Research Experience for Undergraduates (REU) Program in Micron/Nano-Structured Materials, Therapeutics and Devices. Title: Addition of Nanoparticles to Electrospun Nanofibers. Authors: Roxanne Guarin, Wei Liu and Sabit Adanur. Auburn REU Fellows Research Poster Session, July 31, 2008. There were 10 undergraduate students from different parts of the US in this program who spent their summers in Auburn.
- Outstanding Faculty Award, Department of Polymer and Fiber Engineering, 2007-2008
- Outstanding Teacher Award, Department of Textile Engineering, 2002-2003.
- Outstanding Teacher Award, Department of Textile Engineering, 2001-2002.
- Auburn Alumni Professor Award (1999 – 2004).
- Outstanding Teacher Award, Department of Textile Engineering, 2000-2001.
- AU College of Engineering Birdsong Merit Teaching Award 2000
- Outstanding Teacher Award, Department of Textile Engineering, 1999-2000.
- Auburn Alumni Engineering Council Senior Faculty Research Award, 1999.
- My graduate student Mr. Baohua Xu is awarded the academic excellence award for international students (June 1998).



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- Nominated two years in a row (1997 and 1998) as a potential participant in the National Academy of Engineering (NAE)'s Third and Fourth Annual Symposiums on Frontiers of Engineering, Irvine, CA.
- 1995 NSF Faculty Early Career Development (CAREER) Award, National Science Foundation, $ 210,000.00, duration: 4 years (Sept. 1, 96-Aug. 31, 2000).
- Nominated by Dr. William V. Muse two years in a row (1994 and 1995) to represent Auburn University in highly prestigious National Science Foundation, Presidential Faculty Fellows Award competition (only two candidates can be nominated by an institution).
- 1991 George Goldfinger Award. "This award is presented to the graduate of the North Carolina State University, College of Textiles, Fiber and Polymer Science Program who was judged to have submitted the most outstanding Ph.D. thesis over the past two years".

## 4. SCHOLARLY CONTRIBUTIONS

### 4. A. TEACHING

4.A.1 Courses Taught for the Past Five Years

| | |
|---|---|
| ENGR 1110 | Introduction to Engineering |
| FBEN 2250 | Fabric Design and Engineering |
| PFEN 2270 | Introduction to Engineered Fibrous Materials |
| PFEN 3200 | Polymer Processing |
| PFEN 3300 | Fibrous Product Testing and Instrumentation |
| TXTN 3450 | Technical Textiles |
| PFEN 4300 | Engineered Fibrous Structures |
| PFEN 4820 | Senior Design |
| PFEN 5100 | Fabrics for Papermaking |
| PFEN 6100 | Fabrics for Papermaking |
| PFEN 6106 | Fabrics for Papermaking (outreach) |
| PFEN 6250 | Advanced Eng. Fibrous Str. |
| PFEN 7960 | Adv. Polymer Processing lab |
| PFEN 7970 | Advanced Polymer Processing |
| PFEN 7990 | Research and Thesis |
| PFEN 7210 | Fabric Formation and Properties |
| PFEN 7960 | Special Problems in Polymers and Fibers |
| PFEN 7970 | Special Topics |
| PFEN 7980 | Graduate Project |
| PFEN 7990 | Research and Thesis |
| PFEN 8200 | Adv Textl Struct Desi & Develop |
| ITAS 8990 | Research and Dissertation |

4.A.2 Graduate Students Whose Work Has Been Completed

Students for Whom The Candidate Served as Major Professor

| Student | Degree | Chair | Department | Graduation Date | Current Employer |
|---|---|---|---|---|---|
| Meeks, S. B. | MS | Dr. Adanur | PFEN | May 2012 | Interviewing |
| Zheng, H. | MS | Dr. Adanur | PFEN | Dec. 2010 | Graduate Student |
| Gocek, I. | PhD | Dr. Adanur | PFEN | May 2010 | Istanbul Technical Univ. |
| Keskin, R. | PhD | Dr. Adanur | PFEN | May 2010 | Pamukkale University |



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| | | | | | |
|---|---|---|---|---|---|
| Liu, W. | PhD | Dr. Adanur | PFEN | May 2010 | A company in IL |
| Selver, E. | MS | Dr. Adanur | PFEN | May 2010 | PhD Student/England |
| Liu, W. | MPFEN | Dr. Adanur | PFEN | May 2009 | AU PhD student |
| Isikel, L. | MS | Dr. Adanur | PFEN | May 2007 | A company in Turkey |
| Irsale, Swagat J. | PhD | Dr. Adanur | PFEN | Dec. 2005 | Nexus Software Sol,Inc., MN |
| Ascioglu, Birgul | PhD | Dr. Adanur | PFEN | Aug. 2005 | Valeo, Inc., Bursa, Turkey |
| Irsale, Swagat J. | MS | Dr. Adanur | Textile Eng. | Dec. 2003 | Nexus Software Sol, Inc., PA. |
| Hughes, Kevin | MTE | Adanur/Tippur | Textile Eng. | May 2005 | GKN Aerospace |
| Vakalapudi, Sathendra | MS | Dr. Adanur | Textile Eng. | Aug. 2003 | Detroit (software co.) |
| Onal, Levent | PhD | Dr. Adanur | Textile Eng. | May 2002 | Erciyes University |
| Turel, Tacibaht | MS | Dr. Adanur | Textile Eng. | Aug. 2002 | PhD, Consumer Aff. |
| Tascan, Mevlut | MS | Dr. Adanur | Textile Eng. | May 01 | PhD, Clemson Univ. |
| Orak, Hakan | MS | Adanur/Tippur | Textile Eng. | May 01 | PhD, Clemson Univ. |
| Kayathi, K. K. | MS | Dr. Adanur | Textile Eng. | January 01 | India |
| Xu, BaoHua | MS | Dr. Adanur | Textile Eng. | Aug. 99 | PhD Student, TE |
| Arumugam, Yuvaraj | MS | Dr. Adanur | Textile Eng. | July 98 | Goodyear Tire Co. |
| Qi, Jing | MS | Dr. Adanur | Textile Eng. | May 98 | Grad Student in EE |
| Tewari. Ashutosh | MS | Dr. Adanur | Textile Eng. | Dec. 97 | California Co. |
| Hou, Zhenwei | MS | Dr. Adanur | Textile Eng. | Dec. 97 | PhD Candidate |
| Gongalareddy, Sreekanth | MS | Dr. Adanur | Textile Eng. | Dec. 96 | Telecom., Atlanta |
| Mallick, Sumita B. | MS | Dr. Adanur | Textile Eng. | Aug. 96 | PhD (Boston Univ.) |
| Zhai, Honglian | MS | Dr. Adanur | Textile Eng. | Aug. 96 | TCOM, Maryland |
| Yuksekkaya, M. Emin | MS | Dr. Adanur | Textile Eng. | June 96 | Prof., Usak U., Turkey |
| Tsao, Yen P. | MS | Dr. Adanur | Textile Eng. | Dec. 95 | Taiwan |
| Tam, Chi-Wen | MS | Dr. Adanur | Textile Eng. | March. 95 | Taiwan |
| Sartain, Stephen L. | MS | Dr. Adanur | Textile Eng. | Dec. 94 | Own automotive business |

Others:

| | | | | |
|---|---|---|---|---|
| Inan, Gunes | PhD | Dr. Adanur | Textile Eng. | Aug. 04-Dec. 04 |
| Kilinc, F. Selcen | PhD | Dr. Adanur | Textile Eng. | Aug. 00 – Dec. 01 |
| Unsal, Evren | PhD | Dr. Adanur | Textile Eng. | Aug. 00-Feb. 01 |
| Xu, BaoHua | PhD | Dr. Adanur | Textile Eng. | June 99 – Dec. 99 |
| Zhenwei Hou | PhD | Dr. Adanur | Textile Eng. | Jan. 99 – Sept. 99 |
| Mallick, Sumita B. | PhD | Dr. Adanur | Civil Eng. | Aug. 96 – Aug. 98 |
| Nalamati, R. Kumar | MS | Dr. Adanur | Mech. Eng. | Sept. 95- April 96 |

Students for Whom The Candidate Served as Committee Member

| Student | Degree | Chair | Department | Graduation Date | Current Employer |
|---|---|---|---|---|---|
| Blackwell, C. | MPFEN | Dr. Thomas | PFEN | Dec. 2012 | CSP |
| Liu, Yang | MS | Dr. Zhang | PFEN | Fall 2011 | PhD student at AU |
| Quinones ,Vladimir | PhD | Dr. Thomas | PFEN | Spring 2011 | Post-doc at AU |
| Luna, Eric | PhD | Dr. Tatarchuk | Chemical Eng. | Summer 2009 | Syngenta Crop P., NC |
| Anthony, Rebecca | MPFEN | Dr. Thomas | PFEN | Spring 2009 | Unknown |



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| | | | | | |
|---|---|---|---|---|---|
| Hasan Kocer | M.S. | Dr. Broughton | PFEN | Fall 2007 | PhD student ITAS |
| Ray, Rebecca | M.S. | Dr. Thomas | PFEN | Fall 2006 | Unknown |
| Ma, Erjian | PhD | Dr. Jang | Materials Eng. | Spring 01 | Unknown |
| McCarthy, P. J. | MCE | Dr. Elton | Civil Eng. | Spring 96 | Denver, CO |
| Xiao, Liming | PhD | Dr. Yang | Materials Eng. | Spring 98 | Postdoc, AU EE |
| Hunt, Rich | MS | Dr. Nelms | Electrical Eng. | June 97 | Unknown |
| Kirkpatrick, C. T. | MS | Dr. Jang | Materials Eng. | Spring 97 | California Company |
| Kotha, S. | MS | Dr. Gowayed | Textile Eng. | Spring 97 | India |
| Xi, Xiaomei | PhD | Dr. Yang | Materials Eng. | Aug. 96 | California Company |
| Zhang, Qiang | PhD | Dr. Beale | Mechanical Eng. | Jan. 96 | A Comp. in Maryland |
| Vickers, Daniel | MS | Dr. Beale | Mechanical Eng. | March 95 | FMP/Rauma |

Students for Whom the Candidate Served as Outside Reader

| Student | Degree | Chair | Department | Defense Date |
|---|---|---|---|---|
| Donath, Gregory W. | PhD | Dr. Duke | Chemical Eng. | Nov. 10, 2008 |
| Ajitsaria, Jyoti K. | PhD | Dr. Choe | Mech. Eng. | Aug. 29, 2008 |
| Butts, Daniel Alan | PhD | Dr. Gale | Materials Eng. | May 9, 2005 |
| ElBashir, Nimir | PhD | Dr. C. Roberts | Chemical Eng. | Nov 15. 2004 |
| Gopalakrishnan, M. | PhD | Dr. ElHalwagi | Chemical Eng. | May 21, 2002 |
| Noureldin, M. | PhD | Dr. ElHalwagi | Chemical Eng. | Oct.12, 00 |
| Patil, A. R. | PhD | Dr. Crocker | Mechanical Eng. | Sept. 11, 00 |
| Park, Y. | PhD | Dr. Roberts | Chemical Eng. | July 20, 00 |
| Shelley, M. D. | PhD | Dr. El-Halwagi | Chemical Eng. | Apr. 20, 00 |
| Abdo, Z. A. M. | PhD | Dr. Gale | Materials Eng. | Dec. 3, 99 |
| Garrison, W. | PhD | Dr. El-Halwagi | Chemical Eng. | May 8, 97 |
| Yim, J. H. | PhD | Dr. Jang | Materials Eng. | Apr. 25, 97 |
| Hamad, A. A. | PhD | Dr. El-Halwagi | Chemical Eng. | Apr. 21, 97 |
| Mallick, R. B. | PhD | Dr. Brown | Civil Eng. | Apr. 8, 97 |
| Zhao, Li-Ren | PhD | Dr. Jang | Materials Eng. | Feb. 26, 96 |
| Haque, Anwarul | PhD | Dr. Raju | Mechanical Eng. | Oct. 10, 95 |
| Yim, Jong H. | PhD | Dr. Jang | Materials Eng. | April 25, 95 |

4.A.3 Graduate Students on Whose Committee the Candidate is Presently Serving

Students for Whom the Candidate is Serving as Major Professor

| Student | Degree | Chair | Department | Date Started |
|---|---|---|---|---|
| Shen, Yang | M.S. | Dr. Adanur | PFEN | Fall 2012 |
| Cermik, Ozdes | Ph.D. | Marghitu/Adanur | ME | Fall 2010 |

Students for Whom the Candidate is Serving as Committee Member

| Student | Degree | Chair | Department | Date Started |
|---|---|---|---|---|



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| | | | | |
|---|---|---|---|---|
| Smith, James | MS | Dr. Zhang | PFEN | May 2012 |
| Wang, Xialong | MS | Dr. Zhang | PFEN | Fall 2011 |
| White, Charles J. | PhD | Dr. Byrne | CHEN | Spring 2012 |
| Cermik, Ozdes | MS | Dr. Marghitu | ME | Fall 2010 |
| Poyraz, Selcuk | PhD | Dr. Zhang | PFEN | Fall 2008 |
| Liu, Yang | MS | Dr. Zhang | PFEN | Fall 2010 |
| Liu, Zhen | PhD | Dr. Zhang | PFEN | Spring 2009 |
| Chandler, Mark | MS | Dr. Thomas | Textile Eng. | Fall 2001 |
| Zhou, Fangfang | PhD | Dr. Jang | Materials Eng. | Winter 2000 |

Visiting Scholars/Students Supported

| Name | Origin | Duration |
|---|---|---|
| Ms. Roxanne Guarin | Undergraduate student from Univ. of Mass-Amherst | May 21, 2008- July 31, 2008 |
| Ms. Stacy Yee | Undergraduate student from Univ. of Michigan | May 21, 2007- July 27, 2007 |
| Ms. Christina Yacoob | Undergraduate student from SUNY Buffalo | May 29, 2006-Aug. 4, 2006 |
| Dr. Levent Gumusel | Turkey | Jan. – Feb. 2005, Jan. 2006 |
| Dr. Hasan Bas | Turkey | Jan. – Feb. 2005, Jan. 2006 |
| Ms. Abibe Maimaiti | China | Sept. 2001-Sept. 2002 |
| Dr. Gulay Ozcan | Turkey | January 01 – February 01 |
| Dr. Tianyi Liao | China | Aug. 96 - March 99. |
| Dr. Sule Altun | Turkey | July 99-Sept. 99 |

4.A.4 Courses and Curricula Developed

New Undergraduate Courses Developed:

Dr. Adanur has developed the following courses which did not exist before.

1. PFEN 3200 Polymer Processing
2. ENGR 1110 Introduction to Polymer and Fiber Engineering
3. PFEN 3300 Fibrous Product Testing and Instrumentation
4. PFEN 4300 Engineered Fibrous Structures
5. PFEN 5100/6100 Fabrics for Papermaking
6. TXTN 3450 Technical Textiles
7. TE 225 Fabric Design and Manufacturing
8. TE 460 Mechanics of Textile Manufacturing Processes and Systems

New Graduate Courses Developed:

1. PFEN 7210 Fabric Formation and Properties
2. PFEN 6250 Advanced Engineering Fibrous Structures
3. PFEN 8200 Advanced Textile Structure Design and Development

4.A.5 Grants Received Related to Teaching (Total $ 241,864.00; see also 4.B.8)



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1. Adanur, S., Graduate Outreach Program (GOP) Grant, $135.00, Spring 2009.

2. Two injection molding machines were donated to polymer processing lab by ThermoFisher Scientific of Auburn, May 2007, $9,000.00.

3. Travel fund for the ITMA 2003, Birmingham, England.
Funding Agent: Highland Takata Industries
Amount: $ 3,428.92
Duration: Oct. 21-30, 2003.

4. Developing a Course Based on Equipment Design for Introduction to Engineering
Funding Agent: AU College of Engineering
Amount: $ 24,050
PI: P. Jones (leader), C. A. Flood, S. Adanur
Duration: June 1, 1999-May 31, 2000

5. Title: Travel fund for IFAI Expo 1999, San Diego, CA.
Funding Agent: Highland Takata Industries
Amount: $ 4,000.00
PI: W. Walsh, S. Adanur, R. Broughton, Y. ElMogahzy
Duration: Oct. 28-30, 1999.

6. Title: Travel fund for Messe Frankfurt Industrial Textiles Fair, Frankfurt, Germany
Funding Agent: Highland Takata Industries
Amount: $ 4,000.00
PI: S. Adanur (50%), W. Walsh (50%)
Duration: May 11-18, 1998

7. Title: Textile Structural Composites Laboratory
Funding Agent: National Science Foundation, Instrumentation and Laboratory Improvement (ILI)
Amount: $ 87,185.00
PI: S. Adanur (95%), Co-PIs: W. Walsh, R. Walker, B. Jang
Duration: Sept. 1, 94- Aug. 31, 96
This NSF grant is specifically for undergraduate curriculum development purposes.

8. Title: Wellington Sears Handbook of Industrial Textiles
Funding Agent: Wellington Sears Company, Valley, Alabama.
Amount: $ 60,000.00
PI: Sabit Adanur
Duration: Oct. 1, 93 - March 15, 95.

9. Title : Discretionary Teaching Grant-in-Aid
Funding Agent: Auburn University
Amount: $ 200.00



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PI: Sabit Adanur
Duration: Nov. 1, 92 - Apr. 30, 93.

10. Two shuttle looms and a warper were donated to weaving lab by West Point Stevens Company, AL, 1992/1993, $ 50,000.00.

4.A.6 Publications Pertaining to Teaching

Textbooks/Book Chapters

1. Chapter 8 – "Structure and Mechanics of Coated Fabrics", book chapter in "Structure and Mechanics of Fibre Assemblies", edited by Peter Schwartz - Woodhead Publishing Limited and CRC Press LLC, 2008.
2. "Fabrics for Papermaking", first draft of the chapter prepared and submitted for the book, "Technology and Woven Fabrics" edited by Dr. Mansour H. Mohamed, Woodhead Publishing, Ltd.
3. Adanur, S., Wellington Sears Handbook of Industrial Textiles, Technomic Publishing Co., Inc., Lancaster, PA, 1995. Library of Congress Catalog Card No. 95-61229, ISBN No. 1-56676-340-1, 850 pages (519 figures and 140 tables).
4. Adanur, S., Paper Machine Clothing, Technomic Publishing Co., Inc., Lancaster, PA, 1997. Library of Congress Catalog Card No. 97-60981, ISBN No. 1-56676-544-7, 405 pages (338 figures, 55 tables).
5. Adanur, S., Handbook of Weaving, Technomic Publishing Co., Inc., 2001. Library of Congress Catalog Card No. 00-107625, ISBN No. 1-58716-013-7. 446 pages (539 Figures, 52 Tables).

Lecture Notes (Bound)

1. TE 425 Technical Textiles, Lecture Notes, Auburn University, 191 pages.
2. TE 460 Mechanics of Textile Manufacturing Processes and Systems, Lecture Notes, Auburn University, 154 pages.

4.A.7 Other Contributions to Teaching

- Accreditation Board for Engineering and Technology (ABET) Accreditation of Textile Engineering program in 1998 and Fiber Engineering program in 2004 (ABET Coordinator)
- Semester Transition (was responsible for the quarter to semester transition for the curriculums in the Department of Textile Engineering).
- Expansion of Master's Program (actively participated in expanding the Masters program in the Department. There were not adequate graduate level courses that covered certain aspects of the Master of Science program in Textile Engineering. Developed four new graduate level courses for this purpose).
- Establishment of Ph.D. Program (was a member of the Textile Engineering Department Committee to establish a joint Ph.D. program with the Consumer Affairs Department).

Establishment of High Performance Materials Laboratory

Dr. Adanur has established an industrial textiles/composites laboratory in the Department. The lab is equipped with state of the art equipment and is being used for teaching. Besides teaching, the laboratory provides an excellent opportunity for undergraduate and graduate students in their projects and independent studies. The lab will strengthen the University's interaction with industry. A new Instron was purchased and installed in the lab. Dr. Adanur received funding from National Science Foundation for a computerized braiding machine which has been installed in the lab. He



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has purchased and installed a new compression molding machine and Dynatup impact testing machines with the NSF EPSCoR funding. The value of these machines is around $ 600,000.00.

## 4.B RESEARCH / CREATIVE WORK

### 4.B.1 Books/Book Chapters (See 4.A.6)

1. Chapter 8 – "Structure and Mechanics of Coated Fabrics", book chapter in "Structure and Mechanics of Fibre Assemblies", edited by Peter Schwartz - Woodhead Publishing Limited and CRC Press LLC, 2008.
2. "Fabrics for Papermaking", first draft of the chapter prepared and submitted for the book, "Technology and Woven Fabrics" edited by Dr. Mansour H. Mohamed, Woodhead Publishing, Ltd.
3. Adanur, S., Wellington Sears Handbook of Industrial Textiles, Technomic Publishing Co., Inc., Lancaster, PA, 1995. Library of Congress Catalog Card No. 95-61229, ISBN No. 1-56676-340-1, 850 pages (519 figures and 140 tables).
4. Adanur, S., Paper Machine Clothing, Technomic Publishing Co., Inc., Lancaster, PA, 1997. Library of Congress Catalog Card No. 97-60981, ISBN No. 1-56676-544-7, 405 pages (338 figures, 55 tables).
5. Adanur, S., Handbook of Weaving, Technomic Publishing Co., Inc., 2001. Library of Congress Catalog Card No. 00-107625, ISBN No. 1-58716-013-7. 446 pages (539 Figures, 52 Tables).

### 4.B.2 Article-length Publications

Refereed Journal Articles (*: student)

1. Adanur, S., and Liu, W., "Desulfurization Properties of Modified Activated Carbon Fibers and Activated Carbon Fiber Paper", submitted to the Journal of Industrial Textiles, 28 Feb. 2013, 14 pages; accepted: August 5, 2013; Galley proofs were sent August 22, 2013.
2. Liu, W*., and Adanur, S., Desulfurization Properties of Activated Carbon Fibers, submitted to the Journal of Engineered Fibers and Fabrics, 21 Feb. 2013, 6 pages. Accepted: March 12, 2013.
3. Adanur, S., and Zheng, H*., "Synthesis and Characterization of Sulfonated Polyimide Based Membranes for Proton Exchange Membrane Fuel Cells", Journal of Fuel Cell Science and Technology, Aug. 2013, Vol. 10, 041001, pp. 1-5.
4. Liu, W*., Yee, S*., and Adanur, S., "Properties of Electrospun PVA/nanoclay Composites", Journal of the Textile Institute, 2013, http://www.tandfonline.com/doi/abs/10.1080/00405000.2013.819156
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37. Adanur, S. (50%), and Xu, B.* (50%), "Impact Resistance of Microwave Cured Glass/Epoxy Composites", Proceedings of the Second International Conference on Composite Science and Technology, ICCST/2, June 9-11, 1998, Durban, South Africa.

38. Mallick, S. B*. (50%), Elton, D. J. (25%), and Adanur, S. (25%), "A New Approach in Modeling of Soil-Geotextile Interface Behavior in Pullout Tests", Proceedings of the Sixth International Conference on Geosynthetics, March 25-29, 1998, Atlanta, GA.

39. Adanur, S.(50%), and Xu, B.* (50%), "Fast, Net Shape Manufacturing of Textile Composites", Proceedings of the Design and Manufacturing Grantees Conference, National Science Foundation, Monterrey, Mexico, January 1998.



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40. Adanur, S. (50%), Hou, Z. * (50%), "Recycling and Reuse of PVC Coated Polyester Fabric", TCL7, Proceedings of the 7th International Conference on Textile Coating and Laminating, Charlotte, NC, November 1997.

41. Adanur, S. (50%), and Xu, B.* (50%), "Characteristics of Microwave-Cured Braided Glass/Epoxy Composites", Proceedings of the Composites at Lake Louise, CALL '97, Lake Louise, Canada, October 1997.

42. Adanur, S. (50%), Arumugam, Y. S.* (5%), and Xu, B.* (45%), "Fast Net Shape Manufacturing of Braided Textile Composite Structures", Proceedings of the Fourth International Conference on Composites Engineering (ICCE/4), Hawaii, July 1997.

43. Adanur, S. (50%), and Sreekanthreddy, G.* (50%), "Compression Behavior of 3D Reinforced Glass/Epoxy Laminar Composite Profiles", ICAPC-97, Proceedings of the International Conference on Advanced Polymer Composites, Materials, Processing and Applications, Beijing University of Aeronautics and Astronautics, Beijing, China, June 1997.

44. Basu Mallick, S.* (40%), Elton, D. J. (30%), and Adanur, S. (30%), "An Experimental Characterization of Soil-Woven Geotextile Interface in Large Box Pullout Tests", Proceedings of the Geosynthetics '97, Long Beach, CA, March 1997, pp. 927-940.

45. Adanur, S., "Manufacturing of Industrial Textiles", 10 pages, Proceedings of the NSF sponsored Symposium, December 1996, Alexandria, Egypt.

46. Adanur, S. (40%), Mallick, S.* (30%) , and Zhai, H.* (30%), "Analysis of Geotextile-Soil Interaction in Pull-Out Tests", Proceedings of the IS Kyushu '96, International Symposium on Earth Reinforcement, Fukuoka, Japan, November 1996.

47. Warren, A.* (50%), El-Halwagi, M. (25%) and Adanur, S. (25%), "Design of a New Process for Converting Textile Solid Waste into Transportation Fuel", Proceedings of the First Trabzon International Energy and Environment Symposium, Karadeniz Technical University, Trabzon, Turkey, July 1996.

48. Adanur, S. (50%), and Gongalareddy, S.* (50%), "Compressive Properties of Stitched Woven Fiberglass Fabric Reinforced Composite Sections for Civil Engineering Applications", ICCE/3, Proceedings of the Third International Conference on Composites Engineering, New Orleans, LA, July 1996.

49. Adanur, S., (80%) and Tam, C. A*. (20%), "On-machine Stitching of 3-D Laminate Structures for Composites", Proceedings of the 2nd International Conference on Composites Engineering (ICCE/2), New Orleans, LA, August 1995.

50. Wang, S.* (40%), Adanur, S. (40%) and Jang, B. Z. (20%), "Thermo-Mechanical Behavior of Fiber/Filler Reinforced Phenolic Matrix Composites", Proceedings of the 2nd International Conference on Composites Engineering (ICCE/2), New Orleans, LA, August 1995.

51. Wang, S.* (40%), Adanur, S (40%). and Jang, B. Z. (20%), "Mechanical Behavior of Fiber/Filler Reinforced Phenolic Matrix Composites", Proceedings of the 2nd International Conference on Composites Engineering (ICCE/2), New Orleans, LA, August 1995.

52. Adanur, S. (50%), Mallick, S. B.* (25%), and Zhai, H.* (25%), "Design and Characterization of Geotextiles for High Performance Applications", Proceedings of the Hi-Tech Textiles Exhibition and Conference, Textile World and INDA, Greenville, SC, July 1995.

53. Mallick, S. B.* (40%)., and Zhai, H.* (40%), "A Laboratory Study on Pull-out Performance of Woven Geotextiles", Geosynthetics '95 Conference Proceedings, Nashville, TN, February 1995. This student paper, directed by Dr. Adanur (10%) and Dr. Elton (10%), was one of the 6 papers accepted for the conference.

54. Adanur, S. (60%), and Tsao, Y. P.* (40%), "Stitch Bonded Textile Structural Composites", SAMPE, Proceedings of the 26th International Technical Conference, Atlanta, GA, October 94.

55. Kozey, K.* (40%), Kumar, S. (20%), (Ga Tech), Adanur, S. (20%), and Mohamed, M. H. (20%), (NC State), "Compressive Failure Mechanisms in Woven and Laminate Glass/Epoxy Composites", SAMPE, Proceedings of the 26th International Technical Conference, Atlanta, GA, October 94.



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56. Adanur, S. (60%), Tsao, Y. P.* (20%), and Tam, C. W.* (20%), "Improving Fracture Resistance in Laminar Textile Composites", Proceedings of International Conference on Composite Engineering, ICCE/1, New Orleans, LA, August 1994.
57. Adanur, S., "Design and Structure of Fabrics for Papermaking", 3rd Annual International Hi-Tech Textiles Conference, Textile World and INDA, Greenville, SC, June 1994.
58. Adanur, S., (50%) and Walker, R. P. (50%), "Yarn Preparation for Weaving in the Future", Proceedings of the 33rd Annual Textile Slashing Short Course, Auburn University, AL, September 1993.
59. Adanur, S., "Effects of Forming Fabric Design on Paper Properties", Second International Hi-Tech Textiles Exhibition and Conference Proceedings, Greenville, SC, July 1993.

Non-refereed Journal Articles

1. O'Dell, H., "Narrow Fabrics in Broad Use", Industrial Fabrics Products Review, Nov. 2007, pp. 48-51 (Adanur was interviewed and quoted in this article).
2. "Your Firm Has ISO Certification: What Comes Next?", This editorial paper was published based on our article: Allen, B*. (50%), and Adanur, S.(50%), "ISO 9000: First Results After Implementation", Textile World, August 1994.
3. Adanur, S., "Forming Fabrics in Papermaking", Textile and Technique, Turkish/English, August 1994, pp. 115-118.
4. Adanur, S., "Latest Developments in Weaving Machinery at ATME-I 93 Show", Textiles and Technique, Turkish/English, September 1993 (in Turkish).

Tech Briefs:

1. Bakhtiyarov, S., Overfelt, R. A., and Adanur, S., "Improvements in Fabrication of Sand/Binder Cores for Casting", NASA Tech Briefs, July 2005.
2. "US-Turkey Cooperative Research", AL EPSCoR, 2004 Annual Report to the AL Commission on Higher Education, 10 Dec. 2004, pp. 18-19.
3. A summary report was submitted to Ms. Jennifer Braxton, Economic Development Analyst with the Economic Development Partnership of Alabama, Birmingham, entitled "Fiberglass Composite Research", Sept. 3, 2004; 4 pages.
4. Bakhtiyarov, S., Overfelt, R. A., and Adanur, S., "Improvements in Fabrication of Sand/Binder Cores for Casting", NASA Tech Brief, April 9, 2002.

4.B.3 Technical Presentations Made (presenter's name is in *Italic*)

1. *Shen, Y.*, and Adanur, S., "A Biaxial Braiding Tubular Structure Based on Helical Auxetic Yarns", The Fiber Society International Symposium on Fibers Interfacing the World, Oct. 23-25, 2013, Clemson, SC.
2. *Adanur, S.*, and Liu, W, "Desulfurization Properties of Activated Carbon Fibers in Dry Conditions", International Istanbul Textile Congress 2013, New Materials, May 30-31, 2013, Istanbul, Turkey.
3. *Shen, Y.*, Adanur, S., Meir, A. and Cao, Y., "Finite Element Analysis of Uniaxial Tension of Polyester Monofilament Woven Fabric", Auburn Research Week, 3 April 2013.
4. *Adanur, S.*, and Broughton, R., "Recovery and Reuse of Waste PVC Coated PET Fabrics", The 4rd International R&D Project Brokerage Event, Bursa, Turkey, Feb. 2-3, 2012 (presented as poster as well).
5. *Adanur, S.*, "PVA Nanofiber Based Membrane for Proton Exchange Membrane Fuel Cells", The 4rd International R&D Project Brokerage Event, Bursa, Turkey, Feb. 2-3, 2012 (presented as poster as well).



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6. Selver, E., and *Adanur, S.*, Properties of Nanoclay Added Composite Polypropylene Monofilaments Using Twin and Single Screw Extruders, Fiber Society International Symposium on New Frontiers in Fiber Materials Science, Oct. 11-13, 2011, Charleston, SC.
7. *Adanur, S.*, A Novel Filling Insertion System for Weaving, The 3rd International R&D Project Brokerage Event, Bursa, Turkey, Feb. 10-11, 2011.
8. *Adanur, S.*, Conceptual Design and Characterization of 3D Interlaced Fibrous Structures, The 3rd International R&D Project Brokerage Event, Bursa, Turkey, Feb. 10-11, 2011.
9. Zheng, H., and *Adanur, S.*, "Synthesis and Characterization of Sulfonated Polyimide Based Membrane for Proton Exchange Membrane Fuel Cell Applications", Alabama Composites Conference, Aug. 24-26, 2010, Birmingham, AL (presented as poster as well).
10. Liu, W., and *Adanur, S.*, "Activated Carbon Fiber Filter Media in Proton Exchange Membrane Fuel Cells for Automotives", Techtextil North America Symposium, May 18-20, 2010, Georgia World Congress Center, Atlanta, GA.
11. *Adanur, S.*, and Selver, E., "Processing and Properties of nanoclay reinforced polypropylene monofilaments", The 4th International Technical Textiles Congress, 16-18 May, 2010, Istanbul, Turkey.
12. *Adanur, S.*, and Gocek, I., "Nanoclay and Compatibilizer Effects on Polypropylene Cast Film Processing and Properties", Fiber Society Spring 2010 International Conference, May 12-14, 2010, Bursa, Turkey.
13. Keskin, R., and *Adanur, S.*, "Improving Toughness of Polypropylene Injection Molded Parts with Thermoplastic Elastomer Materials", The Fiber Society 2009 Fall Meeting and Technical Conference, The University of Georgia, Athens, GA, Oct. 28-30, 2009.
14. *Gocek, I.*, and Adanur, S., "Effect of Processing Parameters on Polypropylene Film Properties", The Fiber Society 2009 Fall Meeting and Technical Conference, The University of Georgia, Athens, GA, Oct. 28-30, 2009.
15. *Selver, E.*, and Adanur, S., "Processing and Property Relationship of Nanoclay Reinforced Polypropylene Monofilaments", The Fiber Society 2009 Fall Meeting and Technical Conference, The University of Georgia, Athens, GA, Oct. 28-30, 2009.
16. *Liu, W.*, and Adanur, S., "Application of Activated Carbon Fibers in Fuel Cell Cathode Filter Media", The Fiber Society 2009 Spring Conference: International Conference on Fibrous Materials 2009, Shanghai, China, May 27-29, 2009.
17. *Adanur, S.*, Nanotechnology Applications in Textiles, The 6th Textile Congress, Suleyman Demirel University, Isparta, Turkey, May 1-3, 2009.
18. *Liu, W.*, and Adanur, S., "Activated carbon fiber filter media for PEM fuel cell cathode", AU Annual Research Forum, 10 March 2009.
19. *Adanur, S.*, "Nanotechnologies are Coming Your Way", Industrial Fabrics Association International (IFAI) Expo '08, October 21-23, 2008, Charlotte, NC (invited presentation).
20. *Adanur, S.*, and Isikel, L., "Manufacturing of Carbon Nonwoven Gas Diffusion Layers with Wet-Laying Process", Techtextil North America Symposium, April 1-3, 2008, Atlanta, GA.
21. *Adanur, S.*, Gumusel., L. and Bas, H., "A Novel 3D Woven-Knit Hybrid Fabric for Composites", Techtextil North America Symposium, April 1-3, 2008, Atlanta, GA.
22. *Adanur, S.*, and Isikel, L., "Nonwoven Fabrics for Gas Diffusion Layers in Polymer Electrolyte Membrane Fuel Cells", Conference on Structural Composites Applications in Defense, Infrastructure, Transportation, Corrosion-Prevention and Power Industry, March 4-6, 2008, Birmingham, AL.
23. *Auad, M. L.*, Mosiewicki, M. A., Richarson, T., Adanur, S., Aranguren, M. I., Marcovich, N. E., Medeiros, E. S., and Mattoso, L. H. C., "Shape Memory Polyurethanes Reinforced with Electrically Conductive Cellulose Crystals", COMAT 2007, December, 2007, Brazil.
24. *Asciogiu, B.*, and Adanur, S., "Nanofiber Coating and Nanofiber Based Continuous Yarn Manufacturing" (including proceedings), 2nd Textile Technology and Textile Machinery Congress, 19-20 October, 2007, Gaziantep, Turkey.
25. *Adanur, S.*, "Innovation in Textiles, Nanotechnology Practices and Technical Textiles", 1st International Textile and Apparel Summit, June 2-3, 2007, Denizli, Turkey.



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26. *Adanur, S.*, and Isikel, L., "Design and Characterization of Nonwoven Fabrics for Gas Diffusion Layer in Polymer Electrolyte Membrane Fuel Cells", May 23, 20007, Karadeniz Technical University, Trabzon, Turkey.
27. *Ascioglu, B.*, and Adanur, S., "Hexagonal Unit Cell Model for Thermal Conductivity of Nano-Micro Fiber Composites", ULIBTK '07, The 16th Heat Transfer Congress, May 30- June 2, 2007, Erciyes University, Kayseri, Turkey.
28. *Isikel, L.*, and Adanur, S., "Manufacturing of Gas Diffusion Layers for Polymer Electrolyte Membrane Fuel Cell", Auburn University 17th Annual GSC Research Forum, 7 March 2007, Foy Union, AU.
29. *Adanur, S.*, and Irsale, S., "Textile Stent Prototyping and Modeling", IFAI Expo 2006 Medical Textiles Symposium, Atlanta, Oct. 31, 2006.
30. *Adanur, S.*, "Wide World of Industrial Textiles", presentation given to the teachers of the Istanbul Textile Vocational School, June 22, 2006, Istanbul, Turkey.
31. *Adanur, S.*, "Dynamics of Air-Jet Weaving", The First Istanbul International Textile and Textile Machinery Congress, June 1-2, 2006, Istanbul, Turkey.
32. *Adanur, S.*, Aglan, H., Gumusel, L., and Bas, H., "Textile Machinery and Processes for Composite Preform Manufacturing", The First Istanbul International Textile and Textile Machinery Congress, June 1-2, 2006, Istanbul, Turkey.
33. *Adanur, S.*, Isikel, L., and Abdelhady, F., "Coated and Laminated Fabrics for Fuel Cells", TechTextil Symposium North America, March 28-30, 2006, Atlanta, GA.
34. *Adanur, S.*, Schwartz, P., Broughton, R., S., Thomas, H., Byrne, M., and Hong, J. W., "Novel Polymeric Materials and Structures for Biomedical/Health Applications", presentation given to the AU internal committee for NSF Major Research Instrumentation (MRI) Program, 9 Dec. 2005.
35. *Adanur, S.*, "Application of Industrial Textiles", Seminar given to ITAS 8960 Class, 8 Sept. 2005.
36. *Adanur, S.*, "High Tech Textiles", Bossa, Adana, Turkey, 18 July 2005.
37. *Adanur, S.*, "Coated and Laminated Fabrics for Fuel Cells", 2nd International Technical Textiles Congress, Istanbul, Turkey, 13-15 July 2005.
38. *Adanur, S.*, and Ascioglu, B., "Challenges and Opportunities in Nano Fiber Manufacturing and Applications", 2nd International Technical Textiles Congress, Istanbul, Turkey, 13-15 July 2005.
39. *Adanur, S.*, "Higher Education in the U.S", Suleyman Demirel University, Isparta, Turkey, 8 July 2005.
40. *Adanur, S.*, "High Tech Textiles", Suleyman Demirel University, Isparta, Turkey, 8 July 2005.
41. *Adanur, S.*, "High Tech Textiles", Denizli Chamber of Commerce, Turkey, 7 July 2005.
42. *Adanur, S.*, "High Tech Textiles", Pamukkale University, Denizli, Turkey, 6 July 2005.
43. *Adanur, S.*, "Higher Education in the U.S", Karadeniz Technical University, Trabzon, Turkey, 30 June 2005.
44. *Irsale, S.*, and Adanur, S., "Exporing Textile Stents: Prototyping and Modeling", Fiber Society Spring 2005 Conference, May 25-27, 2005, St. Gallen, Switzerland.
45. *Adanur, S.*, "High Performance and Nano Fibers", Twtichell Corporation, Dothan, AL, Sept. 2, 2004.
46. *Adanur, S.*, "Dynamic Analysis of Air-Jet Filling Insertion: Effect of Timing on Air and Yarn Velocity", SECTAM XXII, 22nd Southeastern Conference on Theoretical and Applied Mechanics, August 15-17, 2004, Tuskegee, AL.
47. *Ascioglu, B.*, and Adanur, S., "Heat Transfer Behavior of Particle Reinforced Nanofibers", SECTAM XXII, 22nd Southeastern Conference on Theoretical and Applied Mechanics, August 15-17, 2004, Tuskegee, AL.
48. *Irsale, S.*, and Adanur, S., "Compression Force Modeling of Braided Textile Stents", SECTAM XXII, 22nd Southeastern Conference on Theoretical and Applied Mechanics, August 15-17, 2004, Tuskegee, AL.



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49. *Ascioglu, B.*, and Adanur, S., "Modeling of Thermal Conductivity in Nanofiber Composites", ICCE-11, 11th Annual International Conference on Composites/Nano Engineering, Hilton Head, SC, August 8-14, 2004.

50. *Adanur, S.*, and Ascioglu, B., "Processing Characterization of PVA Nanofibers in Electrospinning", ICCE-11, 11th Annual International Conference on Composites/Nano Engineering, Hilton Head, SC, August 8-14, 2004.

51. *Adanur, S.*, "Geotextiles", Unsa, Inc., Istanbul, Turkey, July 19, 2004.

52. *Adanur, S.*, and Vakalapudi, J. S., "Fabric Design and Analysis System in 3D Virtual Reality", The 2nd International Istanbul Textile Congress, April 22-24, 2004, Istanbul, Turkey.

53. *Irsale, S.*, and Adanur, S., "Monofilament Yarns in Braided Vascular Prostheses", TechTextil Symposium North America, Atlanta, GA, March 30-April 1, 2004.

54. *Ascioglu, B.*, Adanur, S., Patra, P. K., Inan, G., Kim, Y., and Warner, S., "Heat Transfer Modeling in Nanofiber Reinforced Composites", ICCE-10, New Orleans, July 20-26, 2003.

55. *Inan, G.*, Patra, P. K., Warner, S. B., Kim, Y. K., Ascioglu, B., and Adanur, S., "In-Situ Polymerized Flame Retardant Nanocomposites", ICCE-10, New Orleans, July 20-26, 2003.

56. *Onal, L.*, and Adanur, S., "A Novel 3D Structure, 3D Hybrid Woven/Knitted Fabric", Proceedings of the The Fiber Society 2003 Spring Symposium, "Advanced Flexible Materials and Structures: Engineering with Fibers", June 30-July 2, 2003, Loughborough, England .

57. *Adanur, S.*, "Wide World of Industrial Textiles", June 19, 2003, Marmara University, Istanbul, Turkey,

58. *Sathendra, V.*, and Adanur, S., "Fabric Design and Analysis System in 3D Virtual Reality", Auburn University Annual Research Forum, Auburn, AL, 20 March 2003.

59. *Adanur, S.*, "Wide World of Industrial Textiles", Dong Hua University, Shanghai, China, 26 Sept. 2002.

60. *Adanur, S.*, and Onal, L., "Experimental Analysis of Textile Composites", TechTextil North America Symposium, Atlanta, GA. April 9-11, 2002, April 9-11, 2002.

61. *Elton, D. J.*, Howie, D. L., and Adanur, S., "Bubblepoint Testing of Nonwoven Geotextiles", 37th Symposium on Engineering Geology and Geotechnical Engineering, Boise, Idaho, March 27-29, 2002.

62. *Adanur, S.*, and Turel, T., "Mechanics of Air-Jet Filling Insertion", 2001 ASME International Mechanical Engineering Congress & Exposition, New York, NY, Nov. 14, 2001.

63. *Adanur, S.*,, "Role of Technical Fabrics in Papermaking: An Overview", Techtextil Symposium North America, March 13-15, 2001, Atlanta, Georgia.

64. *Adanur, S.*, and Onal, L., "Effects of Production Variables on Stress-Strain Behavior of Glass/Epoxy Textile Composites in Compression Molding", The 2000 American Society of Mechanical Engineers (ASME) Congress & Exposition, Orlando, FL, Nov. 5-10, 2000.

65. *Adanur, S.*, and Onal, L., "Impact Failure Analysis of Glass/Epoxy Textile Composites", The 2000 American Society of Mechanical Engineers (ASME) Congress & Exposition, Orlando, FL, Nov. 5-10, 2000.

66. *Adanur, S.*, and Orak, H., "Textile Composites", DOE/TACOM Army 21st Century Truck Program, Auburn University, Auburn, Al. 3 August, 2000.

67. *Adanur, S.*, Xu, B., and Orak, H., "Braided Composite Automotive Chassis Frame", ICCE/7 Seventh International Conference on Composites Engineering, July 2-8, 2000, Denver, CO.

68. *Elton, D. J.*, and Adanur, S., "Varying Pore Sizes in Hydroentangled Geotextiles", Techtextil North America International Trade Fair for Technical Textiles and Nonwovens", March 22-24, 2000, Atlanta, GA.

69. *Adanur, S.*, Bakhtiyarov, S., and Beale, D., "Characterization of Air-Yarn Interface in Air-Jet Weaving", National Textile Center Annual Forum, January 27-29, 2000, Myrtle Beach, SC.

70. Hou, Z., and *Adanur, S.*, "Direct Use of Waste PVC Coated Fabrics to Reinforce Composites", 1999 International Mechanical Engineering Congress & Exposition, November 17, 1999, Nashville, Tennessee.



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71. *Bakhtiyarov, S.* (50%), and Adanur, S. (50%), "Airflow over Wavy Yarn in Air-jet Filling Insertion", Second International Symposium on Mathematical & Computational Applications, Baku, Azerbaijan, September 1-3, 1999.

72. Adanur, S. (50%), and *Bakhtiyarov, S.* (50%), "Numerical Study of Collision Efficiency of Dust Particles", Second International Symposium on Mathematical & Computational Applications, Baku, Azerbaijan, September 1-3, 1999.

73. *Yuksekkaya, M. E.*, Thomas, H., and Adanur, S.,, "Analysis of Elastic Deformation of Braided Tubular Structures for Medical Applications, The Fiber Society 58th Annual General Conference, Symposium on Textile and Polymer Based Biomaterials, Philadelphia, PA, May 3-4, 1999.

74. *Adanur, S.*, Gowayed, Y., and Thomas, H., "On-Line Measurement of Fabric Properties ", National Textile Center Annual Forum, January 28-30, 1999, Myrtle Beach, SC.

75. *Adanur, S.*, and Xu, B., "Influence of Microwave Fast Preheating on Epoxy Resin Chemorheology Properties", The 1998 International Mechanical Engineering Congress and Exposition, November 15-20, 1998, Anaheim, CA.

76. *Adanur, S.*, and Liao, T., "3D Modeling of Textile Composite Preforms", ICCE/5 Fifth International Conference on Composites Engineering, July 5-11, 1998, Las Vegas, NV.

77. *Adanur, S.*, and Xu, B., "Impact Resistance of Microwave Cured Glass/Epoxy Composites", ICCST/2, Second International Conference on Composite Science and Technology, Durban, South Africa, June 9-11, 1998.

78. Mallick, S. B., Elton, D. J., and *Adanur, S.*, "A New Approach in Modeling of Soil-Geotextile Interface Behavior in Pullout Tests", Sixth International Conference on Geosynthetics, March 25-29, 1998, Atlanta, GA.

79. *Adanur, S.*, and Hou, Z., "Recycling and Reuse of PVC Coated Polyester Fabric", TCL7, The 7th International Conference on Textile Coating and Laminating, Nov. 17-18, 1997, Charlotte, NC.

80. *Adanur, S.*, and Xu, B. , "Characteristics of Microwave-Cured Braided Glass/Epoxy Composites", Composites at Lake Louise, CALL '97, October 12-17, 1997, Canada.

81. *Adanur, S.*, Arumugam, Y. S., and Xu, B., "Fast Net Shape Manufacturing of Braided Textile Structures", ICCE/4, Fourth International Conference on Composites Engineering, July 6-12, 1997, Big Island of Hawaii.

82. *Adanur, S.*, and Sreekanthreddy, G., "Compression Behavior of 3D Reinforced Glass/Epoxy Laminar Composite Profiles", ICAPC-97, International Conference on Advanced Polymer Composites, Materials, Processing and Applications, Beijing University of Aeronautics and Astronautics, Beijing, China, June 3-5, 1997.

83. *Adanur, S.*, "Geotextiles: Design and Applications in Alabama", Presentation to Alabama Congressional Delegation , May 9, 1997.

84. Basu Mallick, S., Elton, D. J., and *Adanur, S.*, "An Experimental Characterization of Soil-Woven Geotextile Interface in Large Box Pullout Tests", Geosynthetics '97, March 10-13, 1997, Long Beach, CA.

85. Yuksekkaya, M., *Thomas, H.*, Adanur, S., Chaikof, E., "Polymeric Braided Stents for Medical Applications", 1996 ASME International Mechanical Engineering Congress and Exposition, Nov. 17-22, 1996, Atlanta, GA.

86. *Ghosh, T.*, and Adanur, S., Design and Characterization of Geotextiles for High Performance Applications, Nonwovens Cooperative Research Center, Semi-Annual Meeting, Year 5, Nov. 20, 1996, Raleigh, NC.

87. *Adanur, S.*, Mallick, S., and Zhai, H., "Analysis of Geotextile-Soil Interaction in Pull-Out Tests", IS Kyushu '96, International Symposium on Earth Reinforcement, November 12-14, 1996, Fukuoka, Japan.

88. Warren, A., El-Halwagi, M. and *Adanur, S.*, "Design of a New Process for Converting Textile Solid Waste into Transportation Fuel", *TIEES-96*, The First Trabzon International Energy and Environment Symposium, July 29-31, 1996, Karadeniz Technical University, Trabzon, Turkey.

89. *Adanur, S.*, and Gongalareddy, S., "Compressive Properties of Stitched Woven Fiberglass Fabric Reinforced Composite Sections for Civil Engineering Applications", ICCE/3, Third International Conference on Composites Engineering, July 21-26, 1996, New Orleans, LA.



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90. *Adanur, S.*, Design and Characterization of Geotextiles for High Performance Applications, Nonwovens Cooperative Research Center, 5th Annual Meeting, May 29, 1996, Raleigh, NC.

91. *Adanur, S.*, "Manufacturing of Industrial Textiles: Requirements and Opportunities", Sulzer-Ruti Technical Fabric Symposium, February 21-23, 1996, Spartanburg, SC.

92. *Adanur, S.*, "State of the Art in Technical Textiles", Discover EXPO '95, Industrial Fabric and Equipment Exposition, Industrial Fabrics Association International, Charlotte, NC, Oct. 12-14, 1995.

93. Wang, S., *Adanur, S.* and Jang, B. Z., "Thermo-Mechanical Behavior of Fiber/Filler Reinforced Phenolic Matrix Composites", 2nd International Conference on Composites Engineering (ICCE/2), August 21-24, 1995, New Orleans, LA.

94. *Adanur, S.*, and Tam, C. A., "On-machine Stitching of 3-D Laminate Structures for Composites", 2nd International Conference on Composites Engineering (ICCE/2), August 21-24, 1995, New Orleans, LA.

95. Wang, S., *Adanur, S.* and Jang, B. Z., "Mechanical Behavior of Fiber/Filler Reinforced Phenolic Matrix Composites", Proceedings of the 2nd International Conference on Composites Engineering (ICCE/2), August 21-24, 1995, New Orleans, LA.

96. *Adanur, S.*, Mallick, S. B., and Zhai, H., "Design and Characterization of Geotextiles for High Performance Applications", Hi-Tech Textiles Exhibition and Conference, July 24-26, 1995, Greenville, SC.

97. *Broughton, R. M.*, Bakhtiyarov, S. I., Brady, P., and Adanur, S., "Initial Design of Nonwoven Fabrics for Air Filtration", Hi-Tech Textiles Exhibition and Conference, July 24-26, 1995, Greenville, SC.

98. *Adanur, S.*, and Tsao, Y. P., "Stitch Bonded Textile Structural Composites", The 26th International Technical Conference, SAMPE, October 24-27, 94, Atlanta, GA.

99. *Adanur, S.*, Tsao, Y. P., and Tam, C. W., "Improving Fracture Resistance in Laminar Textile Composites", First International Conference on Composites Engineering, August 28-31, 1994, New Orleans, LA.

100. *Adanur, S.*, "Design and Structure of Fabrics for Papermaking", Third International Hi-Tech Textiles Exhibition & Conference, June 21-22, 1994, Greenville, SC.

101. *Adanur, S.*, and Walker, B., "Yarn Preparation for Weaving in the Future (Yarn Preparation for the Second Loom)", 33rd Annual Textile Slashing Short Course, September 22, 1993, Auburn University, AL.

102. *Adanur, S.*, "Paper Machine Clothing", Istanbul Technical University, Textile Engineering Department, August 4, 1993.

103. *Adanur, S.*, "Effects of Forming Fabric Design on Paper Properties", 2nd International Hi-Tech Textiles Conference, July 21, 1993, Greenville, SC.

104. ElMogahzy, Y., Gowayed, Y. and Adanur, S., "Mechanical Characterization of Geotextiles/Soil Interaction", The Fiber Society Spring Meeting, May 1993, Raleigh, NC.

105. *Adanur, S.*, "Design and Applications of Forming Fabrics in Papermaking", North Carolina State University, College of Textiles, Fiber, Polymer and Textile Seminar Program, March 17, 1993, Raleigh, NC.

Graduate Student Presentations:

1. Isikel, L., "Comparative Evaluation of GDL Media for PEMFCs", Auburn University Annual Graduate Student Research Paper Competition, 9 March 2006, Foy Union, AU.
2. Ascioglu, B., "Heat Transfer Modeling in Nanofiber Reinforced Composite", Auburn University Annual Graduate Student Research Paper Competition, 10 March 2005, Foy Union, AU.
3. Irsale, S., "Textile Prosthesis for Vascular Applications", NTC Paper presentation, 10 January 2005, Spidle Hall, AU.



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4. Ascioglu, B., "Heat Transfer Modeling in Nanofiber Reinforced Composite", NTC Paper presentation, 10 January 2005, Spidle Hall, AU.

4.B.4 Poster Sessions Presented

1. Shen, Y., and Adanur, S., "Finite Element Analysis of Monofilament Woven Fabrics under Uniaxial Tension", 2nd Annual Graduate Engineering Research Show Case, Auburn University, Oct. 24, 2013.
2. Adanur, S., "A Novel Braided Structure to Increase Compression and Torsion Resistance of Composites", The 5th International R&D Project Brokerage Event, Bursa, Turkey, 4-5 April, 2013.
3. Adanur, S., "Prevention of PEM Fuel Cell Poisoning via Adsorption using Activated Carbon Fiber Based Cathode Filters", The 5th International R&D Project Brokerage Event, Bursa, Turkey, 4-5 April, 2013.
4. Adanur, S., "Health and Safety Effects of Nanoparticles Embedded in Textile Materials", The 5th International R&D Project Brokerage Event, Bursa, Turkey, 4-5 April, 2013.
5. Adanur, S., and Broughton, R., "Recovery and Reuse of Waste PVC Coated PET Fabrics", The 4rd International R&D Project Brokerage Event, Bursa, Turkey, Feb. 2-3, 2012.
6. Adanur, S., "PVA Nanofiber Based Membrane for Proton Exchange Membrane Fuel Cells", The 4rd International R&D Project Brokerage Event, Bursa, Turkey, Feb. 2-3, 2012.
7. *Adanur, S.*, A Novel Filling Insertion System for Weaving, The 3rd International R&D Project Brokerage Event, Bursa, Turkey, Feb. 10-11, 2011.
8. *Adanur, S.*, Conceptual Design and Characterization of 3D Interlaced Fibrous Structures, The 3rd International R&D Project Brokerage Event, Bursa, Turkey, Feb. 10-11, 2011.
9. Liu, W., and Adanur, S., "Activated carbon fiber filter media for proton exchange membrane fuel cell cathode", The Fiber Society 2009 Spring Conference: International Conference on Fibrous Materials 2009, Shanghai, China, May 27-29, 2009 (chosen as one of the 4 best posters).
10. Liu, W., and Adanur, S., "Activated carbon fiber filter media for proton exchange membrane fuel cell cathode Fiber Society Meeting, Shanghai, China, June 2009. Won the best poster award.
11. Adanur, S., and Irsale, "Development of Drug Eluting Textile Stents", NTC Forum, June 3, 2008, Greenville, S.C.
12. Lee, S., Liu, W., and Adanur, S., "Nonwoven Fibrous Structures from Electrospun Nanofibers", NSF Research Experience for Undergraduates REU Program in Micro/Nano-Structured Materials, Therapeutics and Devices Poster Session, AU Saugahatchee Club, July 26, 2007.
13. Liu, W., and Adanur, S., "Characterization of PVA and PAN Electrospun Nonwoven Fibers", Auburn University 17th Annual GSC Research Forum, 7 March 2007, Foy Union, AU.
14. Isikel, L., Adanur, S., Tatarchuk, B., Isikel, L., (Auburn University), Warner, S., Fan, Q., and Narvekar, V., "Coated and Laminated Fabrics for Fuel Cells", NTC Forum, Feb. 25-27, 2007, Hilton Head, S.C.
15. Thomas, H., Riggs, L., Elton, D., and Adanur, S., "Reinforcement Fabrics with Electronic Antenna Capabilities", NTC Forum, Feb. 25-27, 2007, Hilton Head, S.C.
16. Yacoob, S., Isikel, L., and Adanur, S., "Nonwoven Fabric Manufacturing and Testing Using Electrospinning", NSF Research Experience for Undergraduates (REU) Program, Moores Mill Club, Auburn, 4 August 2006.
17. Adanur, S., Isikel, L., and Abdelhady, F., "Coated and Laminated Fabrics for Fuel Cells", TechTextil Symposium North America, March 28-30, 2006, Atlanta, GA.
18. Adanur, S., Choe, B., Fan, Q., and Warner, S., "Coated and Laminated Fabrics for Fuel Cells", National Textile Center 14th Annual Forum, February 19-21, 2006, Hilton Head, SC.
19. Adanur, S., Swagat, I., Warner, S., and Chaikof, E., "Textile Prostheses for Vascular Applications", National Textile Center 14th Annual Forum, February 19-21, 2006, Hilton Head, SC.



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20. Adanur, S., Choe, B., Fan, Q., and Warner, S., "Coated and Laminated Fabrics for Fuel Cells", National Textile Center 13th Annual Forum, March 20-22, 2005, Raleigh, NC.

21. Adanur, S., Swagat, I., Warner, S., and Chaikof, E., "Textile Prostheses for Vascular Applications", National Textile Center 13th Annual Forum, March 20-22, 2005, Raleigh, NC.

22. Adanur, S., Ascioglu, B, Prabir, K. P., Warner, S. B. et al, "Nano Engineered Fire Resistant Composite Fibers", National Textile Center 13th Annual Forum, March 20-22, 2005, Raleigh, NC.

23. Irsale, S., and Adanur, S., "Exploring Textile Stents: Prototyping and Modeling", AU Annual Graduate Student Research Forum, March 10, 2005, Auburn, AL.

24. Adanur, S., and Irsale, S., "Textile Prosthesis for Vascular Applications", Presentation and Poster Session, TechTextil Symposium North America, Atlanta, GA, March 30-April 1, 2004.

25. Adanur, S., Ascioglu, B, Prabir, K. P., Warner, S. B. et al, "Nano Engineered Fire Resistant Composite Fibers", National Textile Center Annual Forum, February 15-17, 2004, Hilton Head, SC.

26. Adanur, S., Swagat, I., Warner, S., and Chaikof, E., "Textile Prostheses for Vascular Applications", National Textile Center Annual Forum, February 15-17, 2004, Hilton Head, SC.

27. Ascioglu, B., and Adanur, S., "Nano Engineered Fire Resistant Composite Fibers", Auburn University Annual Research Forum, Auburn, AL, 20 March 2003. This poster won the 2nd place in Engineering.

28. Adanur, S., Ascioglu, B, Prabir, K. P., Warner, S. B. et al, "Nano Engineered Fire Resistant Composite Fibers", National Textile Center Annual Forum, February 16-18, 2003, Hilton Head, SC.

29. Adanur, S., and Sathendra, V., "Fabric Design and Analysis System in 3D Virtual Reality", National Textile Center Annual Forum, February 16-18, 2003, Hilton Head, SC.

30. Adanur S., and Onal, L., "Design and Characterization of a Novel 3D Hybrid Knitted/Woven Fibrous Structure for Composites", 2003 NSF Design, Service and Manufacturing Grantees and Research Conference, January 6-9, 2003, Birmingham, AL.

31. Turel, T., Adanur, S., Bakhtiyarov, S., Ahmed, A., and Beale, D., "Filling Yarn Insertion in Air-Jet Weaving", National Textile Center Annual Forum, February 10-12, 2002, Charlotte, NC.

32. Sathendra, V., and Adanur, S., "Fabric Design and Analysis System in 3D Virtual Reality", National Textile Center Annual Forum, February 10-12, 2002, Charlotte, NC.

33. Adanur, S., and Onal, L., "Factors Affecting the Mechanical Properties of Laminated Glass/Graphite-Epoxy Hybrid Composites", 2002 NSF Design, Service and Manufacturing Grantees and Research Conference, January 7-10, 2002, San Juan, Puerto Rico.

34. Tascan, M., and Adanur, S., "Filling Yarn Insertion in Air-Jet Weaving", 11th Research Forum, Auburn University, March 19, 2001.

35. Onal, L., and Adanur, S., "Impact Properties of Textile Composites", 11th Research Forum, Auburn University, March 19, 2001.

36. Kilinc, F. S., and Adanur, S., "3D Fabric Design and Analysis", 11th Research Forum, Auburn University, March 19, 2001.

37. Tascan, M., Adanur, S., Bakhtiyarov, S., Ahmed, A., and Beale, D., "Filling Yarn Insertion in Air-Jet Weaving", National Textile Center Annual Forum, February 11-13, 2001, Myrtle Beach, SC.

38. Kilinc, F. S. and Adanur, S., "Fabric Design and Analysis System in 3D Virtual Reality", National Textile Center Annual Forum, February 11-13, 2001, Myrtle Beach, SC.

39. Adanur, S., and Orak, H.., "Design and Manufacturing Automotive Chassis Frame with Net Shape Braided Composite Structures", 2001 NSF Design and Manufacturing Research Conference, January 7-10, 2001, Tampa, FL.



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40. Adanur, S., Bakhtiyarov, S., and Beale, D., "Filling Yarn Insertion in AirJet Weaving", National Textile Center Annual Forum, January 27-29, 2000, Myrtle Beach, SC.

41. Adanur, S., and Xu, B., "Design and Manufacturing Automotive Chassis Frame with Net Shape Braided Composite Structures", 2000 NSF Design and Manufacturing Research Conference, January 3-6, 2000, Vancouver, British Columbia, Canada.

42. Adanur, S., Gowayed, Y., and Thomas, H., "On-Line Measurement of Fabric Properties ", National Textile Center Annual Forum, January 28-30, 1999, Myrtle Beach, SC.

43. Adanur, S., and Xu, B., "Fast Net Shape Manufacturing of Braided Textile Composites", NSF CAREER Awardees Meeting, January 10-12, 1999, Washington D.C.

44. Adanur, S., and Xu, B., "Process Development of Microwave Preheating and Infrared Post Curing of Braided Polymer/Epoxy Composites", The 1999 National Science Foundation (NSF) Design and Manufacturing Grantees Conference, January 5-8, 1999, Long Beach, CA.

45. Adanur, S., Liao, T., and Ghosh, T., "Design and Characterization of Geotextiles for High Performance Applications", National Textile Center Annual Forum, January 29-31, 1998, Panama City, FL.

46. Adanur, S., Gowayed, Y., and Thomas, H., "On-Line Measurement of Fabric Properties", National Textile Center Annual Forum, January 29-31, 1998, Panama City, FL.

47. Adanur, S., and Xu, B., "Fast, Net Shape Manufacturing of Textile Composites", National Science Foundation, Design and Manufacturing Grantees Conference, January 5-8, 1998, Monterrey, Mexico.

48. Adanur, S., Gowayed, Y., Ghosh, T., Goswami, B., Mallick, S. B., Zhai, H., "Design and Characterization of Geotextiles for High Performance Applications", National Textile Center Annual Forum, January 28-30, 1997, Myrtle Beach, SC.

49. Adanur, S., Thomas, H., Gowayed, Y., "On-Line Monitoring", National Textile Center Annual Forum, January 28-30, 1997, Myrtle Beach, SC.

50. Adanur, S., and Xu, B., "Fast, Net Shape Manufacturing of Textile Composites", National Science Foundation, Design and Manufacturing Grantees Conference, Seattle, Washington, Jan. 7-10, 1997.

51. Adanur, S., Mallick, S., and Zhai, H., "Analysis of Geotextile-Soil Interaction in Pull-Out Tests", IS Kyushu '96, International Symposium on Earth Reinforcement, November 12-14, 1996, Fukuoka, Japan.

52. Adanur, S., Mallick, S., and Zhai, H., "Design and Characterization of Geotextiles for High Performance Applications", National Textile Center Annual Forum, January 24-26, 1996, Raleigh, NC.

53. Adanur, S., et al., "Textile Structural Composites", National Textile Center Annual Forum, January 24-26, 1996, Raleigh, NC.

54. Adanur, S., Mallick, S., and Zhai, H., Design and Characterization of Geotextiles for High Performance Applications, National Textile Center, Annual Forum, Atlanta, GA, January 26-28, 1995.

55. Mohamed, M., Adanur, S., et al., "Textile Structural Composites", National Textile Center, Annual Forum, January 26-28, 1995, Atlanta, GA.

56. Adanur, S., and Tam, C. W., "Fabrication and Testing of On-loom Stitched 3-D Glass/Epoxy Laminar Composites", The 8th Annual Alabama Materials Research Conference, Tuscaloosa, AL, Sept. 26-27, 1994.

57. Walker, B., Beale, D., Broughton, R., and Adanur, S., "Improving the Woven Fabric Production Rate by Braiding Process", National Textile Center, Annual Forum, Greenville, SC, February 1994.

58. Mohamed, M., Adanur, S., et al., "Textile Structural Composites", National Textile Center, Annual Forum, Greenville, SC, February 1994.

59. Walker, B., Beale, D., Broughton, R., and Adanur, S., "Improving the Woven Fabric Production Rate by Braiding Process", National Textile Center, Annual Forum, Auburn, AL, February 1993.



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60. Mohamed, M., Adanur, S., et al., "Textile Structural Composites", National Textile Center, Annual Forum, Auburn, AL, February 1993.

4.B.5 Senior Design Projects Supervised

1. Chris Lee, Chris Porter and Austin Yuill, "Formula SAE Composite Wheel", Fall 2012-Spring 2013.
2. Mason Brummal and James Smith (PFEN 4810-4820), "Weight Reduction of Mandrels Used in Composite Manufacturing", GKN Aerospace Alabama, Tallassee, AL, Fall 2011-Spring 2012.
3. Melanie McDonald and Charles Blackwell (PFEN 4820), "Bulkhead Core Crushing", GKN Aerospace Alabama, Tallassee, AL.
4. Joseph Rossi Schell, Steven Crace and James Clay Graben (PFEN 4820), "Carbon Tow Tension Control in Malimo Stitch Bonding Process for Composite Preform Manufacturing", V2 Composites, Auburn, AL.
5. Sam A. Missioum and Betsy Claunch (PFEN 4820), "Engineering Solutions for Increased Efficiency in Hollow-fiber Production of Hemodialysis", Gambro Renal Products, Opelika, AL.
6. Ozbasli, Halil, "Stadium Covers", TXMT 4900, Fall 2006.
7. Anthony, Rebecca, and Hudson, Katie, "Hail Storm Protective Fabrics, FBEN 4910-4920, Fall-Spring 2006.
8. George, Mellany, "Performance of Coated and Laminated Fabrics for Fuel Cells", FBEN 4920, Fall 2005.
9. Bates, Tiffany, and Williams, Jennie, "Medical Stents: Textile Materials versus Metals", FBEN 4920, Spring 2005.
10. Willams, Gerald, "Endovascular Stent Grafts", TXMT 4910, Spring 2005.
11. Cooper, Jared, "Biocompatible Polyester Stents for Vascular Applications", FBEN 4920, Fall 2004.
12. McCollum, Brian, "Composite Drumsticks", FBEN 4920, Fall 2004.
13. Stroud, Megan, "The Price of Turf", FBEN 4920, Fall 2004.
14. Nicole Sizemore, "Bubble Point Test Method", TXEN 4920, Summer 2004.
15. Andrea Rogers, "Operating Room Material Requirements", TXMT 4910, Spring 2004.
16. Joseph Godfrey, "Fiber Optics Woven into Fabrics", TXEN 4920, Fall 2003.
17. Melissa Mitchell, "UV Resistance of Coated Fabrics for Stadium Covers", Summer 2003.
18. Andrea Janel Smith, "Turfgrass Reinforcement", Spring 2003.
19. Thomas Hogan, "Composite Tree Climber", Spring 2003.
20. Carlos Eduardo Handal, "Recycling of T-shirt Waste, Spring 2003.
21. Jason Mattox, "Geocomposite Design", Spring 2003.
22. Kalitha Mitchell, "Carpet Tile Manufacturing Problems", Fall 2002.
23. Eric Chambers, "Composite Baseball Bat", Fall 2002.
24. Jeremy Legg, "Heat Stress Analysis: Making Aubie Cooler", Fall 2002.
25. Paula Bates, "An Examination of Acoustic Textile Structures", Spring 2002.
26. Margaret Harris, "Design of a Polymeric Y Shaped Braided Stent for Aortic Implantation", Spring 2002.
27. Colin Dawson, "The Design, Construction and Testing of Composite Canoes", Spring 2002.
28. Sarah Robinson, "Western Saddle Design", Spring 2002.
29. Dan C. Siggers, "Canine Body Armor", Spring 2002.
30. Leslie Alexander, "Development of Golf Driver Shaft Using Industrial Textiles", Fall 2001.
31. Rebecca A. Bevis, "Interfacial Shear Strength Evaluation of Thermplastic and Thermoset Resins by the Single Fiber Pullout Test", Fall 2001.
32. Kevin Hughes, "Carbon Composite Billiard Cue", Spring 2001.
33. Meredith Kaye Fetner, "Evaluation of Quality Problems Associated with the Manufacture of Inflatable Evacuation Systems", Spring 2001.



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34. Fatma Erdonmez, "Fiber Reinforced Bricks", Spring 2000.
35. Heather M. Anders and Daniel A. Butts, "Fiber Reinforced Concrete", Spring 2000.
36. Mary M. Jacobs, Leia A. Cutcliffe and Ron Levitzke, Jody Aaron, "Composite Golf Club", Spring 2000.
37. Julee E. Diplacido, "Design and Fabrication of a Three Dimensional Woven Fabric Structure Using a Jacquard Loom", Winter 2000
38. Dina R. Tareea, "Composite Bone", Winter 2000.
39. Elizabeth A. Bray, "Braided Tennis Racquet", Winter 2000.
40. Tareek Mohamed, "Permeability of Geotextiles", Winter 99.
41. Leigh N. Haugseth, "Application of Sampling Plan for Codon Airbag Fabric", Winter 99.
42. Robert Gallardo and Dustin Jowers, "Design of a Polymer Stent", Winter 99.
43. Jason Eisele, "Puncture Resistant Military Textiles", Winter 99.
44. Rebecca Kenney and Charles Moore, "Design and Development of a New Geotextile Structure for Soil Reinforcement", Winter 99.
45. Casey Blythe and Wesley Greer, "Incorporating Polypropylene Filament Yarns and Nonwoven Structures for Geotextile Applications", Fall 98.
46. Jeannie Stephens, Erica Graves and Ryan Radel, "Composite Bicycle Frame", Spring 1998 (co-advisor with Dr. Gowayed).
47. James Collier and Kasey Myers, "Flame Resistant Military Fabrics", Spring 1998.
48. Mary Elizabeth Stahr, "Properties of Airbag Fabric Contributing to Strength and Foldability", Winter 1998.
49. Paul Roberts, "Geotextile Pullout Test: Study of Geotextile-Soil Interaction", Fall 1997.
50. Kenneth Cole and Russell Matoy, "Effects of Forming Fabrics on Paper Formation", Spring 1997.
51. Jonathan Douglas and Samuel Mooney, "Design and Development of a Y-Shaped Braided Polyester Aortic Stent", Winter 1997.
52. Barclay Payne, "Warp-out Process", Winter 1997.
53. Leanna Land, "Design of Polyester Stent for Aortic Implantation", Fall 1996.
54. Tara Schaneville and Rotricia Smith, "Design and Applications of Biomaterials for Coronary Artery Reinforcement", Spring 1996.
55. Michelle Struth, "Tiger Textiles", Winter 1996.
56. Stephanie Carnley, "Computers and Computer Aided Design in the Textile Industry", Winter 1995.
57. Coley Jay Smith, "Effects of Fabric Structure on Bending Stiffness", Winter 95.
58. Karen Countess, "Performance Comparison of Woven Geotextiles in Fabric-Soil Interaction", Winter 95.
59. Keith Rollins, "Adhesion Characteristics of Reinforcement Fabrics to Rubber", Fall 1994.
60. Amy N. Goddard, "Ultrasonic Seaming", Spring 94.
61. Dayna M. Smith, "Medical Textiles: Design of Absorbency Tester for Medical Toweling", Spring 94.
62. Brian Allen, "The Effects of ISO 9000 Quality Systems on Textile Product Quality", Winter 94.
63. Mike McCauley and Eva Shelton, "Design and Fabrication of a New Textile Structural Composite Racket" Winter 1994.
64. Brian Wingfield, "Pack Design for a 3/4" Laboratory Extruder", Winter 94.
65. Thomas L. Pritchard, "The Properties of Non-crimp Fabric Based Composites", Winter 94.
66. Westley Mixon, "The Effects of Forming Fabric Design Parameters on Tissue Paper Properties", Spring 93.
67. Philip Douglas Tierce, Jr., "The Effect of Forming Fabric Design on Final Sheet Qualities", Winter 93.
68. David C. Terrell, "Laminated Textile Structural Composites", Winter 93.

4.B.6 Patents / Inventions / Disclosures



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1. Adanur, S, and Zheng, H., "A novel way of measuring proton conductivity of fuel cell membranes", AU Technology Disclosure, filed on 7/9/2010.
2. Adanur, S., Vakalapudi, J. S., and Liao, T., "VirtualFabric Design and Analysis System", Auburn University Software Disclosure, 20 July 2006.
3. Adanur, S., and Ascioglu, B., "Modification of Smooth Polymeric Surfaces with Nanofibers using Electrospinning", Auburn University Technology Disclosure, 12 October 2005.
4. Adanur, S., and Irsale, S., "Polymeric Textile Prostheses for Vascular Surgery Applications", Auburn University Technology Disclosure, 25 July 2005.
5. Adanur, S., "Air-Jet Filling Insertion Simulator", Auburn University Patent Technology Disclosure, Dec. 16, 2003.
6. Adanur, S., "Rotational Curing Device for Fast Net-shape Manufacturing of Braided Composites", Auburn University Patent Technology Disclosure, July 20, 2000.
7. Bakhtiyarov, S. I., Overfelt, R. A., and Adanur, S., "Reinforced Sand-Binder System for Coremaking Process", Patent Disclosure, November 1998.
8. Adanur, S., Hou, Z., and Broughton, R. M., "A New Method to Separate the Components of Coated Fabrics", Patent Disclosure, July 22, 1997.
9. McCumsey, K., and Adanur, S., "Two Layer Fabric with Two Extra Strands", Patent Disclosure, April 15, 1992.

4.B.7 Other Research Contributions

1. Irsale, S., "Exploring Textile Stents: Prototyping and Modeling", submitted to the Fiber Society Graduate Student Research Competition, March 3, 2006.

Technical Reports Submitted

- National Science Foundation annual reports
- Adanur, S., Gowayed, Y., Elton, D., and Ghosh, T. K., Design and Characterization of Geotextiles for High Performance Applications, Nonwovens Cooperative Research Center, Annual Report, Year 5, May 29, 1996, Raleigh, NC.
- National Textile Center (NTC) quarterly and annual reports
- Semi-annual and annual reports to US Army Natick
- NSF EPSCoR annual reports
- Final report to NSF for Instrumentation and Laboratory Improvement Program
- Monthly progress reports to Wellington Sears Company, Valley, AL.

Thesis and Dissertation

1. Adanur, S., "Dynamic Analysis of Single Nozzle Air-Jet Filling Insertion", Ph.D. Thesis, North Carolina State University, May 1989, 219 pages.
2. Adanur, S., "Air-Jet Filling Insertion: Velocity Measurement and Influence of Yarn Structure", Master's Thesis, North Carolina State University, 1985, 133 pages.

4.B.8 Grants and Contracts

Grants and Contracts Completed



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1. Adanur, S., "Development of Composite and Sandwich Structured Fuel Cell Membranes", Sept. 2009-Aug. 2010, $100,000.00, 9/1/2009-8/31/2010.

2. 10, 862 kg of polymers and color additives were donated to the Polymer and Fiber Engineering by Thermo Fisher, whose value is around $21,600 (April 2010).

3. Adanur, S., Graduate Outreach Program (GOP) Grant, $135.00, Spring 2009 (teaching).

4. Adanur, S., "Nanoparticle Reinforced Hybrid Fibers and Films", Department of Commerce, $119,999.00, 6/1/08-5/31/09.

5. Davis, Ed (PI/Mentee), and Adanur, S. (Mentor), "Imogolite/PEO Nanocomposite Fibers and Membranes", $4,000.00, AU 2008 Faculty Mentoring Program.

6. Adanur, S., and 4 other researchers from Clemson University, "Development of Drug Eluting Textile Stents", $4,000, NTC, 2008-2009.

7. Tatarchuk, B. (PI), Adanur, S., and Broughton, R., Tank and Automotive Command Center (TACOM) Project, PFEN share $72,000, Fall 2005-Spring 2010.

8. Ikiz, Y., "Development of Nanofibers for Filtration Using Electrospinning", Pamukkale University, sponsored by TUBITAK of Turkey, 80,500 YTL (~$ 61,923), Jan. 2006-Dec. 2008, (Dr. Adanur is a "consultant" with no compensation).

9. Duke, S. (PI), Byrne, M. E. (Co-PI), Adanur, S., and 10 other researchers, "REU Site for Micro/Nano-Structured Materials, Therapeutics, and Devices", NSF Research Experiences for Undergraduates (REU), $297,846, Summer 2006-Summer 2008.

10. Adanur, S. (PI), and Aglan, H. (Co-PI, Tuskegee University), "U.S.-Turkey Cooperative Research: Design and Processing Characteristics of Novel Three Dimensional Fibrous Preforms for Composite Reinforcement", $34,201.00, Sept. 1, 2004-Aug. 31, 2007, National Science Foundation.

11. Adanur, S. (PI), Choe, B., Fan, Q., and Warner, S., "Coated and Laminated Fabrics for Fuel Cells", $318,074.00, May 1, 2004-April 30, 2008, National Textile Center.

12. Thomas, H., (PI), Adanur, S., Elton, D., and Riggs, L., "Reinforcement Fabrics with Electronic Transmission Capabilities", $278,390.00, May 1, 2005-April 30, 2008, National Textile Center.

13. Two injection molding machines were donated to Auburn University on May 3, 2007 by Thermofisher Scientific of Auburn:
    - FU CHIN SHIN 75 TON, MODEL: KT-75G, SERIAL # H03185, YEAR: 1988, Value: $4,500.00
    - FU CHIN SHIN 75 TON, MODEL: KT-75, SERIAL # H03172, YEAR: 1988, Value: $4,500.00.

14. Adanur, S., (PI), and Warner, S., "Textile Prostheses for Vascular Applications", $389,753.00, Auburn's share: $241,510.00, May 1, 2003-April 30, 2006, National Textile Center.

15. Patra, P. (PI), Adanur, S., and 4 other researchers, "Nano Engineered Fire Resistant Composite Fibers", Auburn's share: $90,920.00, May 1, 2002-April 30, 2005, National Textile Center.

16. Parker, F., Dyer, D. (leaders), Adanur, S., and several other Engineering Faculty, "AU Priority Areas; Transportation Pinnacle: Commercial Highway Systems", October 1, 99-September 30, 2004 (total budget amount is unknown at this time). Budget for Adanur: $24,000.

17. Adanur, S., (leader) ElMogahzy, Y., and Abdelhady, F., "Yarn and Fabric Design and Analysis in 3D Virtual Reality", National Textile Center, $ 177,938, May 1, 2000 - April 30, 2003.

18. Adanur, S. (PI), Bakhtiyarov, S., and Beale, D., "Characterization of Air-Yarn Interface in Air-Jet Weaving", National Textile Center, $ 262,742.00, May 1, 1999-April 30, 2002.



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19. Equipment Secured for Air-Jet Research
    L5200 S 210 N2 IK TE Air-Jet Weaving Machine (L5200 series, filament execution, 210 cm max. reed width, low built (without superstructure), two color pick at will, crank shedding motion, electronic filling feeders)
    Manufacturing # 031166
    Serial # JA 2663
    Machine # 0003
    Manufacturing date: 1997.08
    Market Value: $15,000.00.
    Donor: Sulzer Textile, Inc.
    Date Received: Nov. 22, 2002

20. Adanur, S. , Fast Net-Shape Manufacturing of Polymer Composite Structures, 1995 NSF Faculty Early Career Development (CAREER) Program, National Science Foundation, $ 210,000.00; duration: 5 years, Sept. 1, 96-Aug. 31, 2001.

21. ElHalwagi, M. (leader), Adanur, S., and 15 other faculty, "Bicomplexity Incubation Project Proposal FY 2000-2002", $ 220,000.00, National Science Foundation, Duration: 1 year, Sept. 2000- August 2001.

22. Adanur, S., and Shalaby, S. E. (Egypt), "Design and Manufacture of Stitch Bonded, Thermoplastic Textile Composites", US-Egypt Science and Technology Joint Fund, $ 39,978, September 1, 1998 - August 31, 2001.

23. P. Jones (leader), C. A. Flood, S. Adanur, "Developing a Course Based on Equipment Design for Introduction to Engineering"; AU College of Engineering; $ 24,050; June 1, 1999-May 31, 2000.

24. Adanur, S. (team leader), Thomas, H., Gowayed, Y. and Ghosh, T., On-line Measurement of Fabric Mechanical Properties for Process Control, National Textile Center, $ 446,912.00; duration: 3 years, March 1, 96 – April 31, 2000.

25. Jang, B. Z., Yang, X. F., and Adanur, S. (30%), "Solid Free Form Fabrication of Advanced Alloys and Metal Matrix Composites", College of Engineering Graduate Research Assistantship, $ 20,000.00; duration: October 1, 1997-September 30, 1999.

26. Elton, D., and Adanur, S. (50%), "Waterjet Manufacturing of Custom Geotextiles", College of Engineering Infrastructural Awards, $ 62,524.00; duration: October 1, 1997-September 30, 1999.

27. Utilization of Solid Waste in Alabama, Y. Gowayed (Project Coordinator), S. Adanur and 15 other researchers, NSF/EPSCoR, $ 3 million, Dr. Adanur's share: $ 150,000.00; duration: 4 years, Aug. 95-July 99.

28. Design and Characterization of Geotextiles for High Performance Applications, National Textile Center, Sabit Adanur (PI) and 5 other researchers from 4 universities; amount: $ 915,000.00; Auburn's share $ 520,000.00; duration: March 1, 1994 - April 30, 1998.

29. A New Military Fabric with Flame Resistance Properties; US Army Natick R&D and Engineering Center; PI: S. Adanur (100%), $ 40,000.00; 24 months, Dec. 1995 - Dec. 97.

30. Fingerprinting and Backward Quality Projection in Textile Products, PIs: Y. Elmogahzy (leader), R. Broughton, S. Adanur, Y. Gowayed (Auburn), S. Jayaraman (Ga Tech), M. Suh, W. Oxenham, J. Woo, J. Rust (NC State), E. Backe (ITT), $ 540,000.00, Dr. Adanur's share: $ 40,000.00, National Textile Center, Duration: 1 year, March 1, 1995 - February 28, 1996.

31. Textile Structural Composites Laboratory, National Science Foundation, Instrumentation and Laboratory Improvement (ILI) Award, $ 87,185.00 (42.5% NSF, 42.5 % Auburn cost share, 15% Private Industry Contribution), PI: S. Adanur (95%), Co-PIs: W. Walsh, R. Walker, B. Jang, 30 months, September 1, 94 - August 31, 96 (See 4.A.5).

32. Textile Structures for Composites: Stitch Bonded Laminar Composites, National Textile Center, $ 2,310,000 for 4 universities; Auburn's share $ 223,656.00, PI: S. Adanur (50%), Yasser Gowayed (50%), March 1, 1993 - February 28, 1996.

33. Wellington Sears Handbook of Industrial Textiles, Wellington Sears Company, Valley, AL, PI: Sabit Adanur (100%), $ 60,000.00, October 1, 1993-March 15, 1995.



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34. Design of a Braiding Machine to Produce Wide, Flat Woven Structures at a Significantly Increased Production Rate, PIs: R. Walker (leader), R., Broughton , S. Adanur, D. Beale, M. Nelms, National Textile Center, $ 570,000.00. Adanur's share: $ 90,000.00. March 92 - February 94.

Contracts/Grants in Force

1. Broughton, R. (PI), Beale, D., Adanur, S., and Foster, W., Design and Analysis of Stiffeners and Tension Compression Struts Using Braided, Open-Architecture Composite Structures (O-ACS), $150,000.00, Nov. 2013-May 2015.

2. Adanur, S., Meir, A. J., and Cao, Y., "Virtual 3D Interlaced Fabric Design and Characterization", $37,500.00. AU-IGP, 1 February 2012 - 31 January 2014.

3. National Science Foundation, REU Site for Micro/Nano-Structured Materials, Therapeutics, and Devices, PI: M.E. Byrne, Co-PI: S. Duke, Period: 03/1/11 - 02/28/14; $357,191. Faculty Mentors: S. Adanur, M. Auad, M. Byrne, S. Duke, A. Gorden, E. Davis, V. Davis, O. Fasina, R. Gupta, J.W. Hong, E. Lipke, B. Prorok, W. Ravis, C. Roberts. Submitted 25 August 2010.

Fully Developed Proposals Submitted (Pending)

1. Adanur, S., "Activated Carbon Fiber Based Cathode Filters for Proton Exchange Membrane Fuel Cell Poisoning Prevention via Adsorption", $363,514.00, submitted to NSF, 17 Oct. 2013.
2. Adanur, S., and Cao, Y., "A Novel Scientific Methodology for Interlaced Fibrous Structure Design and Behavior in 3D Virtual Reality", submitted to NSF, 24 Sept. 2013, $442,001.00.

**4.C. OUTREACH**

Short Courses / Workshops / Seminars (presenter's name is in *Italic*)

1. *Adanur, S.*, Composite Materials, Short course given to Boy Scouts at Merit Badge University, March 2, 2013, Auburn University.
2. *Adanur, S.*, "Higher Education in Alabama", Panelist and presenter in "Workshop: Restructuring of Higher Education in Turkey, Problems and Solutions", Marmara University, Istanbul, Turkey, 6 July 2012.
3. *Adanur, S.*, Composite Materials, Short course given to Boy Scouts at Merit Badge University, March 3, 2012, Auburn University.
4. *Adanur, S.*, Composite Materials, Short course given to Boy Scouts at Merit Badge University, March 5, 2011, Auburn University.
5. *Adanur, S.*, Composite Materials, Short course given to Boy Scouts at Merit Badge University, March 6, 2010, Auburn University.
6. *Adanur, S.*, Composite Materials, Short course given to Boy Scouts at Merit Badge University, March 7, 2009, Auburn University.
7. *Adanur, S.*, Composite Materials, Short course given to Boy Scouts at Merit Badge University, March 17, 2007, Auburn University.
8. *Adanur, S., and Isikel, L.*, Fuel cell research at PFE, presentation and demonstration given to Civil Air Patrol students, July 17, 2006, Auburn.



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9. *Adanur, S.*, and Demir, A., Manufacturing of Industrial Textiles, Workshop given to Hassan Textile Inc., Istanbul, Turkey, July 20, 1999.

10. *Adanur, S.*, " Manufacturing of Geotextiles", 5th NSF/IFAI Professor Training Course for Geosynthetics, AU Engineering Extension Service, Auburn, AL, August 9-14, 1998 (also, gave an instructional tour of the Geotextiles and Fabric Formation labs to the course participants).

11. *Adanur, S.*, "Wide World of Industrial Textiles", Seminar given to the faculty of the Department of Textile Science, University of Port Elizabeth, Port Elizabeth, South Africa, June 8, 1998.

12. *Adanur, S.*, "Testing of Technical Textiles", Industrial Textiles Short Course, Clemson University, January 28-29, 1998, Clemson, SC.

13. *Adanur, S.*, "Textile Research Update", presented at the Georgia Association of Family and Consumer Sciences District K Meeting, Tuesday, Nov. 11, 1997, Columbus, GA.

14. *Adanur, S.*, and Broughton, R. M., "Manufacturing, Properties and Testing of Geotextiles", AU-IFAI (Industrial Fabrics Association International) Educate the Educators Short Course, July 20-25, 1997, Auburn, AL (also, gave an instructional tour of the Geotextiles and Fabric Formation labs to the course participants).

15. *Adanur, S.*, and Hou, Z., "Recycling of Coated Fabrics", Workshop on Added Value Reclamation of Solid Waste, NSF EPSCoR, July 22-23, 1997, Auburn, AL.

16. Adanur, S. (90%), and *Mohamed, M. H. (10%)*, "Manufacturing of Industrial Textiles", US-Egypt Workshop on Manufacturing Technologies, Dec. 6-9, 1996, Alexandria, Egypt.

17. Prepared the Weaving and Knitting sessions for the short course Introduction to Textiles for Industry Professionals (ITIP-96), May 14-15, 1996 (cancelled).

18. *Adanur, S.*, "Overview of Industrial Textile Applications", Industrial Fabrics Association International (IFAI) Tutorial "Textiles Used in Structural Composites", 41st International SAMPE Symposium and Exhibition, March 24-28, 1996, Anaheim, CA.

19. *Adanur, S.*, "ISO 9000", Total Quality Management in the Textile Industry (SPC & Quality Engineering), Quality Tech, March 20-22, 1996, Pine Mountain, GA.

20. *Adanur, S.* (70%), and Broughton, R. M. (30%), "Manufacturing, Properties and Testing of Geotextiles", AU-IFAI (Industrial Fabrics Association International) Educate the Educators Short Course, July 7-12, 1996, Auburn, AL (also, gave an instructional tour of the Geotextiles and Fabric Formation labs to the course participants)..

21. *Adanur, S.* (50%) and Walker, R. P. (50%), "Yarn Preparation for Weaving in the Future (Yarn Preparation for the Second Loom)", the 33rd Annual Textile Slashing Short Course, September 20-22, 1993, Auburn University, AL.; enrollment: 81.

22. Member of the committee for AMTEX short course: Textile Fundamentals, 1994.
    - AMTEX Textile Fundamentals Short Course: Weaving, March 27-April 1, 1994, Atlanta, GA (cancelled)
    - AMTEX Textile Fundamentals Short Course: Knitting, March 27-April 1, 1994, Atlanta, GA (cancelled)

Technical Sessions Developed/Chaired

1. International Istanbul Textile Congress 2013, Session: New Materials, Room 3, May 30-31, 2013, 13.40-15.40, Istanbul, Turkey.

2. Session 202: Composites, Techtextil North America Symposium, Wednesday, April 2, 2008, 8:30 a.m. - 11:00 a.m., Atlanta, GA.

3. Session 3 (afternoon session) at the First Istanbul International Textile and Textile Machinery Congress, June 2, 2006, Istanbul, Turkey.

4. Session 4, 2nd International Technical Textiles Congress, Istanbul, Turkey, 13-15 July 2005.



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5. Session TC-1: Computational Mechanics, 1.45 pm – 3.15 pm, Tuesday, August 17, 2004, SECTAM XXII, Twenty Second Southeastern Conference on Theoretical and Applied Mechanics, August 15-17, 2004, Tuskegee University, Tuskegee, AL.
6. Session 4a, NANO 4, 7.20 pm-10.00 pm, Monday August 9, 2004, ICCE-11, 11th Annual International Conference on Composites/Nano Engineering, Hilton Head, SC, August 8-14, 2004.
7. Session 203 Paper Making Fabrics, Techtextil Symposium North America, March 13-15, 2001, Atlanta, Georgia. Developed and chaired the session with 5 speakers.
8. ICCE/5, Fifth International Conference on Composites Engineering, Session 7a, Textile I, 3.40 pm-6.00 pm, July 5-11, 1998, Las Vegas, NV.
9. ICAPC-97, International Conference on Advanced Polymer Composites, Materials, Processing and Applications, Session 2, Mechanics of Composite Materials (I), Beijing University of Aeronautics and Astronautics, Beijing, China, June 3-5, 1997.
10. ICCE/4, Fourth International Conference on Composites Engineering, Session 16c, Textile V, 8.00 am-11.00 am, July 6-12, 1997, Big Island of Hawaii.
11. The Fiber Society, Fall 1996 General Technical Conference, Session IV: Marine Applications of Textiles, Wednesday, Oct. 16, 1996, Newport, Rhode Island.
12. ICCE/3 Third International Conference on Composites Engineering, July 21-26, 1996, New Orleans, LA. Session 12b , July 25, 96, 3.45 pm-5.45 pm, Textile Composites III, Adanur, S., and Wang, Y.
13. ICCE/2 Second International Conference on Composites Engineering, August 21-24, 1995, New Orleans, LA.
    - Session 4d, Aug. 22, 1995, 10.10 am-12.10 pm, Textiles: 3D structures.
    - Session 5d, Aug. 22, 1995, 1.20 pm - 3.20 pm, Textiles: Applications.
    - Session 9d, Aug. 23, 1995, 3.35 pm-5.35 pm, Textiles: Analysis.
14. Paper Machine Clothing: Materials and Technologies. Third International Hi-Tech Textiles Exhibition & Conference, June 21-22, 1994, Greenville, SC. Planned and organized the presentation topics and found five speakers.

*Workshops Attended*

1. Attended the ITM Texpo Eurosia 2013, in Istanbul, Turkey, May 29, 2013.
2. Composite Manufacturing Workshop, March 30-31, 2005, Auburn, AL.

Editorships

1. Member of the Editorial Board for Journal of Industrial Textiles, Sage Publications (Jan. 2000 - present).
2. Member of the Editorial Board for the Electronic Journal of Textiles (August 2002 – present)
3. Member of the Editorial Board for the POLITEKNIK (Turkish/English), Dec. 2004-2009.
4. Member of the Editorial Board for the Electronic Journal of Textiles (August 2002 – 2009.
5. Member of the Editorial Board for Journal of Coated Fabrics, Technomic Publishing, Co., Inc., Lancaster, PA, (January 1998 – Jan. 2000).
6. Member of the editorial board for Textile and Technique which is a specialized monthly textile magazine published in Turkey (Turkish/English), 1993-2003.

Other Extension Activities

- Member of the Fiber Society Award Committee, 2011-2013.



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- Member of the Scientific Committee for the International Congress of Innovative Textiles, ICONTEX2011, 20-22 October, 2011, Tekirdag, Turkey. Reviewed manuscripts for acceptance to the conference.
- Gave the commencement speech at Marmara University, College of Engineering Graduation Ceremony, Istanbul, Turkey, 6 July 2011.
- Presented the NTC booth, 1.00-5.00 pm, Techtextil North America Symposium, April 2, 2008, Atlanta, GA.
- Organized the AU Textile Engineering booth for the Techtextil North America International Trade Fair for Technical Textiles and Nonwovens, March 23-25, 2000, Atlanta, GA.
- Gave a lecture to Prof. Richard Penaskovic's class RELG 0304 – Western Religions on June 1, 1999.
- Attended the Milliken Summer Challenge University/Industry Programs (1997 and 1998).
- Served as judge in the Industrial Fabrics Association International (IFAI)'s annual International Achievement Awards competitions (1995-present)
- International Advisory Board Member, International Conference on Composites Engineering (ICCE); ICCE/9 (2002 San Diego, CA), ICCE/8 (2001 Tenerif, Spain), ICCE/7 (2000, Denver, Colorado), ICCE/6 (1999, Florida Resort, FL), ICCE/5 (1998, Las Vegas, NV), ICCE/4 (1997, Big Island of Hawaii).
- Reviewer of Proposals for National Science Foundation (NSF)
- Attended the workshop "Integrating Design into the Engineering Curriculum", which was offered by the Southern Methodist University, in Dallas, TX on March 19-21, 1998. This was part of ABET preparation activities.
- "Two-man, Three Season, Double Walled Tent for the US Marine Corps Systems Command (MARCORSYSCOM)". Proposal prepared on behalf of National Apparel, Inc., of Montgomery, AL for the US Marine Corps. Project Total: $ 18,750,000.00; 150 pages, July 97.
- Gave a presentation to Alabama Congressional Delegation on Geotextiles, May 9, 1997.
- Prepared and presented the AU Textile Engineering booth during the 3rd International High-Tech Textiles Conference, Greenville, SC, June 94.
- Prepared and presented the AU Textile Engineering booth during the 2nd International High-Tech Textiles Conference, Greenville, SC, July 93.

## 4.D. SERVICE

Department, College and University Service Work

1. Member of the Academic Program Review Committee, Aug. 2013-Aug. 2016.
2. Prepared the SACS assessment reports for PFEN B.S., M.S., and Ph.D. programs for the SACS visit, March 21-22, 2013; updated the reports Oct. 14, 2013.
3. Participated in the AU Strategic Planning Focus Group sponsored by the Office of the Provost, 19 March 2013.
4. Member of the Academic Standards Committee, Aug. 2012-Aug. 2015.
5. Member of the Post Tenure Review Committee, Aug. 2012-Aug. 2015.
6. Prepared the 2011 SACS assessment reports for PFEN B.S., M.S., and Ph.D. programs, Jan.-Feb. 2012.
7. Member of the PFEN faculty search committee, Aug. 2011- Aug. 2012.
8. Member of the Faculty Handbook Review Committee, Aug. 2011-Aug. 2014.
9. Member of the Faculty Dismissal Committee, Aug. 2010-Aug. 2013.
10. Mentor - AU Early Career Faculty Mentoring Program, Sept. 2009-present.
11. Chair of the AU Faculty Grievance Committee, Aug. 2009-Aug. 2010.
12. Member of the Student Discipline Committee, Aug. 2009-Aug. 2012
13. Hosted TALON exhibit for incoming engineering freshman with Julia Freeman at the AU Hotel and Conference Center, Feb. 18, 2008.
14. Member of the new PFEN PhD Program Committee, Apr. 2008-present.
15. Member of the AU Faculty Grievance Committee, Nov. 2007-May 2009.



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16. Member of the PFEN Faculty Search Committee (Chair: Dr. Buschle-Diller), Aug. 2007-Apr. 2008.
17. Member of the CoE Graduate Student Recruiting Committee (appointed by the Dean), Chair of the Best Practices Subcommittee, March. 2007-present (unofficially started Fall semester 2006).
18. Chair of the PFEN Faculty Search Committee, Fall 2006-Spring 2007.
19. Member of the Alumni Engineering Research Award Committee (meeting held on March 10, 2008).
20. Responsible for the polymer processing equipment purchase (visited University of Akron, Oct. 2006).
21. Chair of the AU Student Academic Grievance Committee, Jan. 2006-Aug. 2008.
22. Member of the AU Student Academic Grievance Committee, Aug. 2005- Dec. 2005.
23. Member of the AU Academic Honesty Committee, 2003-2006.
24. PFEN ABET Coordinator, Spring 2003-present (Attended the Learning Outcomes Seminar, Apr. 7, 2008, 200 Allison Lab).
25. Member of the Alumni Professorship Committee, 2002-2005.
26. Member of the Budget Advisory Committee, Feb. 2003-2005.
27. Graduate Faculty (reappointed November 2002)
28. Member of the Ginn Professorship Selection Committee, 2002.
29. Member of the Engineering Faculty Council (EFC), 2002-2205.
30. Member of the AU Diversity Leadership Council, May 2002-2004.
31. TE Department Futures Committee Member, 2001.
32. Mentoring Committee member for Dr. Aliecia McClain, Assistant Professor. February 2001- 2004.
33. Member of the AU Senate Research Grant-in-Aid Committee, Fall 2000- Fall 2003.
34. Member of the Textile Engineering Department Head Search Committee, 1999-2000.
35. Member of the College of Engineering Freshman Computing Initiative (FCI) Committee (1999-2000)
36. National Textile Center (NTC) Site Director for Department of Textile Engineering (June 1998 to October 2001). Responsible for the overall coordination of NTC proposals, projects and budgets for the Textile Engineering Department.
37. Chairman of the Textile Engineering Curriculum Committee (1993-2000).
38. Coordinated the Semester Transition activities for TXEN, TXCH, TXMT, TXTS and ITAS programs. Prepared/edited the departmental semester transition package (162 page document)
39. College of Engineering Priorities Task Force Member (1998). Participated in two task force teams: one in research and one in teaching.
40. Member of the College of Engineering Curriculum Committee (1993 to present)
41. Chairman of the Textile Engineering Award Committee. The committee nominated Pat Smith and Paul Brady for the Spirit of Excellence Award which they won (1992-2000).
42. Member of the new PhD program in Integrated Textiles and Apparel (ITAS) preparation committee (1994 - 1998).
43. Member of the three new faculty and two new technician search committees in Textile Engineering (1994-2000).
44. Participated in the 1994-1995 and 1995-96 Faculty/Student Mentor Program
45. Honorary Member of the Phi Psi Textile Fraternity.
46. Freshmen scholarship interviewer (1993-2000)

Professional Society Activities

- Member of the TASSA (Turkish-American Scientists and Scholars Association) Interim Council, 2004-2006.
- Member, Industrial Fabrics Association International (IFAI) Safety & Protective Products Division, 2003-present.



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- Chair of the American Society of Mechanical Engineers-Textile Engineering Division, ASME-TED (2000-2001). Attended the ASME Technical Executives Committee (TEC) meeting in New York, NY, November 2001.
- Vice-Chair of the American Society of Mechanical Engineers-Textile Engineering Division, ASME-TED (1998-2000). Attended the ASME Technical Executives Committee (TEC) meeting in Houston, TX, March 3-5, 2000.
- Newsletter Editor of the American Society of Mechanical Engineers-Textile Engineering Division, ASME-TED (1995-present). Prepared and published the ASME Textile Engineering Division Newsletter - Fall 1996 issue.
- Secretary-Treasurer of the American Society of Mechanical Engineers-Textile Engineering Division, ASME-TED (1995-1997).
- Program Chairman of the American Society of Mechanical Engineers (ASME), Chattahoochee Section (1995-96)
- Secretary of the American Society of Mechanical Engineers (ASME), Chattahoochee Section (1994-95).
- Treasurer of the American Society of Mechanical Engineers (ASME), Chattahoochee Section (1993-94).
- Member of the American Society of Mechanical Engineers-Textile Engineering Division (ASME-TED) Revitalization Task Force. There has been a lack of enough activity in recent years in TED and the objective of the Task Force is to retain Textile Engineering as an active ASME technical division (1994 - 1995).

Membership

- Manufacture Alabama
- The Fiber Society
- Honorary member of the Phi Psi Textile Fraternity

Proposals Reviewed:

1. NSF Panelist for Nanomanufacturing Proposals (Panel #: P100737), Dec. 14, 2009, Arlington, VA. Reviewer/Lead/Scribe for 8 proposals, Panelist for 26 proposals.
2. Panelist for NSF SBIR-STTR Program, Aug. 23, 2007, National Science Foundation, Arlington, VA.
3. NSF Proposal No. 0242891 entitled "Human Powered Wearable Computers" by Hechmi Hamouda and Warren J. Jasper, November 2002.
4. Proposal No: INT-9811022, National Science Foundation
   PI: C. L. Smith, North Carolina State University, June 1998.
5. Reviewer for the National Textile Center Proposals (Fabrication Competency), 1998-2001.
6. Visited National Science Foundation on Nov. 4, 1999 as a panel reviewer of 15 CAREER proposals.

Reviewing for Journals:

Textile Research Journal, Journal of Elastomers and Plastics, International Composites Engineering Journal, Journal of Cotton Science, Journal of the Textile Institute (England). 67 articles have been reviewed to date.

Other:

- Judge for the "Turkey Innovation Week", Dec. 6-8, 2012, Istanbul, Turkey. Judged 10 proposals.
- Recommendation letter for promotion of a professor at an NTC University, December 2004.
- Helped with the Engineering Technologies Academy for Civil Air Patrol cadets, July 8-12, 2003, Auburn University.



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Companies and Organizations Served

Majority of the work done was on a no charge bases. Inquiries varied; some visits, some by analysis and transmittal of samples and/or data, some literature search, technical reports, etc. The following list does not include companies that I served through the phone.

- KilpatrickStockton
- U.S. CRDF Science Center
- Dority-Manning
- Milliken
- Gallery Co.
- Southern Mills
- Berry Plastics
- NSF Panelist
- InterVascular
- Eastern Technologies
- Zyvex Corporation
- Mr. Les Letlow
- Tyco Industries, AL.
- Unsa, Istanbul, Turkey.
- EverCare Co.
- TrustForte Corporation.
- Mesa Associates.
- A-Carb LLC
- Illinois Tool Works
- Cordis Corp.
- SulzerTextil.
- Textrade.com
- N. V. Bekaert S. A., Belgium.
- Amoco Fabrics and Fibers Company, Bainbridge, GA.
- Hassan Textile Inc., Istanbul, Turkey.
- Kinedyne Corporation, Prettville, AL.
- Allied Signal, Medical Textiles, Virginia.
- 3Tex, Raleigh, NC. Analysis of McGinley System.
- PE Technikon and CSIR of South Africa. Textile Engineering education and research.
- Commissariat A L'energie Atomique and Aerospatiale of France. Composite research.
- Asten Forming Fabrics, Appleton, WI.
- Milliken & Company, Specialty Industrial Business, LaGrange, GA. Geotextiles, composites.
- Johnston Industries, Utilization Plant, Valley, AL. Fibrograph.
- Startex, Spartanburg, SC. Recycling of coated fabrics.
- National Apparel, Inc., Montgomery, AL. Combat tent.
- Sulzer-Ruti, Inc., Spartanburg, SC. Forming fabrics.
- Clark Schwebel, Inc. 3D weaving.
- Eaton Corp, Milwaukee, Woven and knit reinforcements for composites



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- Industrial Textile Associates, Greer, SC. Analysis of a rayon fabric carbonized after weaving.
- Environmental Technical Services. Recycling.
- Wellington Sears Co., Valley, AL.
- Emory University, Atlanta, GA. Polymeric stents.
- Bo-Tex Sales Corporation, Hogansville, GA. Recycling.
- Johnston Composite Reinforcements, Inc., Phenix City, AL. Process improvement.
- Twitchell Corporation, Dothan, AL.Weaving.
- Cooley Inc. Recycling.
- C. M. Offray & Son, Inc. Recycling.
- John Boyle & Co., Inc. Recycling.
- Weblon, Inc. Recycling.
- Bruin Plastics Co. Recycling.
- Industrial Fabrics Association International (IFAI). Recycling.
- AU Vet. School, testing of ligaments on Instron, Sept. 29-Oct. 3, 1995.
- Shakespeare Monofilament, Columbia, SC. Development of Forming Fabric, 1994.
- Development and testing of "Hail no Hail" fabric for Marks & Flinn of Montgomery, AL, 1994.
- Doran Textiles, Shelby, NC. Mr. Reuben Bond on 'Team Weaving' concept. (6.5.93)
- Lindsay Wire, Florence, MS. Mr. Ton Rietzelt on Jacquard Weaving (6.30.93)
- Deerfield Specialty Papers, Inc., Augusta, GA on wear of forming fabrics.
- Hoechst Celanese, Mr.Dan Cain, Spartanburg, SC on developing a warp knitted structure using elastomeric monofilament fiber.
- Seattle Textile Company, Seattle, WA, on testing of PVC coated polyester sheeting designed for use in flame resistant, coated fabric type hose.
- North Carolina State University, College of Textiles. Consultant for the Air-Jet Loom Simulator.
- US Geotextiles, Opelika, AL., Evaluation of ultrasonic seams of geotextiles.

Community Service

- Soccer coach, U13G, Auburn Parks and Recreation Department, Fall 2013 season
- Soccer coach, U13G, Auburn Parks and Recreation Department, Spring 2013 season
- Soccer coach, U13G, Auburn Parks and Recreation Department, Fall 2012 season
- Soccer coach, U10G, Auburn Parks and Recreation Department, Spring 2012season
- Participated at the Spring Fling, Yarbrough Elementary School, Apr. 29, 2011
- Soccer coach, U10G, Auburn Parks and Recreation Department, Spring 2011season
- Soccer coach, U16, Auburn Parks and Recreation Department, Fall 2010 season
- Soccer coach, U16, Auburn Parks and Recreation Department, Fall 2009 season
- Gave a tour of the Polymer Processing lab to Drake Middle School 6th graders Cosmic Cat team, Spring 2009.
- Chaperon for AU Explore field trip of Yarbrough Elementary School 5th graders, Apr. 25, 2008, 8.30-13.30.
- Soccer Coach for U13 Boys, Auburn Parks and Recreation Department, Fall 2007.
- Soccer Coach for U6 coed team, Auburn Parks and Recreation Department, Spring 2007 and Fall 2007.
- Attended the 'football throwing" booth at Yarbrough Elementary School's "Spring Fling", 28 April 2006.
- Gave a seminar about Polymer and Fiber Engineering to Mrs. Fleming's 5th grade class at Yarbrough Elementary School, Thursday, April 27, 2006.
- Soccer Coach for U10 and U13 Boys, Auburn Parks and Recreation Department, Spring 2006, Fall 2006, Spring 2007.
- Soccer Coach for U10 and U13 Boys, Auburn Parks and Recreation Department, Spring 2005 and Fall 2005.



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- Participated at the Yarbrough Elementary School WinterFest, Feb. 25, 2005.
- Soccer Coach for U8 Boys, Auburn Parks and Recreation Department, Fall 2004
- President of the Auburn Ministerial Association (AMA) 2003-2004, member since 2002.
- Seminar given at the Leadership Alabama Retreat: "Religion: Does it Unite or Divide?", Tuskegee University Chapel, Jan. 30, 2004.
- Participated in home building for Habitat for Humanity (2002-present)
- Participated in Community Market activities (2003-present)
- Presentation made at the Interfaith Community Service of Thanksgiving, Nov. 21, 2000, Auburn University Chapel.
- Gave 5 seminars/tours to Auburn City School students between 1994 to 2000.
- Member of the United Way of Lee County, Campus Division, Campaign pilot program, 1996-present.
- Certified soccer coach for Under 6, Under 8, Under 10 and Under 13 years old kids, Auburn Parks and Recreation Department, 1993-present.
- Gave a lab tour to AU Child Study Center Preschool Class, January 19, 2000.

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# SUPPLEMENTAL DECLARATION OF EDWARD C. FREDERICK

## I. INTRODUCTION

1. I, Dr. Edward C. Frederick, make this declaration in connection with the Opposition filed by adidas AG ("adidas") to Nike, Inc.'s ("Nike") Motion to Amend in the *Inter Partes* Review of U.S. Patent No. 7,347,011 ("the '011 Patent") owned by Nike.

2. I submitted a declaration presenting my opinions regarding the validity of claims 1-46 of the '011 Patent on November 28, 2012. Paragraph 98 of that declaration stated that: "I reserve the right to supplement my opinions in the future to respond to any arguments raised by the owner of the '011 Patent and to take into account new information as it becomes available to me." I incorporate my previous declaration by reference.

3. Paragraph 7 of my November 28, 2012 declaration included a list of the materials that I reviewed in preparation of that declaration. I have supplemented that list with additional materials that I reviewed in preparation of this declaration as follows: industry information provided by adidas; two on line articles on KnittingIndustry.com (Billy Hunter, editor, Editor's Viewpoint: Nike Flyknit: Quantum leap for flat knitting. Knitting Industry website 26 July 2012, Website link, http://www.knittingindustry.com/nike-flyknit-quantum-leap-for-flat-



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knitting/; and Billy Hunter, editor, Editor's Viewpoint: Nike Flyknit: Ready, Steady, Go! 31st July 2012, Website link: http://www.knittingindustry.com/nike-flyknit-ready-steady-go/; U.S. Patent No. 2,178,941 "Knitted Helmet" to Schuessler, and U.S. Patent No. 2,150,730 "Knitting Machine" to Schuessler.

4. In addition to the materials I have referenced, I discussed with Dr. Sabit Adanur how a person of ordinary skill in the art ("POSITA") at the time the '011 Patent was filed would have been motivated to modify Nishida to incorporate a "knit to shape" flat knit textile, my understanding of the POSITA standard, and the proposed constructions for "flat knit textile element" and "flat knit edges."

5. Since submitting my November 28, 2012 declaration, counsel for adidas has asked me to review Nike's Motion to Amend the '011 Patent, the Declaration of Raymond F. Tonkel, and Exhibits submitted therewith, and a copy of the transcript of the November 5, 2013, cross-examination deposition of Raymond F. Tonkel. In particular, counsel for adidas has asked for my opinion regarding the statements by Mr. Tonkel regarding the secondary considerations of non-obviousness, as well as the obviousness of modifying Nishida's process of knitting the unitary upper in flat form as part of a larger structure with a "knit to shape" process of knitting the unitary upper in flat form.

## II. Principles of Claim Construction and Proposed Constructions

6. As stated in Paragraph 12 of my November 28, 2012 declaration, I



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understand from counsel for adidas that, in a review proceeding, the claims are to be given their broadest reasonable construction consistent with the patent specification. I also understand that limitations from the specification are not to be read into the claims.

7. While the specification of the '011 Patent describes flat-knitting as a sub-type of weft knitting, the specification does not define "flat knit," "flat knit textile," or "flat knitting," or otherwise state that flat knitting is *exclusively* a sub-type of weft knitting. (Ex. 1015, pp. 34-36.)

8. Based on my discussion with Dr. Adanur, I understand that a broadest reasonable interpretation that is consistent with the '011 Patent specification of "flat knit textile element" is "a knitted textile that is knit in flat form." I also understand that a broadest reasonable interpretation that is consistent with the '011 Patent specification of "flat knit edges" is "edges of a knitted textile that are knit in flat form."

## III. Motivation to Modify Nishida to Include "Knit to Shape" Flat Knit Textile Element

9. I have reviewed U.S. Patent No. 5,345,638 to Nishida ("Nishida"), U.S. Patent No. 2,178,941 to Schuessler ("Schuessler I"), and U.S. Patent No. 2,150,730 to Schuessler ("Schuessler II").

10. Nishida is directed to knitted textiles that are produced by



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"conventional textile processes," which I understand was construed by the Board to "include knitting, including 'weft-knitting.'" (Ex. 1005, 3:6-12; Paper 18, p. 20.) Nishida discloses that the layout 2 is flat knit as part of a larger web of material 1 and removed therefrom to form the final shoe upper 3. (Ex. 1005, 3:6-42; 4:6-46.)

11. Nishida is directed to improving efficiency of manufacturing shoe uppers 3 by reducing the costs of materials needed to produce the uppers 3. (Ex. 1005, 1:10-37, 2:15-25.) However, Nishida also recognizes that there are advantages to reducing the amount of cutting waste, such as by having individual patterns or partial patterns already "produced directly in the production of the web of material in the desired shoe size, by which the cutting waste can be still further limited, since the individual patterns or partial patterns in the provided size can directly adjoin one another." (Ex. 1005, 2:27-32.)

12. I have also spoken with Dr. Adanur to confirm my understanding that this statement in Nishida would suggest to a POSITA at the time the '011 Patent was filed to modify Nishida's process of knitting the unitary upper in flat form as part of a larger structure with a "knit to shape" process of knitting the unitary upper in flat form.

13. Thus, a person of ordinary skill in the relevant art at the time the '011 Patent was filed would understand that Nishida suggests there may be certain benefits of additional reductions in cutting and material waste, which the skilled



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person could reasonably understand to include flat knitting the layout 2 in final form without the need to remove the textile element from a larger textile structure.

14. For example, Schuessler I teaches knitting a swatch in flat form with edges that are stitched together to form a three-dimensional helmet (i.e., cap) by joining some of the edges. (Ex. 1020, 1:22-27, 1:48-2:2, 2:41-45.) Schuessler I and Nishida are in similar fields: the use of knitted two-dimensional textile elements having edges that are stitched together to form three-dimensional wearable items, and Schuessler II confirms that a flat knitting machine may be used to produce the two-dimensional textile elements of Schuessler I (Ex. 1021), which would be equally applicable to Nishida.

15. Because the textile elements of Schuessler I serve the same purpose when combined with Nishida's textile elements, namely to form a three-dimensional wearable item in an efficient and economical way from a knitted two-dimensional textile element, a person of ordinary skill in the relevant art at the time the '011 Patent was filed would have been motivated to combine Schuessler I's flat knitted textile elements having selvage edges that are sewn together with Nishida's knitted textile elements also having edges that are sewn together to create a wearable item.

## IV. NIKE'S SECONDARY INDICIA OF NON-OBVIOUSNESS

16. The argument put forth in the declaration of Mr. Tonkel that the '011



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Patent describes a method of making uppers that is "more efficient from a manufacturing perspective" is untenable. Before commenting on the specific statements made by Mr. Tonkel in his declaration, I would like to describe how the embodiments mentioned in the '011 Patent would be rendered into practice by a POSITA.

17. Making unitary uppers on a flat knitting machine requires considerable expertise and investment. A staff of programmers and skilled machine operators are required to keep these high-tech machines running and to program them to make the uppers properly. In addition, skilled shoemakers are still needed to finish the uppers, to ready them for the final steps in making finished shoes.

18. The website, *KnittingIndustry.com*, has analyzed the requirements for making uppers by these methods, and published an assessment of what would be needed in terms of equipment to produce sufficient uppers. I quote from an *Editorial Viewpoint* by *KnittingIndustry.com* editor, Billy Hunter,

> Based on information currently available and making some informed assumptions we calculate, not surprisingly, that very large numbers of flat knitting machines will be required to meet market demands, especially for the Nike Flyknit Trainer+ mass market product.
>
> If we assume Flyknit is knitted in 10 or 12 gauge and estimate a production time of approximately 30 minutes per upper, then one machine working 24/7 might produce around 320 uppers per week. That's only enough for 160 pairs of Flyknit shoes and at that rate, 1000 machines would be required to produce 160,000 pairs per week.
>
> The point is that these are small numbers by Nike standards and



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> therefore huge numbers of flat knitting machines could be involved if Flyknit is as successful as Nike anticipates.

Ex. 1024.

19. The key conclusions of this analysis are that approximately 30 minutes are required to knit each upper (*i.e.*, 60 minutes per pair), and that a large number of knitting machines would be required. The high-tech computer-controlled flat, weft-knitting machines, like a Stoll CMS 530 HP (cited as a likely candidate in another article by Mr. Hunter, Ex. 1025), which are required to make these uppers, cost well over one hundred thousand dollars each and they require expert technicians to maintain them and keep them operating.

20. It is not unusual for a well-run Asian supplier to produce 1500 to 2000 pair per line of production per day. This is a good measure of productivity. In order for the knitted uppers made by the methods described in the '011 Patent to match that current level of productivity, at least 60 to 80 knitting machines running 24/7 would be required to keep up with just one line of production. Multiple lines of production would require equivalent multiples of 60 to 80 knitting machines on the order of $120,000 to $150,000 per machine, which would be required just to match conventional manufacturing methods.

21. The best way to more fully understand what this all means in terms of the efficiencies and costs of manufacturing is to make a more detailed comparison of this way of making uppers with conventional methods.



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22. Making a finished upper using conventional methods involves multiple steps. The component materials must be acquired. The individual pieces that may number from a few to dozens must be cut from larger pieces of material. These precisely cut pieces must be assembled into a complete upper. This upper assembly process is still most often done by stitching together the individual pieces.

23. This is indeed a tedious and labor intensive process. Taken together the steps required to create a finished upper ready for lasting, represent the most labor intensive part of shoemaking. In my experience about one-half to two-thirds of the labor required to make a shoe is tied up in making the upper. Depending on the complexity of the design and the type of shoe, it takes about 1.3 to 2 hours of labor to make each pair of shoes in an Asian shoe factory. Approximately one (1) hour of that total can be attributed to the steps required to make the upper. Labor rates for conventional shoemaking in Southern China are currently around $2 per hour and rising. Labor rates in other countries in Asia are generally below that figure.

24. The process of making a pair of uppers on a flat knitting machine trades the roughly one hour of low cost labor per pair required to make uppers conventionally, for highly-skilled, and more expensive, labor required to program and maintain these machines, amortization of the investment in these extremely expensive knitting machines, plus the skilled shoemaking labor required to finish



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the knitted uppers readying them for lasting and the remaining steps in shoemaking. The total time required per upper to program, operate and monitor the special computerized knitting machines required to make a pair of uppers includes at least the 60 minutes of machine time required to complete the knitting, but, as I will show later in this report, other steps are also required to bring the upper to the point where it is equivalent to the finished upper made by conventional methods. Skilled labor that is trained and experienced in programming and operating computerized flat knitting machines would be many times more expensive than typical Asian shoe manufacturing labor rates. In addition to this technically skilled labor to program and monitor the machinery, approximately 30 minutes per pair of skilled shoemaking would still be required to bring these uppers to the point where they could be used to make a finished shoe.

25. The net effect of these tradeoffs is a reduction from one hour to ½ hour of hands-on shoemaking, and the addition of some amount of highly-skilled labor, and high costs to amortize large numbers of expensive machines.

26. The idea that knitting unitary uppers as described in the '011 Patent is a more efficient and economical method of manufacturing does not agree with these facts as I understand them. This will become even more apparent with respect to the specific comments made in the Tonkel declaration.

27. In paragraph 45 of his declaration, Mr. Tonkel states:



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> One of skill in the art would also understand that by flat knitting the embodiments shown in Figures 8, 10 and 11 efficiency can be increased. As discussed above, the embodiment described in Figure 9 (and claimed in issued claim 36) requires that "[e]ach textile element 40 [be] removed from textile structure 60 with a die-cutting, laser-cutting, or other conventional cutting operation." (Ex. 1002 at 8:8-10). In contrast, the embodiments shown in Figures 8, 10 and 11 are formed without a surrounding textile structure from which the textile element must be removed. Such embodiments are more efficient from a manufacturing perspective because they eliminate the additional "cutting operation" after knitting associated with the embodiment shown in Figure 9.

Ex. 2010, ¶ 45.

28. The advantages of multiple sizes per unit, as described in Nishida (Ex. 1005, 2:27-32), is eliminated by the '011 Patent method, as acknowledged by Mr. Tonkel in his deposition. Ex. 1015, pp. 101-103. Being able to make multiple-size uppers is an advantage because it reduces the inventory of uppers required to meet production demands. It also reduces set-up time on the knitting machines as fewer uppers need to be programmed to meet size run requirements. The process of cutting specific sized uppers from a large textile element that covers multiple sizes would not be a difficult or time-consuming task for a typical shoe manufacturer.

29. The embodiments described in the '011 Patent are clearly not more efficient from a manufacturing perspective. The extra time, equipment, equipment amortization, and costly labor required to produce uppers like the embodiments shown in Figures 8, 10, and 11 are disadvantageous from a manufacturing



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perspective as I have explained in detail above.

30. In paragraph 46 of his declaration, Mr. Tonkel states:

> In addition, such embodiments are efficient because they also eliminate the extra processing steps associated with stabilizing the cut edges. (*E.g.,* Glidden, Ex. 1007 p. 2, ll. 43-63; 'Where the cutting of the textile upper … leaves a raw textile edge which might ravel or fray, the edges may be protected, as by an overcast stitch …'); (Whiting, Ex. 1009 at 3:68 – 4:16; '[T]he last 16 may be provided with a guide groove 20 along which a cutter effects severance of portion 13 from the ultimate upper 11. … The shoe is now complete except for providing a finish for the contour edge of the upper. … [S]aid edge may be seared with a heated tool to fuse the fibers of the yarn along the severance line to coagulate the same and form a finishing bead 21. … Fig. 5 shows another edge finishing method, the same entailing the application of a binding 22 by stitching, cementing or pasting the same in place.'). Furthermore, such embodiments are environmentally beneficial because they reduce the expense and waste associated with the extra material that must be removed from the textile element.

Ex. 2010, ¶ 46.

31. Contrary to what Mr. Tonkel asserts, trimming and cutting are not totally eliminated by the process described in the '011 Patent. As is clearly visible in the photo of the unitary upper intended for a Nike Flyknit shoe that has been made on a flat knit machine (reproduced below), when uppers are made according to the methods described in the '011 Patent, these uppers are not complete and still need to be finished and readied for the next steps in making the shoe.



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Ex. 1024.

32. The threads and loops of material around the perimeter need to be manipulated. In the case of this particular upper, a tongue also needs to be inserted, presumably by stitching on a separately flat-knitted tongue. Also there is a high likelihood of a need for a lining, for example in the inside heel area, and reinforcing such as the addition of a fabric tape to cover and reinforce any seams created by forming the upper into a 3D shape. The addition of finishing details like a logo would also be required. Most importantly, the edges that form the edges of

the base of the upper would need to be Strobel stitched to a Strobel board to complete the upper.

33. I hold this image of an upper from Exhibit 1024 as an example of what a unitary upper produced by flat-knitting might look like and to explain the extra finishing steps that would need to be performed to make it ready for assembly into a finished shoe.

34. In addition, the examples shown in Figure 8 of the '011 Patent show an internal edge (31 and 32, as well as 44b and c and 43b and c). This is the border to which a Strobel board or sockliner would be stitched in order to finish the upper to ready it for lasting, bottoming and making. The addition of the Strobel process in order to make the upper ready for lasting is a significant step. In other words, according to what a POSITA would understand, the upper is not finished as knitted by a flat knitting machine, either as shown in Exhibit 1024, or as it is described in the '011 Patent.

35. In paragraphs 177-179 of his declaration, Mr. Tonkel states:

> I understand that objective or secondary consideration factors can be considered when assessing whether an invention would have been obvious. I understand that one of those factors supporting non-obviousness is a long felt need for the invention. It is my opinion that there was a long felt need for the invention described in substitute claim 47.
>
> Nishida shows that reducing material waste during manufacture of textile footwear uppers was a long-felt need. Nishida asserted that



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> 'with the known material [as described in German Patent No. 627878] that has crosswise strips, the entire cutting waste . . . consists of an expensive tubular material, multilayer material or the like.' (Ex. 1005, 2:22-25). Over thirty years after that German Patent, Nishida's response to this problem was to make the "cutting waste" a simpler, lighter or cheaper material. (Id. at 2:15-18). Even if one assumes that Nishida teaches flat knitting of his 'web' with multiple 'layouts', however, this underlying problem remained. In particular, manufacturing uppers Patent Owner NIKE, Inc. Exhibit No. 2010 - page 93 91 from flat textile elements still resulted in material that must be wasted when a flat textile element is cut from a "web of material." Over ten years then elapsed between Nishida and the filing of the '011 patent application. Unlike Nishida, which simply tried to make "cutting waste" less expensive, the upper of substitute claim 47 solves the long-felt need to reduce flat textile footwear upper manufacturing waste by eliminating the need to cut a textile element from a textile structure, thereby eliminating "cutting waste" (and the associated cutting step) instead of simply making the cutting waste cheaper.
>
> Therefore, for at least these reasons, the objective factor of long felt need for the invention supports the non-obviousness of the inventions described in substitute claim 47, and the claims dependent thereon, i.e., substitute claims 48-50.

Ex. 2010, ¶¶ 177-179.

36. The elimination of cutting waste and reducing the need for extra steps may be a long-felt need in shoemaking, but it has to be put in perspective. Any invention that addresses such a need must pass certain tests. It must not increase labor costs or materials costs, and must not significantly decrease overall productivity. What is described in the '011 Patent fails this test in all three areas.

37. All labor required to make finished uppers via the flat knitting



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approach, is not eliminated. In fact, labor costs might be equivalent or even increased because the manufacturer would need to retain at least ½ of the labor required to create a finished upper conventionally and would have to add to it much more expensive labor in the form of technical expertise to program and operate the knitting machines. This does not include significant amortization costs that I have folded into the material costs covered below.

38. The special yarns used to knit flat-knitted uppers are more expensive than the vast majority of materials used to make shoes conventionally, and the machines used to make these uppers are extremely expensive. One way to look at the cost of the materials is to combine the cost of the yarns with amortization for the machines used to knit the uppers. The amortization on the machinery required to produce 1500 to 2000 pair of unit uppers by flat knitting would be based on an initial outlay of as much as $10.8 million in US Dollars. And that would cover just one line of production. In my opinion, the net materials cost would be significantly greater for the methods described in the '011 Patent.

39. Lastly, the productivity of computerized knitting machines is poor compared to conventional manufacturing techniques. As I mentioned above, 60 to 80 knitting machines running 24/7 would be required just to keep up with one line of conventional production.

40. Therefore, the reduced waste resulting from making shoes by these



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methods would come at an unacceptable cost for manufacturers in terms of increased labor and material costs as well as lower productivity.

41. It is clearly a good thing to reduce material waste. In fact, many footwear manufacturers invest in expensive computer-controlled cutting machines to reduce waste and improve yields (i.e., the percentage of useful parts vs waste from rolls of materials). Special computer programs are also used to reduce material waste by controlling the cutting paths of waterjet or laser cutting machines. It's not unusual, using these methods, to reduce waste to about 2% to 5%. These computer-controlled cutting machines, besides reducing waste, also boost productivity and reduce labor costs by allowing many more parts to be cut in a unit of time. In fact, the long-felt need to reduce material waste is already being addressed by these technologies, and with decidedly positive economic benefits for manufacturers.

42. In addition to the gains in addressing these long-felt needs with computer-controlled high-yield cutting methods, computer-controlled stitching machines have also been introduced to the stitching rooms of many manufacturers. This significantly improves the productivity and reduces waste due to errors of sewing machine operators charged with assembling the pieces of the upper, and by doing so, reduces labor rates.

43. I mention these relatively recent technical developments because these



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are examples of addressing the long-felt need for greater efficiency and less waste, suggested by Tonkel. But contrary to the methods described in the '011 Patent, these methods increase efficiency and reduce waste in a way that makes economic sense.

44. Eventually the costs of the knitting machinery will come down and the yields and productivity will improve, but I don't foresee these factors ever improving to the point where they will be able to produce a shoe more quickly or more economically compared with conventional construction methods, even if we assume that conventional methods will not continue to evolve.

45. In conclusion, the argument put forth in the declaration of Raymond Tonkel that the '011 Patent describes a method of making uppers that is "more efficient from a manufacturing perspective" is untenable. In fact, the embodiments described are extremely capital-intensive, while being less efficient and more expensive in terms of material costs and reductions in productivity.

## V. CONCLUSION

46. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested 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



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cross examination within the United States during the time allotted for cross examination.

47. I reserve the right to supplement my opinions in the future to respond to any arguments raised by the owner of the '011 Patent and to take into account new information as it becomes available to me.

48. I 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; 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: 12 November 2013





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# Electronic Acknowledgement Receipt

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| **EFS ID:** | 29874249 |
| **Application Number:** | 15610089 |
| **International Application Number:** | |
| **Confirmation Number:** | 4757 |
| **Title of Invention:** | ARTICLE OF FOOTWEAR HAVING A TEXTILE UPPER |
| **First Named Inventor/Applicant Name:** | BHUPESH DUA |
| **Customer Number:** | 78342 |
| **Filer:** | Elizabeth Ashley Lucas |
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| 1 | Transmittal Letter | 276100_IDS_Cover_Letter.pdf | 15812<br>b1b889159707e0f36ef66f09e808db56fdc05f99 | no | 1 |

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| 3 | Non Patent Literature | 276100_10_NPL_05_Petitioners_Reply_Owners_Oppo_Motion_to_Exclude_IPR2013_00067.pdf | 53248<br>5ec605d4ec12c446ec5408be3788e059ee093511 | no | 8 |
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| 17 | Non Patent Literature | 276100_10_NPL_09_Final_Written_Decision_IPR2013_00067.pdf | 330687<br>24e9599f78a6c0b752c21c75080378bab4ceb86c | no | 43 |
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| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 34155730 | | |

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | | | |
|---|---|---|---|
| Appl. No. | : | 15/610,089 | Confirmation No. 4757 |
| Inventor | : | Bhupesh Dua | |
| Applicants | : | NIKE, Inc. | |
| Filed | : | 5/31/2017 | |
| Title | : | ARTICLE OF FOOTWEAR HAVING A TEXTILE UPPER | |
| Group Art Unit | : | 3765 | |
| Examiner | : | Marie D. Bays | |
| Matter No. | : | NIKE.276100/08-1313US82CON | |
| Customer No. | : | 78342 | |

**VIA EFS – 7/24/2017**

Mail Stop Amendment
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

**IDS SUBMISSION**

This correspondence is being submitted with an Information Disclosure Statement pursuant to 37 C.F.R. § 1.97. Due to the number of references, the IDS is separated into multiple forms. Accordingly, Applicant hereby submits IDS forms 1-11 as this IDS submission. Each IDS form corresponds to an IDS form filed in the Application No. 14/503,514 from which this pending application depends. Pursuant to 37 C.F.R. § 1.97(c)(2), Applicant submits herewith the fee set forth in § 1.17(g) for the IDS submission.

Respectfully submitted,

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Skechers EX1013-p. 6519
Skechers v Nike

US007347011B2

(12) **United States Patent**
**Dua et al.**

(10) **Patent No.: US 7,347,011 B2**
(45) **Date of Patent: Mar. 25, 2008**

(54) **ARTICLE OF FOOTWEAR HAVING A TEXTILE UPPER**

(75) Inventors: **Bhupesh Dua**, Portland, OR (US); **Edward Nathaniel Thomas**, Portland, OR (US)

(73) Assignee: **NIKE, Inc.**, Beaverton, OR (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 506 days.

(21) Appl. No.: **10/791,289**

(22) Filed: **Mar. 3, 2004**

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(51) **Int. Cl.**
*A43B 1/04* (2006.01)

(52) **U.S. Cl.** ..... **36/45**; 36/10; 36/3 A

(58) **Field of Classification Search** ..... 36/45, 36/3 A, 10, 55
See application file for complete search history.

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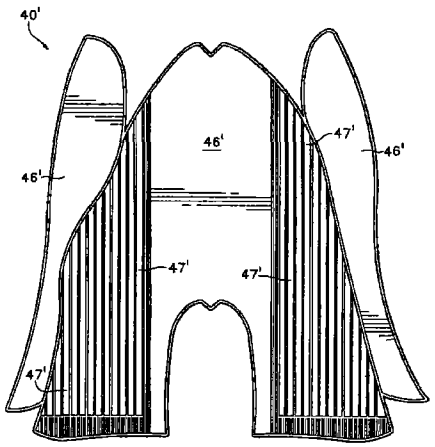
*Primary Examiner*—Marie Patterson
(74) *Attorney, Agent, or Firm*—Banner & Witcoff, Ltd.

(57) **ABSTRACT**

An article of footwear and a method of manufacturing the article of footwear are disclosed. The footwear may include an upper and a sole structure. The upper incorporates a textile element with edges that are joined together to define at least a portion of a void for receiving a foot. The textile element may also have a first area and a second area with a unitary construction. The first area is formed of a first stitch configuration, and the second area is formed of a second stitch configuration that is different from the first stitch configuration to impart varying textures to a surface of the textile element. Various warp knitting or weft knitting processes may be utilized to form the textile element.

**46 Claims, 12 Drawing Sheets**

**NOTE: This exhibit is identical to exhibit no. 2007 marked during the July 23, 2013, cross-examination deposition of Edward C. Frederick, except for the inclusion of this note and the addition of a footer to comply with 37 CFR §42.63(d).**




NIKE EXHIBIT 2007 IPR 2013-00067

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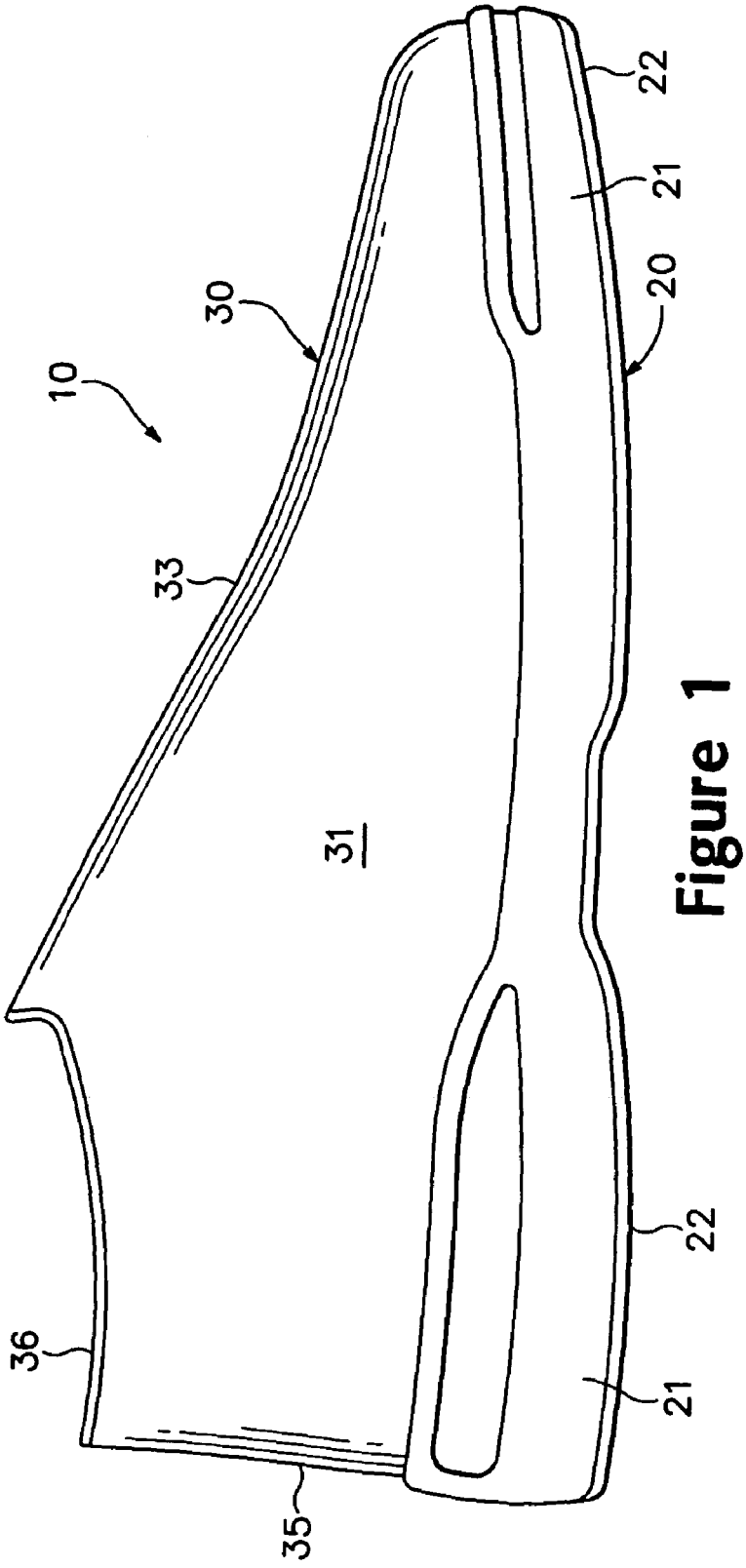



Figure 1

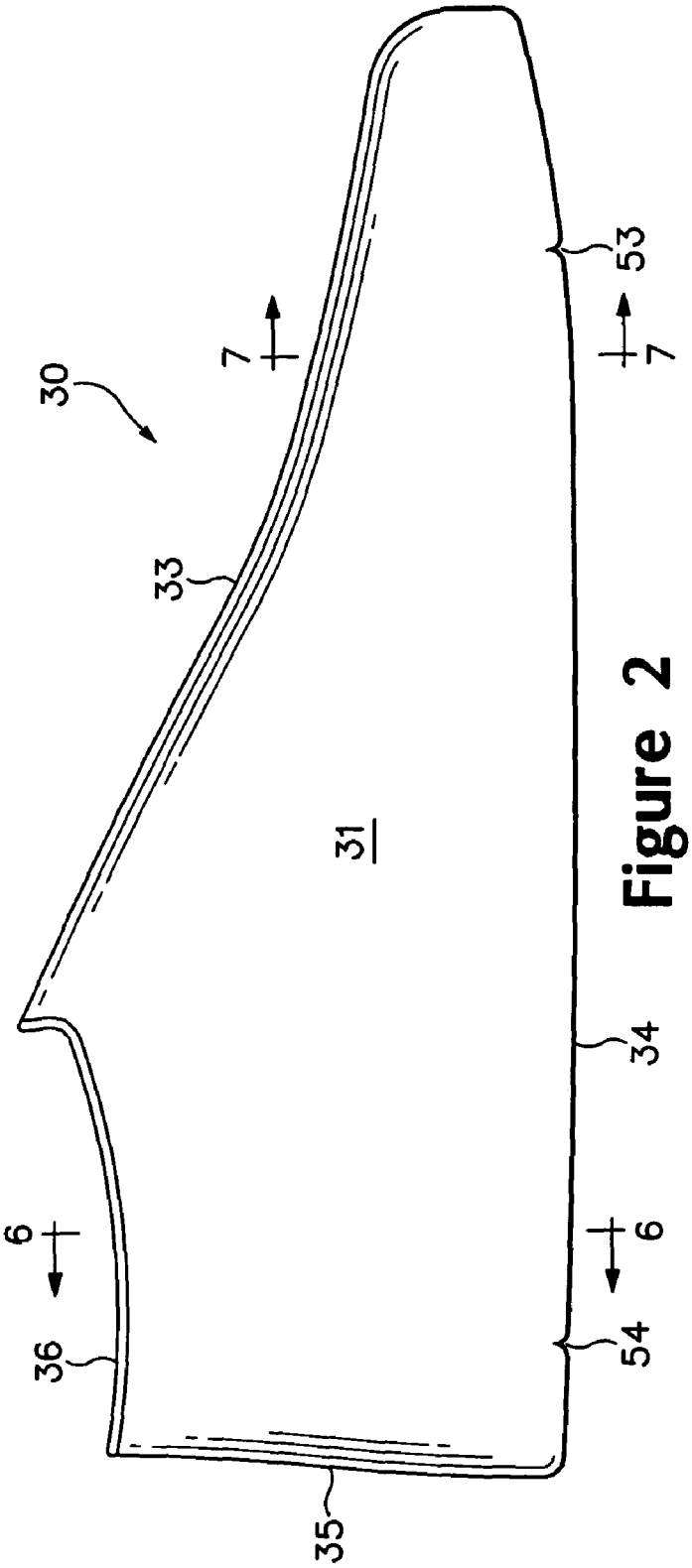



Figure 2

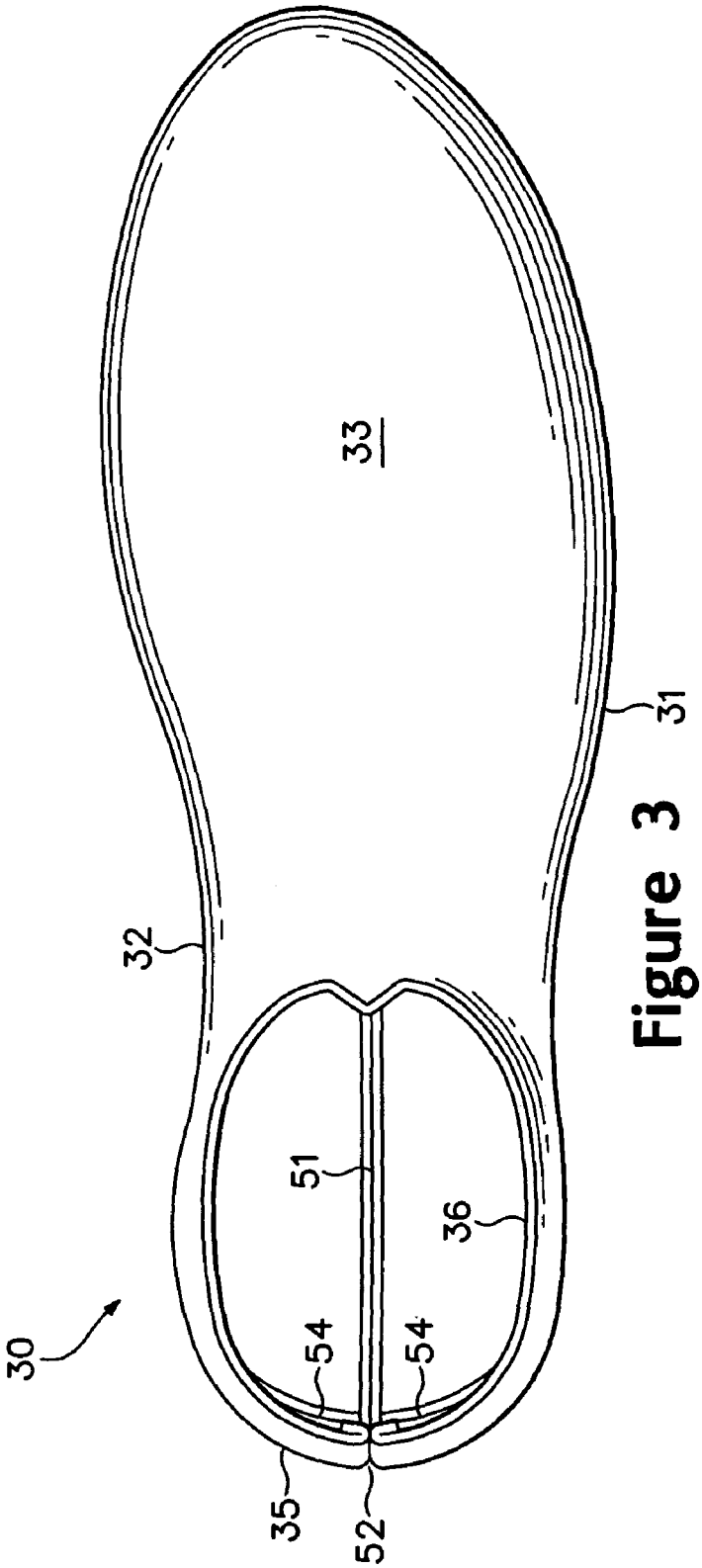



Figure 3

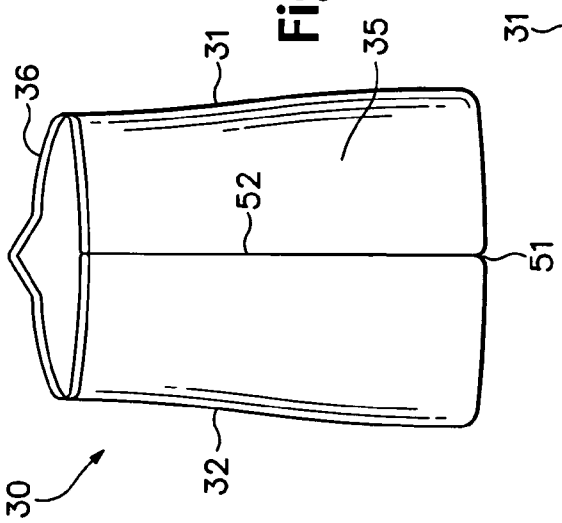



Figure 4

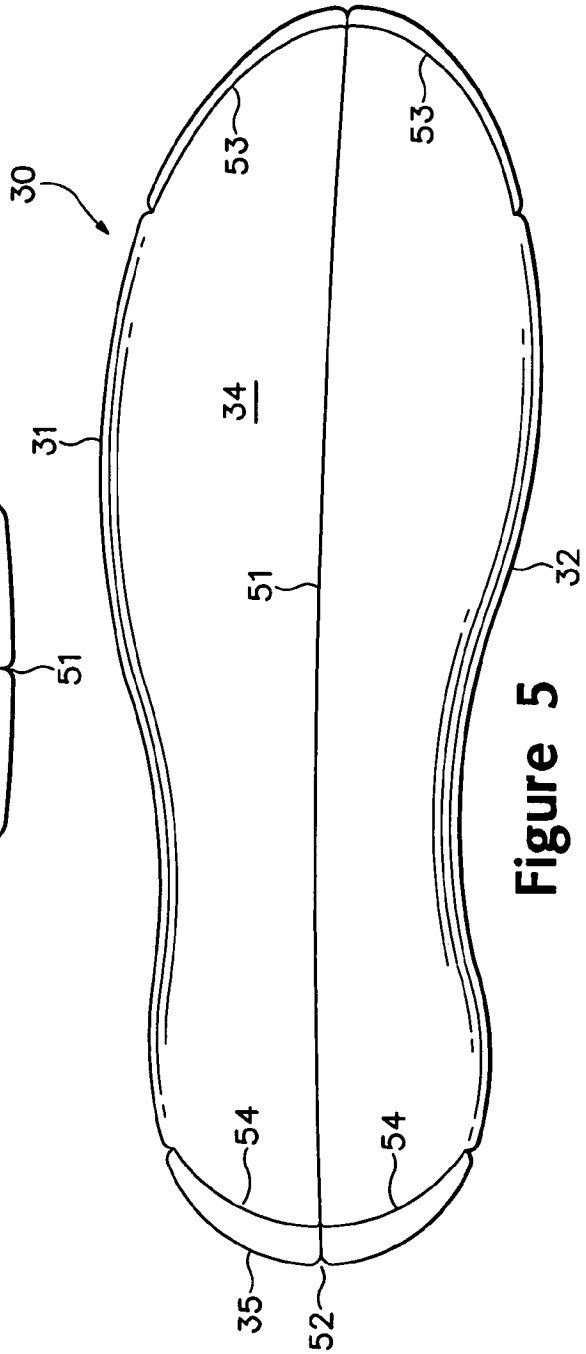



Figure 5

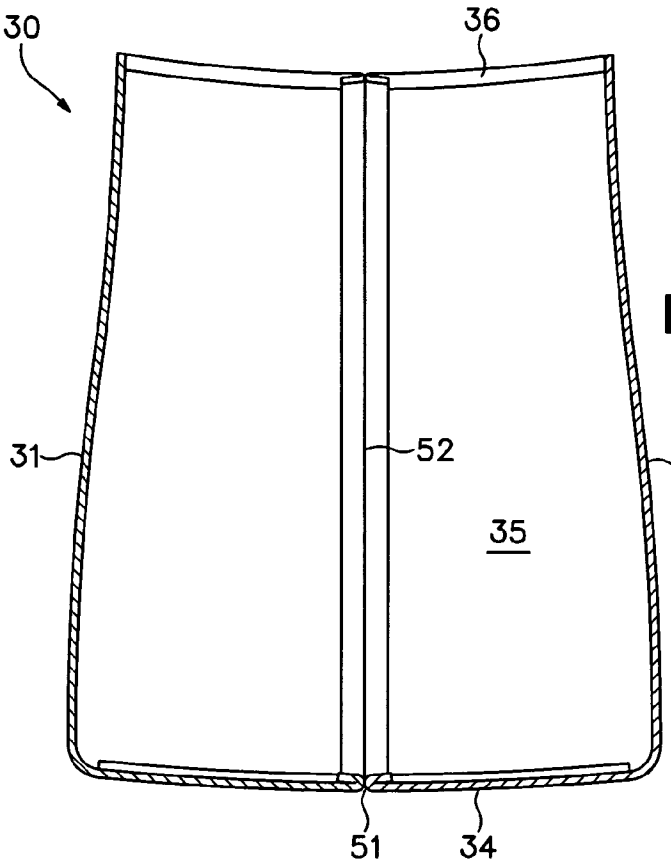



Figure 6

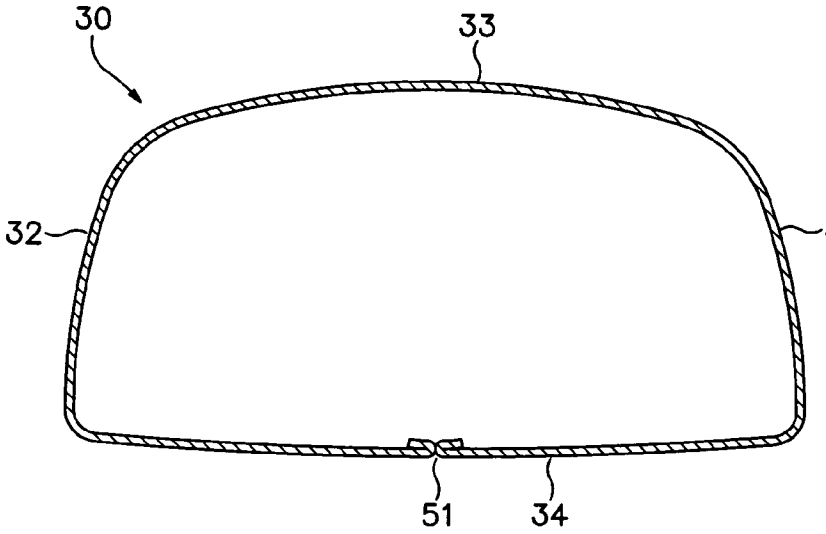



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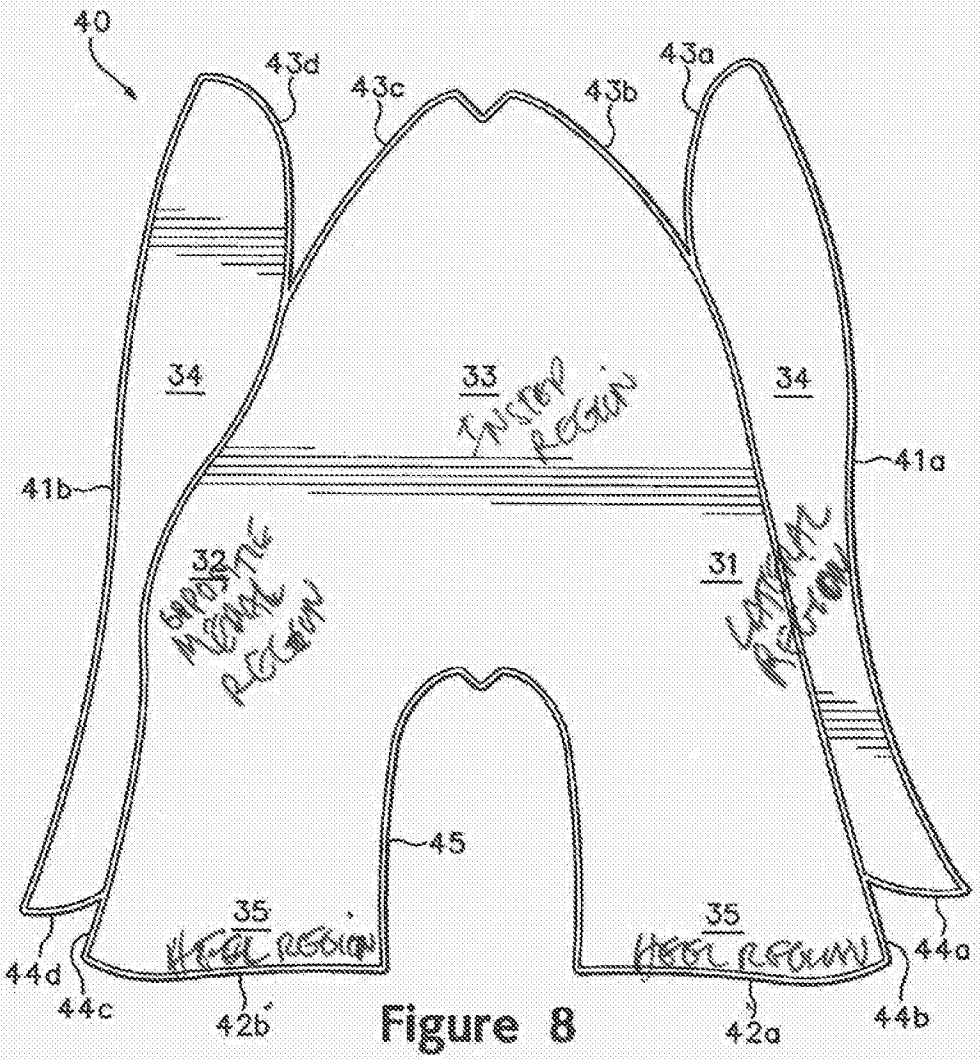

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Figure 8

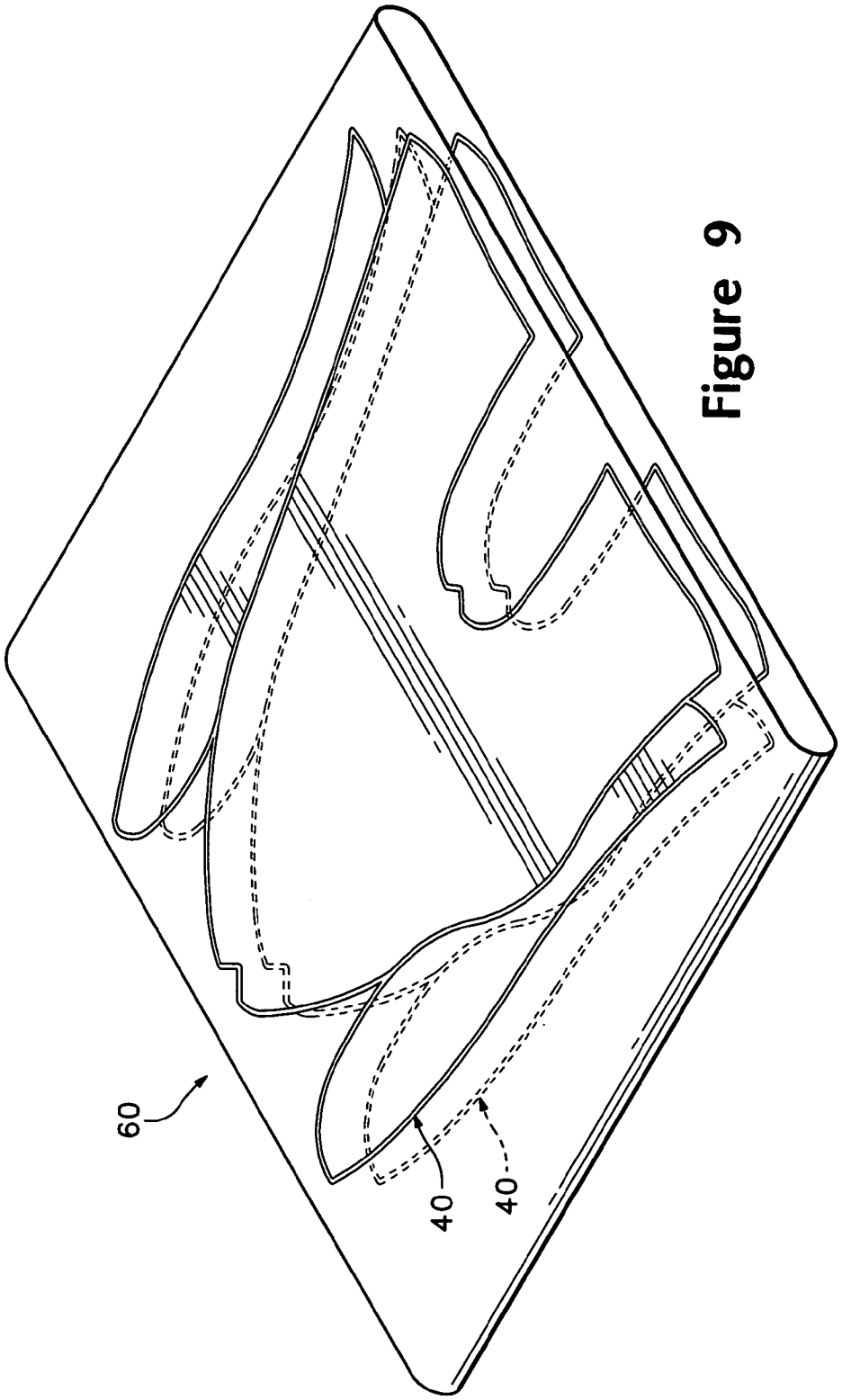



Figure 9

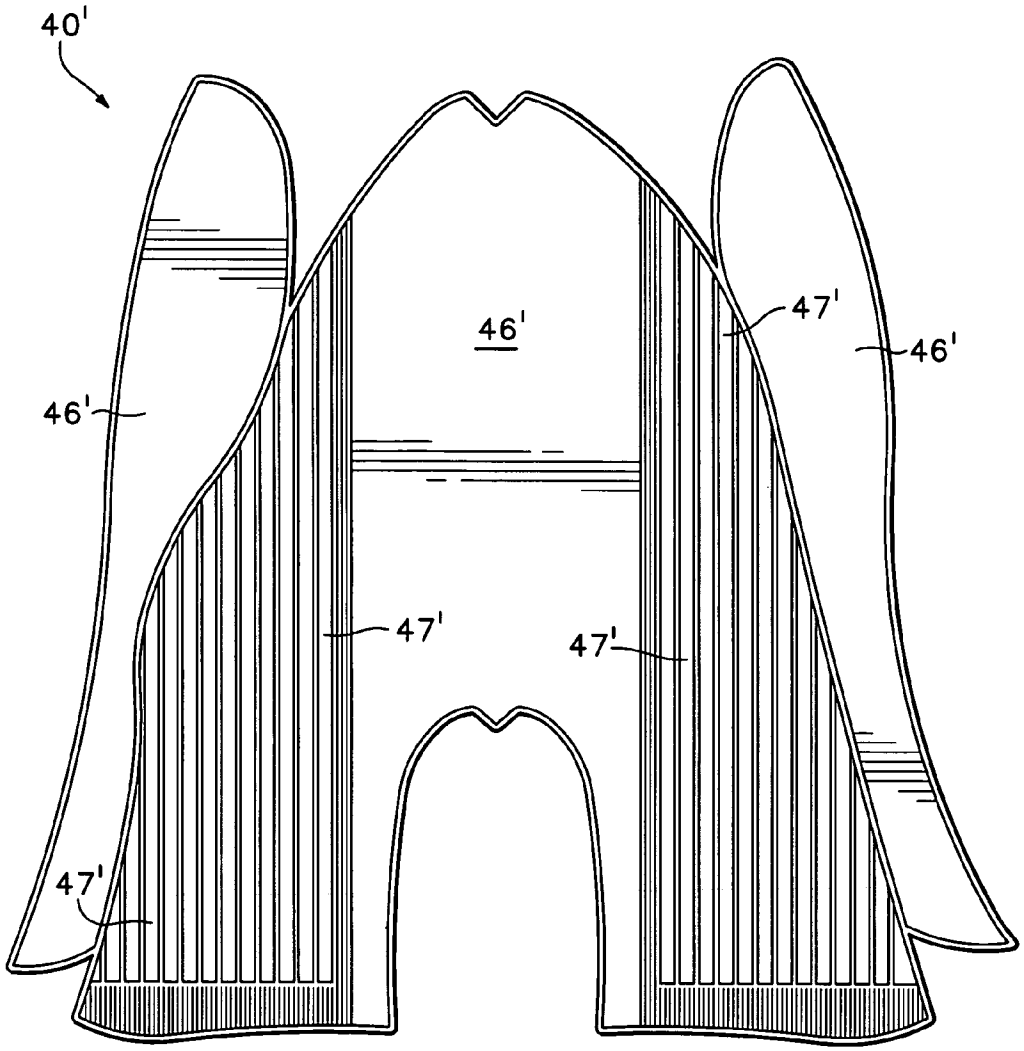



Figure 10

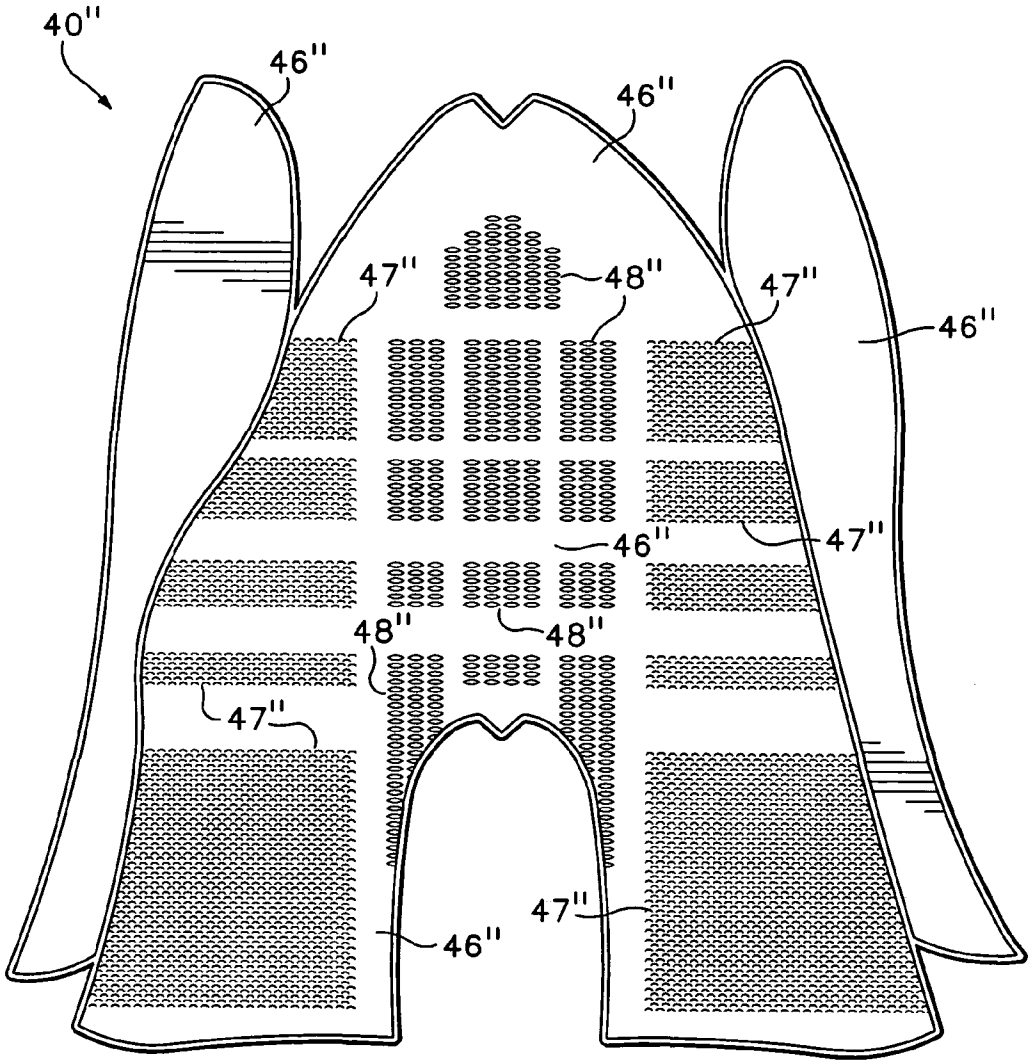



Figure 11

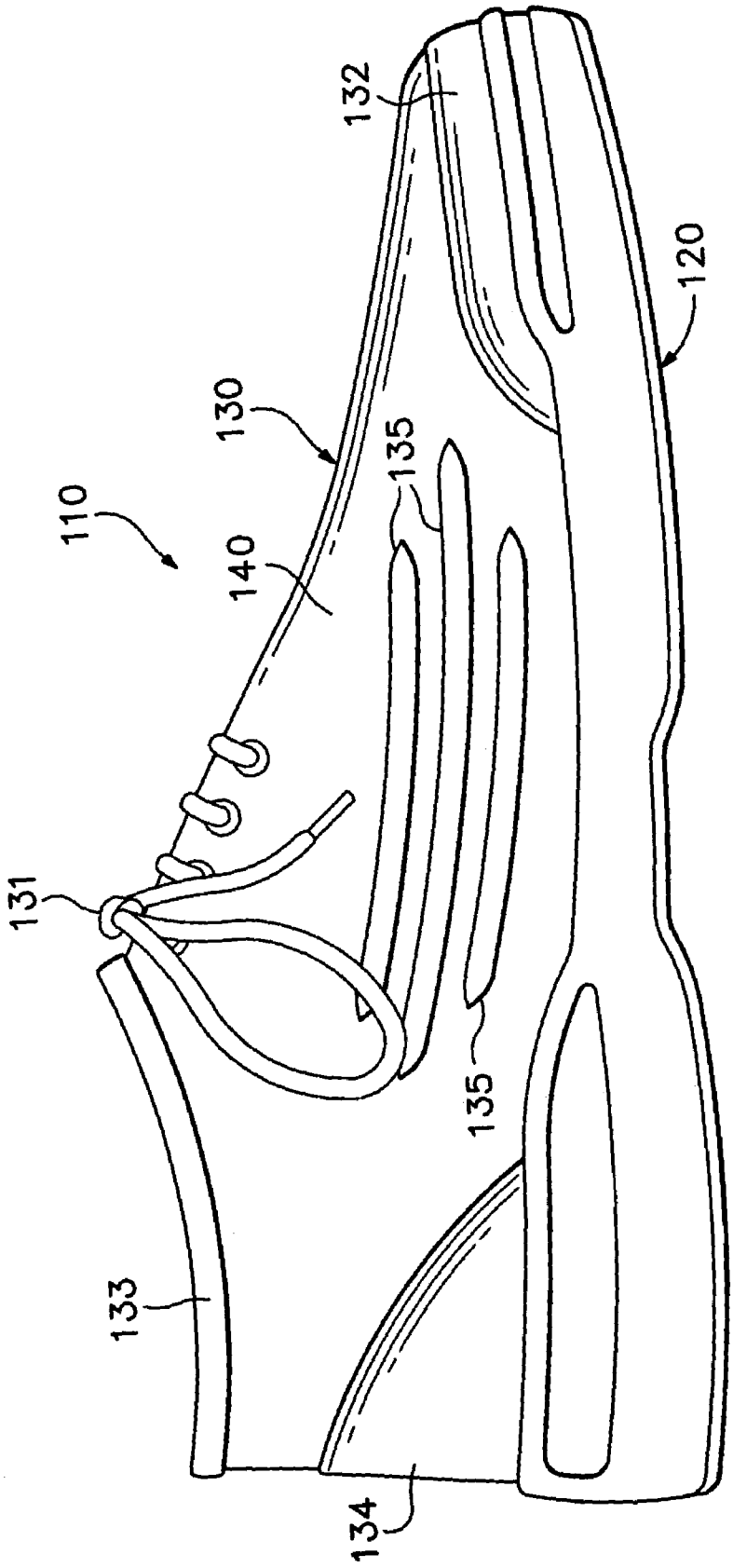



Figure 12

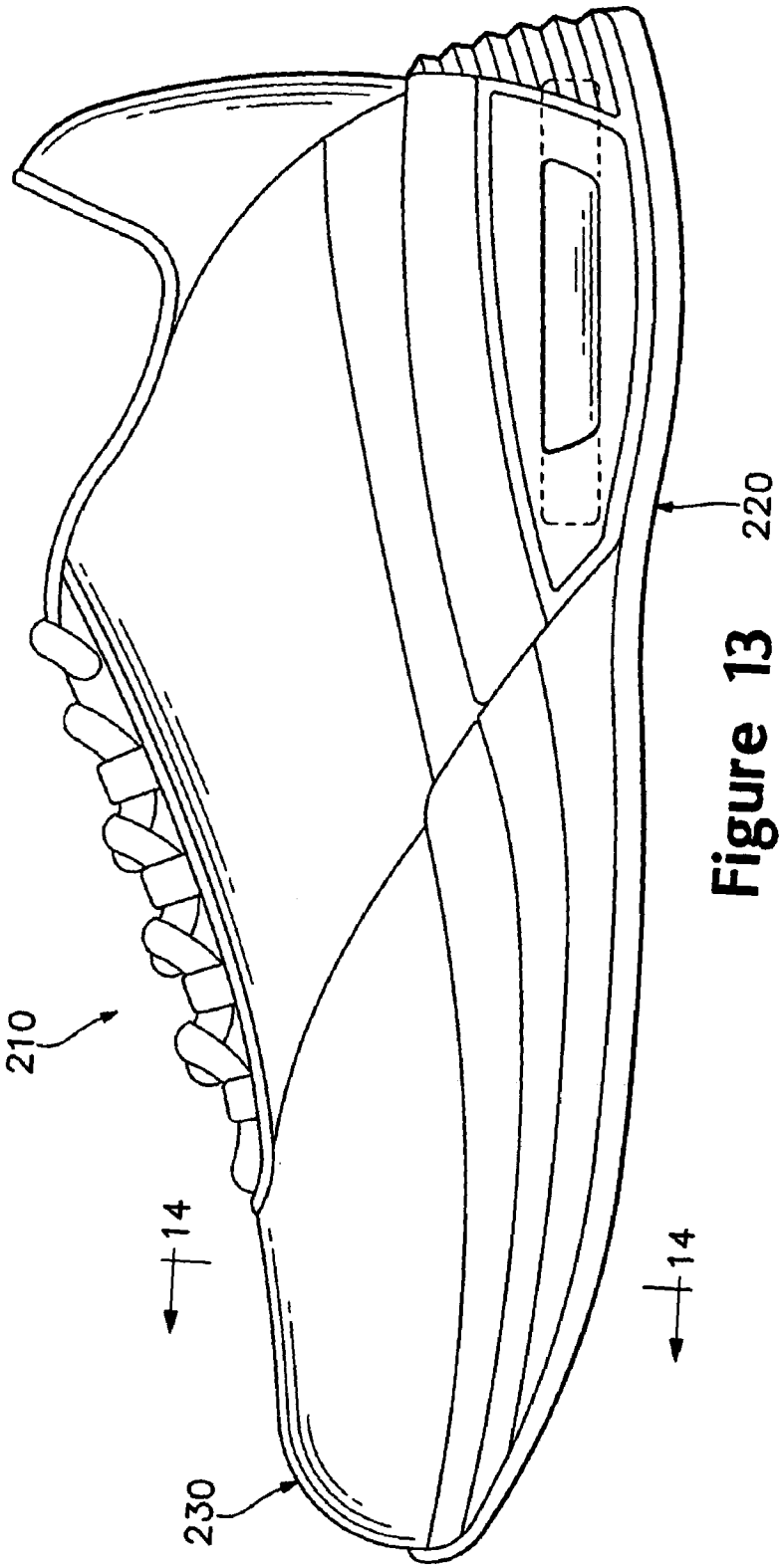



Figure 13

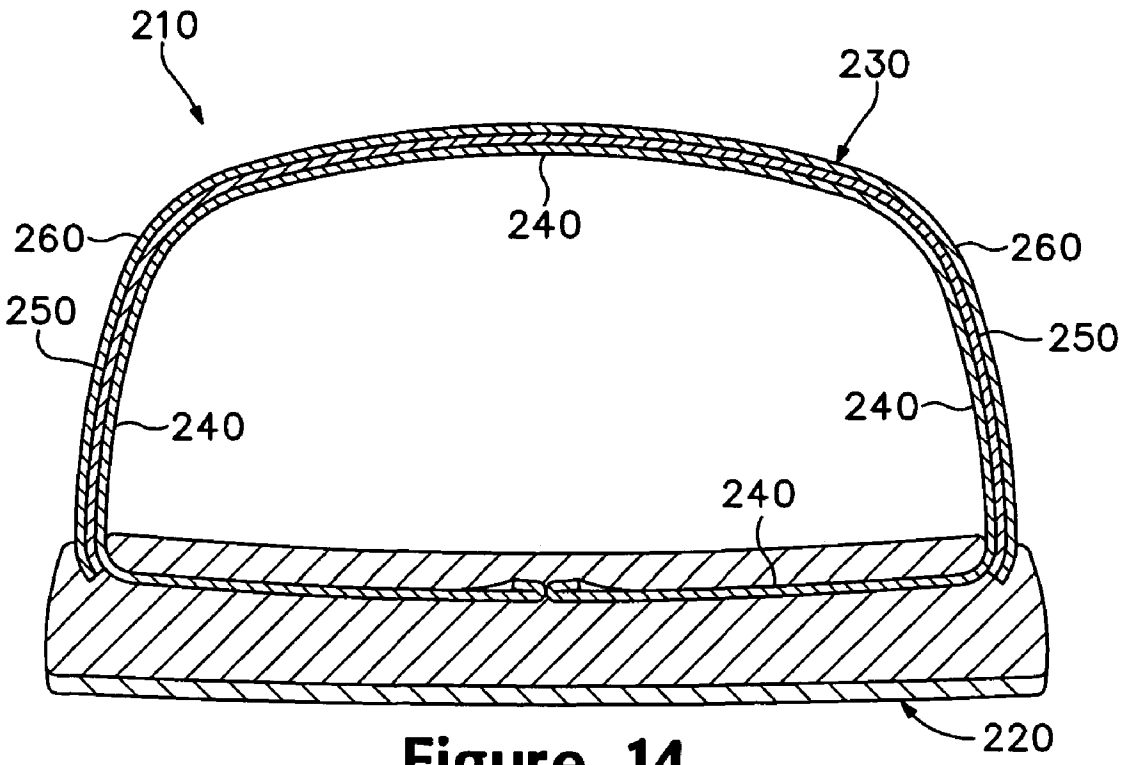



Figure 14

# ARTICLE OF FOOTWEAR HAVING A TEXTILE UPPER

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to footwear. The invention concerns, more particularly, an article of footwear incorporating an upper that is at least partially formed from a textile material.

2. Description of Background Art

Conventional articles of athletic footwear include two primary elements, an upper and a sole structure. The upper provides a covering for the foot that securely receives and positions the foot with respect to the sole structure. In addition, the upper may have a configuration that protects the foot and provides ventilation, thereby cooling the foot and removing perspiration. The sole structure is secured to a lower surface of the upper and is generally positioned between the foot and the ground. In addition to attenuating ground reaction forces and absorbing energy (i.e., imparting cushioning), the sole structure may provide traction and control potentially harmful foot motion, such as over pronation. Accordingly, the upper and the sole structure operate cooperatively to provide a comfortable structure that is suited for a wide variety of ambulatory activities, such as walking and running. The general features and configuration of the conventional upper are discussed in greater detail below.

The upper forms a void on the interior of the footwear for receiving the foot. The void has the general shape of the foot, and access to the void is provided by an ankle opening. Accordingly, the upper extends over the instep and toe areas of the foot, along the medial and lateral sides of the foot, and around the heel area of the foot. A lacing system is often incorporated into the upper to selectively increase the size of the ankle opening and permit the wearer to modify certain dimensions of the upper, particularly girth, to accommodate feet with varying proportions. In addition, the upper may include a tongue that extends under the lacing system to enhance the comfort of the footwear, and the upper may include a heel counter to limit movement of the heel.

Various materials may be utilized in manufacturing the upper. The upper of an article of athletic footwear, for example, may be formed from multiple material layers that include an exterior layer, an intermediate layer, and an interior layer. The materials forming the exterior layer of the upper may be selected based upon the properties of wear-resistance, flexibility, and air-permeability, for example. With regard to the exterior layer, the toe area and the heel area may be formed of leather, synthetic leather, or a rubber material to impart a relatively high degree of wear-resistance. Leather, synthetic leather, and rubber materials may not exhibit the desired degree of flexibility and air-permeability. Accordingly, various other areas of the exterior layer of the upper may be formed from a synthetic or natural textile. The exterior layer of the upper may be formed, therefore, from numerous material elements that each impart different properties to specific portions of the upper.

An intermediate layer of the upper may be formed from a lightweight polymer foam material that provides cushioning and protects the foot from objects that may contact the upper. Similarly, an interior layer of the upper may be formed of a moisture-wicking textile that removes perspiration from the area immediately surrounding the foot. In some articles of athletic footwear, the various layers may be joined with an adhesive, and stitching may be utilized to join elements within a single layer or to reinforce specific areas of the upper.



Although the materials selected for the upper vary significantly, textile materials often form at least a portion of the exterior layer and interior layer. A textile may be defined as any manufacture from fibers, filaments, or yarns characterized by flexibility, fineness, and a high ratio of length to thickness. Textiles generally fall into two categories. The first category includes textiles produced directly from webs of filaments or fibers by randomly interlocking to construct non-woven fabrics and felts. The second category includes textiles formed through a mechanical manipulation of yarn, thereby producing a woven fabric, for example.

Yarn is the raw material utilized to form textiles in the second category. In general, yarn is defined as an assembly having a substantial length and relatively small cross-section that is formed of at least one filament or a plurality of fibers. Fibers have a relatively short length and require spinning or twisting processes to produce a yarn of suitable length for use in textiles. Common examples of fibers are cotton and wool. Filaments, however, have an indefinite length and may merely be combined with other filaments to produce a yarn suitable for use in textiles. Modern filaments include a plurality of synthetic materials such as rayon, nylon, polyester, and polyacrylic, with silk being the primary, naturally-occurring exception. Yarn may be formed of a single filament, which is conventionally referred to as a monofilament yarn, or a plurality of individual filaments grouped together. Yarn may also include separate filaments formed of different materials, or the yarn may include filaments that are each formed of two or more different materials. Similar concepts also apply to yarns formed from fibers. Accordingly, yarns may have a variety of configurations that generally conform to the definition provided above.

The various techniques for mechanically manipulating yarn into a textile include interweaving, intertwining and twisting, and interlooping. Interweaving is the intersection of two yarns that cross and interweave at right angles to each other. The yarns utilized in interweaving are conventionally referred to as warp and weft. Intertwining and twisting encompasses procedures such as braiding and knotting where yarns intertwine with each other to form a textile. Interlooping involves the formation of a plurality of columns of intermeshed loops, with knitting being the most common method of interlooping.

The textiles utilized in footwear uppers generally provide a lightweight, air-permeable structure that is flexible and comfortably receives the foot. In order to impart other properties to the footwear, including durability and stretch-resistance, additional materials are commonly combined with the textile, including leather, synthetic leather, or rubber, for example. With regard to durability, U.S. Pat. No. 4,447,967 to Zaino discloses an upper formed of a textile material that has a polymer material injected into specific zones to reinforce the zones against abrasion or other forms of wear. Regarding stretch resistance, U.S. Pat. No. 4,813,158 to Brown and U.S. Pat. No. 4,756,098 to Boggia both disclose a substantially inextensible material that is secured to the upper, thereby limiting the degree of stretch in specific portions of the upper.

From the perspective of manufacturing, utilizing multiple materials to impart different properties to an article of footwear may be an inefficient practice. For example, the various materials utilized in a conventional upper are not generally obtained from a single supplier. Accordingly, a manufacturing facility must coordinate the receipt of spe-

cific quantities of materials with multiple suppliers that may have distinct business practices or may be located in different regions or countries. The various materials may also require additional machinery or different assembly line techniques to cut or otherwise prepare the material for incorporation into the footwear. In addition, incorporating separate materials into an upper may involve a plurality of distinct manufacturing steps requiring multiple individuals. Employing multiple materials, in addition to textiles, may also detract from the breathability of footwear. Leather, synthetic leather, or rubber, for example, are not generally permeable to air. Accordingly, positioning leather, synthetic leather, or rubber on the exterior of the upper may inhibit air flow through the upper, thereby increasing the amount of perspiration, water vapor, and heat trapped within the upper and around the foot.

## SUMMARY OF THE INVENTION

The present invention is an upper for an article of footwear, the upper incorporating a textile element formed with a knitting machine, for example. In one aspect of the invention, the textile element has edges that are joined together to define at least a portion of a void for receiving a foot. In another aspect of the invention, the textile element has a first area and a second area of unitary construction. The first area is formed of a first stitch configuration, and the second area is formed of a second stitch configuration that is different from the first stitch configuration to impart varying textures to a surface of the textile element. The knitting machine may have a configuration that forms the textile element through either warp knitting or weft knitting.

Another aspect of the invention involves a method of manufacturing an article of footwear. The method includes a step of mechanically-manipulating a yarn with a circular knitting machine, for example, to form a cylindrical textile structure. In addition, the method involves removing at least one textile element from the textile structure, and incorporating the textile element into an upper of the article of footwear.

In another aspect of the invention, an article of footwear has an upper and a sole structure secured to the upper. The upper incorporates a textile element formed with a knitting machine. The textile element is removed from a textile structure that includes an outline of the textile element, and the textile element has edges that are joined together to define at least a portion of a void for receiving a foot.

The advantages and features of novelty characterizing the present invention are pointed out with particularity in the appended claims. To gain an improved understanding of the advantages and features of novelty, however, reference may be made to the following descriptive matter and accompanying drawings that describe and illustrate various embodiments and concepts related to the invention.

## DESCRIPTION OF THE DRAWINGS

The foregoing Summary of the Invention, as well as the following Detailed Description of the Invention, will be better understood when read in conjunction with the accompanying drawings.

FIG. **1** is a lateral elevational view of an article of footwear having an upper in accordance with the present invention.

FIG. **2** is a lateral elevational view of the upper.

FIG. **3** is a top plan view of the upper.

FIG. **4** is a rear elevational view of the upper.

FIG. **5** is a bottom plan view of the upper.

FIG. **6** is a first cross-sectional view of the upper, as defined by section line **6-6** in FIG. **2**.

FIG. **7** is a second cross-sectional view of the upper, as defined by section line **7-7** in FIG. **2**.

FIG. **8** is a plan view of a textile element that forms at least a portion of the upper.

FIG. **9** is a perspective view of a textile structure that incorporates two of the textile element.

FIG. **10** is a plan view of another textile element.

FIG. **11** is a plan view of yet another textile element.

FIG. **12** is a lateral elevational view of another article of footwear having an upper in accordance with the present invention.

FIG. **13** is a lateral elevational view of yet another article of footwear having an upper in accordance with the present invention.

FIG. **14** is a cross-sectional view of the footwear depicted in FIG. **13**, as defined by section line **14-14**.

## DETAILED DESCRIPTION OF THE INVENTION

The following discussion and accompanying figures disclose an article of footwear **10** and a method of manufacturing footwear **10**, or components thereof, in accordance with the present invention. Footwear **10** is depicted in the figures and discussed below as having a configuration that is suitable for athletic activities, particularly running. The concepts disclosed with respect to footwear **10** may, however, be applied to footwear styles that are specifically designed for a variety of other athletic activities, including basketball, baseball, football, soccer, walking, and hiking, for example, and may also be applied to various non-athletic footwear styles. Accordingly, one skilled in the relevant art will recognize that the concepts disclosed herein may be applied to a wide range of footwear styles and are not limited to the specific embodiments discussed below and depicted in the figures.

The primary elements of footwear **10** are depicted in FIG. **1** as being a sole structure **20** and an upper **30**. Sole structure **20** is secured to a lower portion of upper **30** and provides a durable, wear-resistant component that imparts cushioning as footwear **10** impacts the ground. Upper **30** is at least partially formed from a textile element **40** that defines an interior void for comfortably receiving a foot and securing a position of the foot relative to sole structure **20**. Various edges of textile element **40** are then secured together to form the shape of upper **30**. In some embodiments, textile element **40** may form substantially all of upper **30**, or textile element **40** may only be a portion of an upper.

Sole structure **20** has a generally conventional configuration that includes a midsole **21** and an outsole **22**. Midsole **21** is secured to a lower portion of upper **30** and is formed of a polymer foam material, such as ethylvinylacetate or polyurethane. Accordingly, midsole **21** attenuates ground reaction forces and absorbs energy (i.e., provides cushioning) as sole structure **20** impacts the ground. To enhance the force attenuation and energy absorption characteristics of sole structure **20**, midsole **21** may incorporate a fluid-filled bladder, as disclosed in U.S. Pat. Nos. 4,183,156 and 4,219,945 to Rudy. Alternately or in combination, midsole **21** may incorporate a plurality of discrete, columnar support elements, as disclosed in U.S. Pat. Nos. 5,343,639 and 5,353,523 to Kilgore et al. Outsole **22** is secured to a lower surface of midsole **21** and may be formed from carbon black rubber compound to provide a durable, wear-resistant surface for

engaging the ground. Outsole **22** may also incorporate a textured lower surface to enhance the traction characteristics of footwear **10**. In addition, footwear **10** may include an insole (not depicted), which is a relatively thin, cushioning member located within upper **30** and adjacent to a plantar surface of the foot for enhancing the comfort of footwear **10**.

Sole structure **20** is described above as having the elements of a conventional sole structure for athletic footwear. Other footwear styles, including, dress shoes and boots, for example, may have other types of conventional sole structures specifically tailored for use with the respective types of footwear. In addition to a conventional configuration, however, sole structure **20** may also exhibit a unique, non-conventional structure. Accordingly, the particular configuration of sole structure **20** may vary significantly within the scope of the present invention to include a wide range of configurations, whether conventional or non-conventional.

Upper **30** is depicted in FIGS. **2-7** as having a lateral region **31**, an opposite medial region **32**, an instep region **33**, a lower region **34**, and a heel region **35**. Lateral region **31** extends through a longitudinal length of footwear **10** and is generally configured to contact and cover a lateral side of the foot. Medial region **32** has a similar configuration that generally corresponds with a medial side of the foot. Instep region **33** is positioned between lateral region **31** and medial region **32**, and instep region **33** extends over an instep area of the foot. Lower region **34** forms a bottom surface of upper **30** and also extends through the longitudinal length of footwear **10**. Heel region **35** forms a rear portion of upper **30** and is generally configured to contact and cover a heel area of the foot. In addition, lateral region **31**, medial region **32**, instep region **33**, and heel region **35** cooperatively define an ankle opening **36** for providing the foot with access to the void within upper **30**.

Upper **30** is at least partially formed from textile element **40**, which forms regions **31-35**, and may also include laces or other elements associated with a conventional upper for footwear. Textile element **40** is a single material element that is formed to exhibit a unitary (i.e., one-piece) construction, and textile element **40** is formed or otherwise shaped to extend around the foot. As depicted in FIGS. **2-7**, textile element **40** forms both an exterior surface and an interior surface of upper **30**. Textile element **40** may be formed as a part of a larger textile element. Textile element **40** is then removed from the larger textile element and various edges of textile element **40** are secured together to form the shape of upper **30**. A plurality of seams **51-54** are formed, therefore, when joining the edges of the textile element. Seam **51** extends along the longitudinal length of lower region **34** and is centrally-located with respect to lateral region **31** and medial region **32**. Seam **52** is also centrally-located and extends upward along heel region **35**. A seam **53** is positioned in a forefoot area of upper **30** and joins a portion of lower region **34** with both of lateral region **31** and medial region **32**. In addition, a seam **54** is positioned in a rear area of upper **30** and joins a portion of lower region **34** with heel region **35**.

Textile element **40** exhibits the general shape depicted in FIG. **8** prior to the formation of seams **51-54**. Following formation of seams **51-54**, however, textile element **40** exhibits the shape of upper **30** depicted in FIGS. **2-7**. Seams **51-54** are formed by securing various edges of textile element **40** together. More specifically, (1) seam **51** is formed by securing an edge **41***a* with an edge **41***b*; (2) seam **52** is formed by securing an edge **42***a* with an edge **42***b*; (3) a first portion of seam **53** is formed by securing an edge **43***a* with an edge **43***b* (4) a second portion of seam **53** is formed by securing an edge **43***c* with an edge **43***d*; (5) a first portion of seam **54** is formed by securing an edge **44***a* with an edge **44***b*; and (6) a second portion of seam **54** is formed by securing an edge **44***c* with an edge **44***d*. Referring to FIG. **8**, the positions of regions **31-35** and ankle opening **36** are identified to provide a frame of reference relating to the various portions of textile element **40**.

In order to join edges **41***a* and **41***b* to form seam **51**, textile element **40** is folded or otherwise overlapped such that edge **41***a* is placed adjacent to edge **41***b*. Stitching, an adhesive, or heat bonding, for example, is then utilized to secure edge **41***a* and edge **41***b*. Textile element **40**, as depicted in FIG. **8**, has a generally planar configuration. Upon the formation of seam **51**, however, one portion of textile element **40** overlaps the other portion of textile element **40**. The volume between the overlapping portions effectively forms a portion of the void within upper **30** for receiving the foot.

The folding or overlapping of textile element **40** to form seam **51** places edge **42***a* adjacent to edge **42***b*, which facilitates the formation of seam **52**. With reference to FIG. **8**, an edge **45** forms a generally u-shaped area in textile element **40**. Upon the joining of edges **42***a* and **42***b* to form seam **52**, the u-shaped area becomes an aperture in textile element **40** and effectively forms ankle opening **36**. Each of edges **43***a*-**43***d* and edges **44***a*-**44***d* are formed from a generally v-shaped area of textile element **40**. Accordingly, seams **53** and **54** may be formed by closing the v-shaped areas and securing the various edges together.

Following the formation of each of seams **51-54**, the manufacturing of upper **30** is essentially complete. Various finishing steps may be performed, such as reinforcing ankle opening **36**, for example. Upper **30** (i.e., textile element **40**) is then secured to sole structure **20**, with an adhesive, for example. The insole is then placed into the void within upper **30** and adjacent to lower region **34**. In some embodiments, various reinforcing members may be added to the exterior or interior surface of upper **20** in order to limit the degree of stretch in upper **20** or provide enhanced wear-resistance. In addition, a lacing system may be added to provide adjustability.

Textile element **40** is a single material element with a unitary construction, as discussed above. As defined for purposes of the present invention, unitary construction is intended to express a configuration wherein portions of a textile element are not joined together by seams or other connections, as depicted with textile element **40** in FIG. **8**. Although the various edges **41***a*-**44***d* are joined together to form seams **51-54**, the various portions of textile element **40** are formed as an unitary element without seams, as discussed below.

Textile element **40** is primarily formed from one or more yarns that are mechanically-manipulated through either an interweaving, intertwining and twisting, or interlooping process, for example. As discussed in the Background of the Invention section above, interweaving is the intersection of two yarns that cross and interweave at right angles to each other. The yarns utilized in interweaving are conventionally referred to as warp and weft. Intertwining and twisting encompasses procedures such as braiding and knotting where yarns intertwine with each other to form a textile. Interlooping involves the formation of a plurality of columns of intermeshed loops, with knitting being the most common method of interlooping. Textile element **40** may, therefore, be formed from one of these processes for manufacturing a textile.

A variety of mechanical processes have been developed to manufacture a textile. In general, the mechanical processes

may be classified as either warp knitting or weft knitting. With regard to warp knitting, various specific sub-types that may be utilized to manufacture a textile include tricot, raschel, and double needle-bar raschel (which further includes jacquard double needle-bar raschel). With regard to weft knitting, various specific sub-types that may be utilized to manufacture a textile include circular knitting and flat knitting. Various types of circular knitting include sock knitting (narrow tube), body garment (seamless or wide tube), and jacquard.

Textile element **40** may be formed through any of the mechanical processes discussed above. Accordingly, textile element **40** may be formed on either a warp knitting machine or a weft knitting machine. One suitable knitting machine for forming textile element **40** is a wide-tube circular knit jacquard machine. Another suitable knitting machine for forming textile element **40** is a wide-tube circular knitting machine that is produced in the Lonati Group by Santoni S.p.A. of Italy under the SM8 TOP1 model number. This Santoni S.p.A. wide-tube circular knitting machine may form a textile structure having a diameter that ranges from 10 inches to 20 inches, with 8 feeds for each diameter. The machine exhibits a maximum 140 revolutions per minute for 10 inch diameters, and a maximum 120 revolutions per minute for 13 inch diameters. Furthermore, the machine gauge is variable between 16, 22, 24, 26, 28, and 32 needles per inch, and is suitable for various needle gauges ranging from 48 to 75.

A wide-tube circular knitting machine, as produced by Santoni S.p.A., forms a generally cylindrical textile structure and is capable of forming various types of stitches within a single textile structure. In general, the wide-tube circular knitting machine may be programmed to alter the design on the textile structure through needle selection. That is, the type of stitch that is formed at each location on the textile structure may be selected by programming the wide-tube circular knitting machine such that specific needles either accept or do not accept yarn at each stitch location. In this manner, various patterns, textures, or designs may be selectively and purposefully imparted to the textile structure.

An example of a textile structure **60** that may be formed with a wide-tube circular knitting machine is depicted in FIG. **9**. Textile structure **60** has a generally cylindrical configuration, and the types of stitches vary throughout textile structure **60** so that a pattern is formed with the outline of textile element **40**. That is, differences in the stitches within textile structure **60** form an outline with the shape and proportions of textile element **40**.

The Santoni S.p.A. wide-tube circular knitting machine may form a textile structure having a diameter that ranges from 10 inches to 16 inches, as discussed above. Assuming that textile structure **60** exhibits a diameter of 10 inches, then the circumference of textile structure **60** is approximately 31 inches. In many circumstances, the total width of textile element **40** will be approximately 12 inches, depending upon the size of footwear **10**. The outlines for at least two textile elements **40** may, therefore, be formed on textile structure **60**. Referring to FIG. **9**, the outline of textile element **40** is depicted on a front portion of textile structure **60**, and the outline of another textile element **40** is depicted on a rear portion of textile structure **60**. Accordingly, a first textile element **40** and a second textile element **40** may be simultaneously formed in a single textile structure **60**. As the diameter of textile element **60** is increased or the width of textile element **40** decreases, however, an even greater number of textile elements **40** may be outlined on textile structure **60**.

Textile structure **60** may be formed with a wide-tube circular knitting machine, as discussed above. The types of stitches that form textile structure **60** may be varied to form an outline of one or more textile elements **40** on textile structure **60**. That is, the wide-tube circular knitting machine may be programmed to form different types of stitches in textile structure **60** so as to outline one or more textile elements **40**. Each textile element **40** is then removed from textile structure **60** with a die-cutting, laser-cutting, or other conventional cutting operation. Once textile element **40** is removed from textile structure **60**, seams **51-54** may be formed and textile element **40** may be incorporated into footwear **10**.

The yarn forming textile element **40** may be generally defined as an assembly having a substantial length and relatively small cross-section that is formed of at least one filament or a plurality of fibers. Fibers have a relatively short length and require spinning or twisting processes to produce a yarn of suitable length for use in an interlooping process. Common examples of fibers are cotton and wool. Filaments, however, have an indefinite length and may merely be combined with other filaments to produce a yarn suitable for use in an interlooping process. Modern filaments include a plurality of synthetic materials such as rayon, nylon, polyester, and acrylic, with silk being the primary, naturally-occurring exception. Yarn may be formed of a single filament (conventionally referred to as a monofilament yarn) or a plurality of individual filaments. Yarn may also be formed of separate filaments formed of different materials, or the yarn may be formed of filaments that are each formed of two or more different materials. Similar concepts also apply to yarns formed from fibers. Accordingly, yarns may have a variety of configurations within the scope of the present invention that generally conform to the definition provided above.

In order to provide the stretch and recovery properties to upper **30**, and particularly textile element **40**, a yarn that incorporates an elastane fiber may be utilized. Elastane fibers are available from E.I. duPont de Nemours Company under the LYCRA trademark. Such fibers may have the configuration of covered LYCRA, wherein the fiber includes a LYCRA core that is surrounded by a nylon sheath. One suitable yarn, for example, includes a 70 denier elastane core that is covered with nylon having a 2 ply, 80 denier, 92 filament structure. Other fibers or filaments exhibiting elastic properties may also be utilized.

As discussed above, a yarn that incorporates elastane fibers is suitable for textile element **40**. A plurality of other yarns, whether elastic or inelastic, are also suitable for textile element **40**. The characteristics of the yarn selected for textile element **40** depend primarily upon the materials that form the various filaments and fibers. Cotton, for example, provides a soft hand, natural aesthetics, and biodegradability. Elastane fibers, as discussed above, provide substantial stretch and recoverability. Rayon provides high luster and moisture absorption. Wool also provides high moisture absorption, in addition to insulating properties. Polytetrafluoroethylene coatings may provide a low friction contact between the textile and the skin. Nylon is a durable and abrasion-resistant material with high strength. Finally, polyester is a hydrophobic material that also provides relatively high durability. Accordingly, the materials comprising the yarn may be selected to impart a variety of physical properties to textile element **40**, and the physical properties may include, for example, strength, stretch, support, stiffness, recovery, fit, and form.

Textile element **40** is depicted as having a generally smooth, non-varied stitch configuration. That is, similar stitches are utilized throughout textile element **40** to impart a common texture to the various portions of textile element **40**. As discussed above, however, a wide-tube circular knitting machine is generally capable of forming various types of stitches within a single textile structure. The wide-tube circular knitting machine may, therefore, vary the stitches within textile element **40** to produce various patterns, designs, or textures, for example. Various types of stitches may also be formed with other types of knitting machines. With reference to FIG. **10**, a textile element **40'** with the general shape of textile element **40** is depicted as having various areas with different textures. For example, a central area that corresponds with instep region **33** has a first texture **46'** that is generally smooth. In addition, textile element **40'** includes a second texture **47'** that is a plurality of longitudinal ribs. When incorporated into footwear **10**, the ribs will extend longitudinally along lateral region **31** and medial region **32**, and the ribs may extend into heel region **35**. The ribs may be present for aesthetic purposes, or may affect the stretch properties of upper **20**, for example. Accordingly, textile element **40'** exhibits areas with different textures in a single element of textile material.

Many conventional articles of footwear incorporate uppers with various material elements that each exhibit different properties. For example, a first material element may be smooth, and a second material element may be textured. The first and second material elements are then stitched together to form a portion of the conventional upper. Textile element **40'** also exhibits smooth and textured areas. In contrast with the conventional upper, however, first texture **46'** and second texture **47'** are incorporated into a single, unitary element of textile, rather than two separate elements that are stitched or otherwise joined together.

A textile structure **40"** is depicted in FIG. **11** and has the general shape of both textile element **40** and textile element **40'**. Textile element **40"** includes areas with three different textures. A first texture **46"** is generally smooth and has the configuration of various strips that extends laterally across areas corresponding with lateral region **31**, medial region **32**, and instep region **33**. Various portions of textile element **40"** also include a second texture **47"**, which is generally rough in comparison with first texture **46"**. In addition, the area of textile element **40"** corresponding with instep region **33** includes a third texture **48"**. The different textures **46"-48"** are formed by merely varying the type of stitch formed by the wide-tube circular knitting machine at each location of textile element **40"**. Textures **46"-48"** may exhibit aesthetic differences, or the differences may be structural. For example, the degree of stretch in areas with textures **46"-48"** may be different, or the wear resistance of the areas may vary depending upon the stitch utilized. The air-permeability of textile element **40"** may also vary in the different areas. Third texture **48"** is formed to include a plurality of apertures that extend through textile element **40"**. The apertures may be formed by omitting stitches at specific locations during the wide-tube circular knitting process, and the apertures facilitate the transfer of air between the void within upper **20** and the area outside of upper **20**. Accordingly, the various stitches formed in textile element **40"**, or one of textile elements **40** or **40'**, may be utilized to vary the texture, physical properties, or aesthetics of footwear **10** within a single, unitary element of material.

In addition to varying the stitch types to form textures **46'-47'** and **46"-48"**, the type of yarn utilized in various areas of textile elements **40'** and **40"** may be changed to impart different properties. As discussed above, yarn may be formed from cotton, wool, elastane, rayon, nylon, and polyester, for example. Each of these yarn types may impart differing properties to the areas corresponding with textures **46'-47'** and **46"-48"**. For example, elastane may be utilized to impart stretch, wool may be utilized for insulation, and nylon may be utilized for durability. Accordingly, different yarn types may be utilized to impart different properties. The types of knitting that may be utilized to form different zones with different properties (e.g., yarn characteristics, textures, etc.) may vary significantly to include the various warp knitting and weft knitting processes discussed earlier, such as tricot, raschel, double needle-bar raschel, circular knitting, and flat knitting, for example.

An article of footwear **110** is depicted in FIG. **12** and includes a sole structure **120** and an upper **130**. Upper **130** includes a textile element **140** having the general configuration of textile element **40**. As with textile element **40**, textile element **140** forms both an exterior surface and an interior surface of upper **130**. In addition, upper **130** includes a lace **131** and a plurality of elements **132-135** that also form a portion of the exterior surface. Lace **131** extends through a plurality of apertures formed in textile element **140**. The apertures may be formed by omitting stitches at specific locations. Element **132** is positioned in a forefoot area of footwear **110** and may be formed of leather or rubber, for example, to provide additional wear-resistance. Element **133** extends around the ankle opening to reinforce and limit stretch in the area of the ankle opening. Element **134** extends around the heel region to counter movement of the heel and seat the heel above sole structure **120**. Furthermore, elements **135** are substantially inextensible strips of material, such as leather or synthetic leather, that limit stretch on the lateral side of footwear **110**. Whereas upper **30** was almost exclusively formed by textile element **40**, upper **130** also includes lace **131** and elements **132-135**. Accordingly, an upper in accordance with the present invention may incorporate a plurality of additional components.

Another article of footwear **210** is depicted in FIGS. **13-14** and includes a sole structure **220** and an upper **230**. Upper **230** includes a textile element **240** that forms an interior layer. In addition, upper **230** includes an intermediate layer **250** and an exterior layer **260**. As discussed in the Background of the Invention section above, the upper of a conventional article of footwear may be formed from multiple material layers that include an exterior layer, a intermediate layer, and an interior layer. The materials forming the exterior layer of the upper may be selected based upon the properties of wear-resistance, flexibility, and air-permeability, for example. The intermediate layer of the upper may be formed from a lightweight polymer foam material that provides cushioning and protects the foot from objects that may contact the upper. Similarly, an interior layer of the upper may be formed of a moisture-wicking textile that removes perspiration from the area immediately surrounding the foot.

Upper **230** has a configuration that is similar to the configuration of the conventional upper in that various material layers are utilized. In contrast with the conventional upper, however, the interior layer is formed of textile element **240**, which is manufactured through the process discussed above. That is, textile element **240** is a single element of textile that forms the interior layer of upper **230**. A benefit to utilizing textile element **240** for the interior layer is that textile element **240** includes few seams that may contact the foot. In addition, the stitches utilized at various locations of textile element **240** may modify the texture of the interior

surface of upper **230**, thereby limiting the degree of slip that occurs between the foot and upper **230** or enhancing the air-permeability of upper **230** in specific locations.

Various warp knitting or weft knitting processes may be utilized to form textile element **40**, or the various other textile elements discussed above. An advantage of this process is that various stitches may be incorporated into specific locations of textile element **40** to modify the physical properties or aesthetics of textile element **40**. Whereas a conventional upper includes various elements that stitched or adhesively joined, textile element **40** is a single, unitary element of material. From the perspective of manufacturing, utilizing multiple materials to impart different properties to an article of footwear may be an inefficient practice. By forming textile element **40** to be a single, unitary element of material, however, efficiency is increased in that upper **20** may include a single textile element, rather than numerous joined elements.

A variety of knitting processes may be utilized to form textile element **40**, as discussed above. As a specific example, a jacquard double needle-bar raschel knitting machine may be utilized to form a flat textile structure, and may also be utilized to form the textile structure to have the configuration of a spacer mesh textile. Unlike textile structure **60**, which exhibits a generally cylindrical configuration, the textile structure formed with the jacquard double needle-bar raschel knitting machine will have a flat configuration. Like textile structure **60**, however, an outline of a textile element may be imparted to the textile structure formed with the jacquard double needle-bar raschel knitting machine. That is, differences in the stitches within the textile structure may form an outline with the shape and proportions of the intended textile element. Accordingly, the textile element may be removed from the textile structure and incorporated into footwear **10**. In addition, the jacquard double needle-bar raschel knitting machine may be utilized to impart various textures, different properties, or different yarn types to the textile element. Similarly, other types of knitting, such as a flat knitting, may be utilized within the scope of the present invention to impart various textures, different properties, or different yarn types to the textile element.

The present invention is disclosed above and in the accompanying drawings with reference to a variety of embodiments. The purpose served by the disclosure, however, is to provide an example of the various features and concepts related to the invention, not to limit the scope of the invention. One skilled in the relevant art will recognize that numerous variations and modifications may be made to the embodiments described above without departing from the scope of the present invention, as defined by the appended claims.

That which is claimed is:

**1**. An article of footwear comprising:

an upper incorporating a weft-knitted textile element having edges that are joined together to define at least a portion of a void for receiving a foot, wherein the weft-knitted textile element incorporates a single type of textile having a plurality of knit constructions; and

a sole structure secured to the upper.

**2**. The article of footwear recited in claim **1**, wherein the welt-knitted textile element forms at least a portion of a lateral side, a medial side, and an instep region of the upper.

**3**. The article of footwear recited in claim **1**, wherein the edges include a pair of first edges that are joined to form a first seam extending longitudinally along a lower region of the upper.

**4**. The article of footwear recited in claim **3**, wherein the edges include a pair of second edges that are joined to form a second seam extending along a heel region of the upper.

**5**. The article of footwear recited in claim **4**, wherein the second seam extends vertically.

**6**. The article of footwear recited in claim **4**, wherein the edges include at least a pair of third edges that are joined to form a third seam extending through a forefoot area of the upper.

**7**. The article of footwear recited in claim **1**, wherein the weft-knitted textile element is one of an exterior layer, an intermediate layer, and an interior layer of the upper.

**8**. The article of footwear recited in claim **1**, wherein the upper includes an exterior layer, an intermediate layer, and an interior layer, and the weft-knitted textile element farms at least a portion of the interior layer.

**9**. The article of footwear recited in claim **1**, wherein the weft-knitted textile element forms at least a portion of both an interior surface and an exterior surface of the upper.

**10**. The article of footwear recited in claim **9**, wherein at least one additional element is secured to the exterior surface and forms a portion of the exterior surface.

**11**. The article of footwear recited in claim **10**, wherein the additional element is secured to a forefoot area of the upper.

**12**. The article of footwear recited in claim **10**, wherein the additional element is secured to a heel area of the upper.

**13**. The article of footwear recited in claim **1**, wherein the textile element forms an interior surface of the upper.

**14**. The article of footwear recited in claim **1**, wherein the weft-knitted textile element is created by circular knitting.

**15**. The article of footwear recited in claim **1**, whcrein the weft-knitted textile element is created by flat knitting.

**16**. An article of footwear comprising:

an upper incorporating a weft-knitted textile element, the textile element having a first area and a second area with a unitary construction, the first area being formed of a first stitch configuration, and the second area being formed of a second stitch configuration that is different from the first stitch configuration to impart varying properties to the textile element; and

a sole structure secured to the upper.

**17**. The article of footwear recited in claim **16**, wherein the first stitch configuration provides a substantially smooth texture to the first area, and the second stitch configuration provides a texture to the second area that is rougher than the smooth texture.

**18**. The article of footwear recited in claim **17**, wherein the second stitch configuration forms a rib structure in the second area.

**19**. The article of footwear recited in claim **16**, wherein at least one of the first stitch configuration and the second stitch configuration forms an aperture in the weft-knitted textile element.

**20**. The article of footwear recited in claim **16**, wherein the weft-knitted textile element is one of an exterior layer, an intermediate layer, and an interior layer of the upper.

**21**. The article of footwear recited in claim **16**, wherein the upper includes an exterior layer, an intermediate layer, and an interior layer, and the weft-knitted textile element forms at least a portion of the interior layer.

**22**. The article of footwear recited in claim **16**, wherein the textile layer forms at least a portion of both the interior surface and an exterior surface of the upper.

**23**. The article of footwear recited in claim **16**, wherein the weft-knitted textilc element forms an interior surface of the upper.

24. An article of footwear comprising:

an upper incorporating a textile element having edges that are joined together to form seams and define at least a portion of a void for receiving a foot, the seams including a first seam and a second seam, the first seam extending from a heel area to a forefoot area of the footwear along a lower surface of the upper, and the second seam extending vertically in the heel area, wherein the textile element incorporates a single type of textile having a plurality of knit constructions; and

a sole structure secured to the upper.

25. The article of footwear recited in claim 24, wherein the footwear includes a third seam extending through the forefoot area of the upper.

26. The article of footwear recited in claim 24, wherein at least one of the knit constructions forms an aperture in the textile element.

27. The article of footwear recited in claim 24, wherein the knit constructions produce varying properties in the textile element including a varying elasticity of the textile element.

28. The article of footwear recited in claim 24, wherein the knit constructions produce varying properties in the textile element including a varying air permeability of the textile element.

29. The article of footwear recited in claim 24, wherein the textile element is one of an exterior layer, an intermediate layer, and an interior layer of the upper.

30. The article of footwear recited in claim 24, wherein the textile element forms at least a portion of both an interior surface and an exterior surface of the upper.

31. The article of footwear recited in claim 24, wherein the textile element forms an interior surface of the footwear, and at least one additional layer forms an exterior surface of the footwear.

32. The article of footwear recited in claim 24, wherein at least a portion of the textile element has a weft knitted construction.

33. The article of footwear recited in claim 32, wherein the weft knitted construction is produced by one of circular knitting and flat knitting.

34. The article of footwear recited in claim 24, wherein the textile element has a warp knitted construction.

35. The article of footwear recited in claim 34, wherein the warp knitted construction is produced by a jacquard double needle-bar raschel.

36. An article of footwear comprising:

an upper incorporating a knitted textile element formed with a knitting machine, the textile element being removed from a textile structure that includes an outline of the textile element, and the textile element having edges that are joined together to define at least a portion of a void for receiving a foot, wherein the textile element incorporates a single type of textile having a plurality of knit constructions; and

a sole structure secured to the upper.

37. The article of footwear recited in claim 36, wherein the knitted textile element has a structure formed by a wide-tube circular knitting machine.

38. The article of footwear recited in claim 36, wherein the knitted textile element has a structure formed by a jacquard double needle-bar raschel knitting machine.

39. The article of footwear recited in claim 36, wherein the edges include a pair of first edges that are joined to form a first seam extending longitudinally along a lower region of the upper.

40. The article of footwear recited in claim 39, wherein the edges include a pair of second edges that are joined to form a second seam extending along a heel region of the upper.

41. The article of footwear recited in claim 40, wherein the edges include at least a pair of third edges that are joined to form a second seam extending through a forefoot area of the upper.

42. The article of footwear recited in claim 36, wherein the knitted textile element is one of an exterior layer, an intermediate layer, and an interior layer of the upper.

43. The article of footwear recited in claim 36, wherein the knitted textile element forms an interior surface of the upper.

44. An article of footwear comprising:

an upper incorporating a flat-knitted textile element, the flat-knitted textile element having a first area with a first unitary construction and a second area with a second unitary construction different from the first unitary construction, the first area having a first set of properties, and the second area having a second set of properties that is different from the first set of properties to impart varying characteristics to the textile element; and

a sole structure secured to the upper.

45. The article of footwear recited in claim 44, wherein the first set of properties and the second set of properties are at least one of a stitch configuration and a yarn type.

46. The article of footwear recited in claim 44, wherein the textile element is one of an exterior layer, an intermediate layer, and an interior layer of the upper.

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UNITED STATES PATENT AND TRADEMARK OFFICE

# CERTIFICATE OF CORRECTION

PATENT NO. : 7,347,011 B2
APPLICATION NO. : 10/791289
DATED : March 25, 2008
INVENTOR(S) : Bhupesh Dua et al.



It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title page, Item (56), References Cited section, Other Publications:
Please insert the following reference: --International Search Report in corresponding PCT application, International Application No. PCT/US2005/004776, mailed May 19, 2005.--

In Column 11, Claim 2, Line 62:
Please replace "welt-knitted" with --weft-knitted--

In Column 12, Claim 8, Line 15:
Please replace "farms" with --forms--

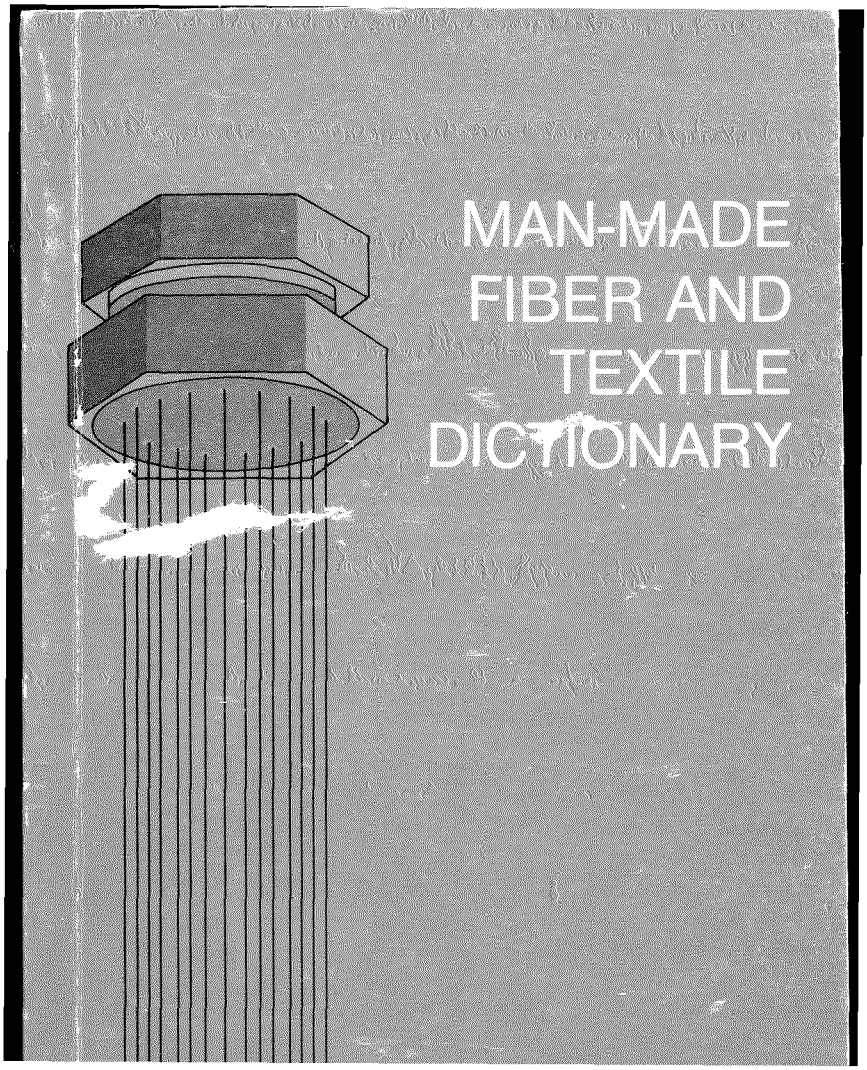
In Column 12, Claim 23, Line 66:
Please replace "textilc" with --textile--

Signed and Sealed this

Seventeenth Day of February, 2009

John Doll

JOHN DOLL
*Acting Director of the United States Patent and Trademark Office*




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# MAN-MADE FIBER
# AND
# TEXTILE DICTIONARY

CELANESE CORPORATION

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## FOREWORD

This Man-Made Fiber and Textile Dictionary is presented to you as a convenient reference for textile terminology, with special emphasis on man-made fibers. It attempts to convey as much basic information as is possible without making the book cumbersome. The first and second editions were published to provide a source for Celanese personnel. The third edition was published in response to numerous requests from our customers and others in the textile industry for an up-to-date glossary of terms encountered in the man-made fiber and textile trades. To enhance its usefulness, the dictionary has been revised, expanded, and illustrated.

Generic terms such as *dyeing* and *knitting* are handled comprehensively with specific terms presented under one heading. The more widely used man-made fibers are listed by their Federal Trade Commission generic names and definitions, in most cases followed by a brief description of their manufacture, characteristics, and applications. Our more familiar fiber and fabric trademarks, along with those of Fiber Industries, our subsidiary, are listed in the Appendix. Also given in the Appendix are abbreviations, equivalent weights and measures, and various conversion tables and formulas needed by the textile technologist.

We hope that this dictionary will familiarize the reader with the language of textiles. Only through you, the user, can we determine its value, and we therefore invite your comments.

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**CHELATING AGENT:** A compound that will inactivate a metallic ion by making it an integral part of an inner ring structure. The metal is attached by coordinate links to two or more nonmetal atoms in the same molecule.

**CHEMICAL CRIMPING:** A crinkled or puckered effect in fabric obtained by printing sodium hydroxide onto the goods in a planned design. When the material is washed, the part to which the paste has been applied will shrink and cause untreated areas to pucker. The same effect is obtained with a caustic resist print and a sodium hydroxide bath.

**CHEMICAL FIBER:** See MAN-MADE FIBER.

**CHEMICAL STABILITY:** Degree of resistance of a material to chemicals, such as acids, bases, solvents, oils, and oxidizing agents, and to chemical reactions, including those catalyzed by light.

**CHENILLE:** 1. A yarn with a fuzzy pile protruding from all sides, cut from a woven chenille weft fabric. Chenille yarns are made from all fibers, and they are used as filling in fabrics and for embroidery, fringes, and tassels. 2. Fabric woven with chenille yarns. (Also see TUFTED FABRIC.)

**CHEVIOT:** A rugged tweed made from uneven yarn, this fabric usually has a rather harsh hand.

**CHEVRON:** A broad term applied to prints in zigzag stripes or to herringbone weaves.

**CHIFFON:** A plain-weave, lightweight, sheer, transparent fabric made from fine, highly twisted yarns. It is usually a square fabric, i.e., having approximately the same number of ends and picks and the same count in both warp and filling.

**CHINCHILLA CLOTH:** A heavy, twill-weave fabric with a napped surface that is rolled into little tufts or nubs. The material is frequently double faced with a knitted or woven plaid back. Chinchilla cloth is used primarily in coats.

**CHINO:** A cotton or cotton blend twill used by armies throughout the world for summer-weight uniforms. Chino is frequently dyed khaki.

**CHINTZ:** A glazed fabric produced by friction calendering. Unglazed chintz is called cretonne.

**CHIPS:** 1. The form of polymer feedstock used in fiber production. Also see FLAKE. 2. The feedstock for a pulp digestor. 3. A defect in a nonwoven fabric.

**CHLORINE RETENTION:** A characteristic of several resins and textile finishes whereby they retain some of the chlorine from bleach. On heating of the goods, the chlorine forms hydrochloric acid, causing tendering of the cloth. This is especially true of certain wrinkle resistant finishes for cotton and rayon.

**CHOKED COILER:** A condition in carding or drawing in which sliver is either puffy, badly condensed, or very uneven, leading to overloading of the coiler trumpets and causing work stoppage.



**CHOKED FLYERS:** A situation in which roving will not pass through the flyer channels because of heavy or cockled conditions caused by such factors as uneven drafting, waste, overcut fibers, and improper finish.

**CHROMATICITY:** The quality of color expressed as a function of wavelength and purity.

**CHROMATOGRAPHY:** The generic name of a group of processes for separating and analyzing mixtures of chemical compounds. The separation depends on the redistribution of molecules of the mixture between phases, one of which is thin, often reaching molecular dimensions. For this reason, molecular size and shape are important in the separation and extremely subtle separations are possible.

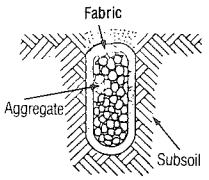
**CIRCULAR-KNIT FABRIC:** A tubular weft-knit fabric made on a circular-knitting machine.

**CIRCULAR KNITTING:** See KNITTING.

**CIRE:** A brilliant patent leather effect produced by application of wax, heat, and pressure.

**CIVIL ENGINEERING FABRICS:** A broad term referring to a variety of fabrics used in construction.

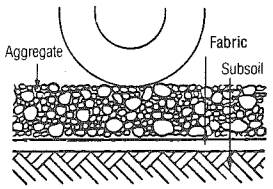
**Drainage Fabrics:** Fabrics used as the filter medium in subgrade drainage structures. The fabric can be wrapped around a drain pipe or coarse stone to from a subsurface drain; the fabric allows water to pass freely from the soil into the drain but prevents soil particles from migrating into the drain system.



Drainage Fabric

**Erosion Control Fabrics:** Fabrics used in the stabilization of embankments and the containment of silt run-off from erodible slopes. In embankment stabilization, the fabric functions as a filter medium behind stabilizing rip-rap revetments. In siltation control, the fabric acts as a filter to contain silt while allowing excess water to drain freely from the site.

**Ground Stabilization Fabrics:** Fabrics used in the construction of access roads, railroads, parking and storage areas over soft, unstable soils. The fabric is placed between the subgrade and the stabilizing fill material where it provides separation of subsoil and fill, filtration of moisture at the subsoil/fill interface and added tensile reinforcement of the compacted fill.



Ground Stabilization Fabric

**CLAMPS:** The parts of a testing machine which are used to hold a specimen while it is subjected to force. (Also called jaws.)

**CLARITY:** 1. In general, the optical property of being clear. 2. In acetate manufacture, a measure of the appearance of dope solutions, indicating



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warp yarns (ends) and filling yarns (picks) per inch in a woven fabric, or the number of wales and courses per inch in a knit fabric. For example, a fabric count of 68 × 52 indicates 68 ends per inch in the warp and 52 picks per inch in the filling.

**COURSE:** The row of loops or stitches running across a knit fabric, corresponding to the filling in woven fabrics.

**COVER:** 1. The degree of evenness of thread spacing. 2. The degree to which underlying structure is concealed by the surface material, as in carpets, the degree to which pile covers backing. 3. The ability of a dye to conceal defects in fabric.

**COVER FACTOR:** The fraction of the surface area which is covered by yarns assuming round yarn shape.

**COVERT:** A medium- to heavyweight wool or wool blend cloth woven with a steep twill from two or more shades of yarn-dyed fibers to produce a mottled or melange effect.

**CRAB:** A hand device used to stretch carpets in a small area.

**CRABBING:** The process of heating wool or hair fabrics, under tension, in a hot or boiling liquid, then cooling under tension, to provide the fabric with dimensional stability for further wet processing.

**CRACK:** A defect in a woven fabric consisting of an open fillingwise streak extending partly or entirely across the fabric.

**CRASH:** A coarse fabric with a rough, irregular surface made from thick, uneven yarns.

**CREASE:** A break or line in a fabric generally caused by a sharp fold. Creases may be either desirable or undesirable, depending upon the situation. A crease may be intentionally pressed into a fabric by application of pressure and heat and sometimes moisture.

**CREASE RECOVERY:** See WRINKLE RECOVERY.

**CREASE-RESISTANT:** A term used to describe a fabric treated chemically to improve its resistance to and recovery from wrinkling.

**CREASE RETENTION:** The ability of a fabric to maintain an inserted crease. Crease retention can be measured subjectively or by the relation of a crease in a subsequent state to the crease in the initial state. Crease retention may be strongly dependent on the conditions of use, e.g., normal wear, washing, or tumble drying.

**CREEL:** 1. A framework arranged to hold slivers, rovings, or yarns so that many ends can be withdrawn smoothly and evenly without tangling. 2. A similar device used to aggregate sub-tows to tows in man-made staple processing, especially polyester.

**CREELING:** The mounting of supply packages in a creel to feed a warp or beaming unit.

**CREEP:** See DELAYED DEFORMATION.

**CRENULAR CROSS SECTION:** See CROSS SECTION.

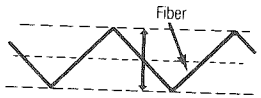


**CREPE:** A lightweight fabric characterized by a crinkling surface obtained by the use of: (1) hard-twist filling yarns, (2) chemical treatment, (3) crepe weaves, and (4) embossing.

**CRETONNE:** See CHINTZ.

**CRIMP:** 1. The waviness of a fiber expressed as crimps per unit length. 2. The difference in distance between two points on an unstretched fiber and the same two points when the fiber is straightened under specified tension. Crimp is expressed as a percentage of the unstretched length. 3. The difference in distance between two points on a yarn as it lies in a fabric and the same two points when the yarn has been removed from the fabric and straightened under specified tension, expressed as a percentage of the distance between the two points as the yarn lies in the fabric.

**CRIMP AMPLITUDE:** The height of displacement of the fiber from its uncrimped condition.



Crimp Amplitude

**CRIMP DEREGISTERING:** The process of opening a tow band by causing the peaks and valleys of the crimp to lay randomly rather than uniformly.

**CRIMPED YARN:** See TEXTURED YARNS, 4.

**CRIMP ENERGY:** The amount of work required to uncrimp a fiber.

**CRIMP FREQUENCY:** The crimp level, or number of crimps per inch in yarn or tow band.

**CRIMPING:** The process of imparting crimp to tow or filament yarn.

**CRIMP SETTING:** An aftertreatment to set the crimp in yarn or fiber. Usually heat and steam are used, although the treatment may be chemical in nature.

**CRINKLE:** 1. A wrinkled or puckered effect in fabric. It may be obtained either in the construction or in the finishing of the fabric. 2. The term is sometimes incorrectly used to describe the crimp of staple fiber.

**CRINKLE YARN:** See TEXTURED YARNS.

**CRINOLINE:** A stiff, heavily sized fabric used as an interlining or to support areas such as the edge of a hem.

**CRITICAL LENGTH:** See BREAKING LENGTH.

**CROCHETING:** The interlocking of loops from a single thread and a hooked needle. Crocheting can be done either by hand or by machine.

**CROCKING:** The rubbing off of dye from a fabric as a result of insufficient dye penetration or fixation, the use of improper dyes or dyeing methods, or insufficient washing and treatment after the dyeing operation. Crocking can occur under dry or wet conditions.

**CROOKED CLOTH:** See BAGGY CLOTH.

**CROSS DYEING:** See DYEING.

**CROSS-LINKING:** The stabilization of cellulosic fibers through chemical reaction with certain compounds in such a way that the cellulose

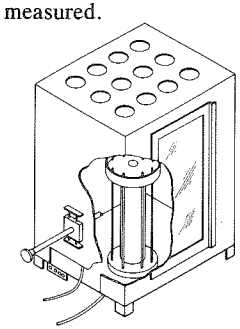


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**Methenamine Pill Test:** A test for the flame resistance of carpets or rugs in which a methenamine tablet is ignited on a test sample under controlled conditions and the size of the burn hole is measured.

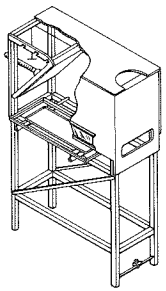
**Mushroom Apparel Flammability Test:** This test method involves igniting a cylinder of fabric around a core containing heat sensors. The rate of heat transfer from the burning material to the sensors is measured.



Mushroom Apparel Flammability Tester

**Radiant Panel Test:** A test for the flammability of carpets or rugs in which the specimen is mounted on the floor of the test chamber and exposed to intense radiant heat from above. The rate of flame spread is assessed.

**Smoke Chamber Test:** This method assesses the smoke generating characteristics of a sample due to pyrolysis and combustion by measuring the attenuation of a light beam by smoke accumulating in a closed chamber under controlled conditions. Results are expressed in terms of specific optical density.

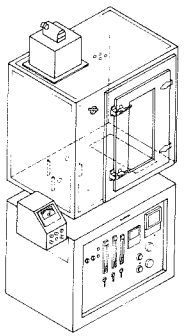


Radiant Panel Test Apparatus

**Tablet Test:** See FLAMMABILITY TESTS, Methenamine Pill Test.

**Thermo-Man:** This instrumented mannequin system, interfaced with a computer, allows full-scale testing of garments for protection capability or degree of flammability. The system was developed by Accurex Corporation for the U. S. Air Force and is exceedingly expensive.

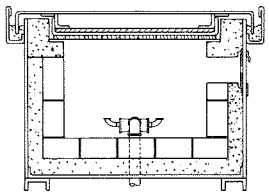
**Tunnel Test:** Test for the flammability of floor coverings in which a sample is placed on the ceiling of a tunnel of specified dimensions and ignited under controlled conditions to determine the extent to which it will burn. (Also sometimes called Steiner tunnel test.)



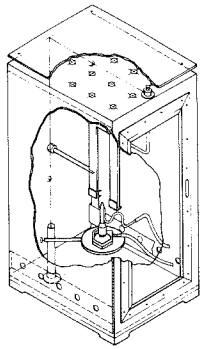
Smoke Chamber Test Apparatus

**Vertical Flame Test:** A test for flame resistance in which a specimen is mounted in a vertical holder and exposed to an open flame for a specific time. Flaming time and char length after the flame extinguishes are measured.





Tunnel Test Apparatus



Vertical Flame Test Apparatus

**FLANGE CRIMPING:** Simultaneous crimping of two ends of yarn by using heated snubber pins, then combining both ends on a draw roll after they contact a rubber flange on the draw roll.

**FLANNEL:** Medium weight plain or twill weave, slightly napped fabric, usually of wool, but may be made of other fibers.

**FLAPPER:** The movable side of a fiber-crimping chamber which periodically opens or flaps to permit crimped fiber to be expelled from the chamber.

**FLASH AGEING:** A process for rapid reduction and fixation of vat dyes obtained when the printed fabric is padded with caustic soda and sodium hydrosulfite and immediately steamed in air-free steam.

**FLASH SPINNING:** See SPINNING, 5.

**FLAT:** In carding, one of the parts forming an endless chain which partially surrounds the upper portion of the cylinder and gives the name to a revolving flat card. Flats are made of cast iron, T-shaped in section, about 1 inch wide, and as long as the width of the cylinder. One side of the flat is nearly covered with fine card clothing, and the flats are set close to the teeth of the cylinder so as to work point against point. A chain of flats contains approximately 110 flats and operates at a surface speed of about 3 inches per minute.

**FLAT ABRASION TESTER:** See STOLL-QUARTERMASTER UNIVERSAL WEAR TESTER.

**FLAT DUCK:** See DUCK.

**FLAT-KNIT FABRIC:** 1. A fabric made on a flat-knitting machine, as distinguished from tubular fabrics made on a circular-knitting machine. While tricot and milanese warp-knit fabrics (non-run) are knit in flat form, the trade uses the term flat-knit fabric to refer to weft-knit fabrics made on a flat machine, rather than warp-knit fabrics. 2. A term used in the underwear trade for plain-stitch fabrics made on a circular-knitting machine. These fabrics have a flat surface and are often called flat-knit



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fabrics to differentiate them from ribbed-knit or Swiss rib fabrics. In this case, the term refers to the texture, not the type of machine on which the fabric was knit.

**FLAT KNITTING:** See KNITTING.

**FLAT-KNITTING MACHINE:** A weft-knitting machine with needles arranged in a straight line in a flat plate called the bed. The yarn travels alternately back and forth, and the fabric may be shaped or varied in width, as desired, during the knitting process. Lengthwise edges are selvages. Flat-knitting machines may be divided into two types: latch-needle machines for sweaters, scarves, and similar articles and fine spring-needle machines for full-fashioned hosiery.

**FLATSPOTTING:** A characteristic of certain tire cords. It occurs with all materials but is more noticeable with nylon cord and is associated with nylon cord by users. Nylon exerts a shrinkage force as it becomes heated in tire operation. When the tire is stopped under load, the cord in the road-contact portion of the tire is under less tension than that in other portions of the tire, and it shrinks to conform to the flat surface of the road. When cooled in this position, the cord maintains the flat spot until it reaches its glass transition temperature as it will in use.

**FLAT-TOP CARD:** See REVOLVING FLAT CARD.

**FLAX:** The plant from which the cellulosic fiber linen is obtained.

**FLEECE FABRIC:** A fabric with a thick, heavy surface resembling sheep's wool. It may be a pile or napped fabric of either woven or knit construction.

**FLEX ABRASION TESTER:** See STOLL-QUARTERMASTER UNIVERSAL WEAR TESTER.

**FLEXIBILITY:** 1. The ability to be flexed or bowed repeatedly without rupturing. 2. A term relating to the hand of fabric, referring to ease of bending and ranging from pliable (high) to stiff (low).

**FLEXURAL FATIGUE:** A physical property expressed by the number of times a material can be bent on itself through a prescribed angle before it ruptures or loses its ability to recover.

**FLEXURAL RIGIDITY:** This measure of a material's resistance to bending is calculated by multiplying the material's weight per unit area by the cube of its bending length.

**FLOAT:** 1. The portion of a warp or filling yarn that extends over two or more adjacent filling picks or warp ends in weaving for the purpose of forming certain designs. 2. In a knit fabric, a portion of yarn which extends for some length without being knitted in. 3. A fabric defect consisting of an end lying or floating on the cloth surface instead of being woven in properly. Floats are usually caused by slubs, knot-tails, knots, or fly waste, or sometimes by ends being drawn in heddle eyes incorrectly or being twisted around heddle wires.

**FLOATING ENDS:** See FLOAT, 3.

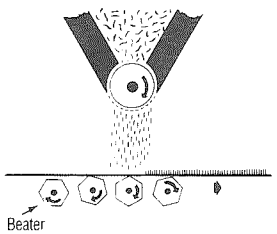
**FLOAT STITCH:** See MISS-STITCH.



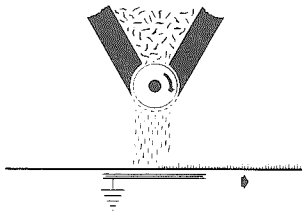
**FLOCCULATING:** Coagulating or coalescing a material into a small, loosely aggregated mass.

**FLOCK:** The material obtained by reducing textile fibers to fragments by cutting or grinding. There are two main types: precision cut flock, where all fiber lengths are approximately equal, and random cut flock, where the fibers are ground or chopped to produce a broad range of lengths.

**FLOCKING:** A method of cloth ornamentation in which adhesive is printed or coated on a fabric, and finely chopped fibers are applied all over by means of dusting, air-blasting, or electrostatic attraction. In flock printing, the fibers adhere only to the printed areas and are removed from the unprinted areas by mechanical action.



Mechanical Flocking


Electrostatic Flocking

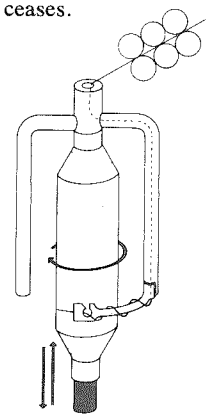
**FLUFFING:** A term describing the appearance of a carpet after loose fiber fragments left during manufacture have worked their way to the surface. Fluffing is not a defect; it is simply a characteristic of new carpets which disappears with vacuuming.

**FLUORESCENCE:** Emission of electromagnetic radiation, usually as visible light, that is caused by the flow of energy into the emitting body. The emission ceases abruptly when the excitation ceases.

**FLY:** The short, waste fibers that are released into the air in textile processing operations such as picking, carding, spinning, and weaving.

**FLYER:** 1. A device used to insert twist into slubbing, roving, or yarn, and to serve as a guide for winding it onto a bobbin. The flyer is shaped like an inverted U that fits on the top of the spindle and revolves with it. One arm of the U is solid and the other is hollow. The yarn enters through the top of the hollow arm, travels downward, and emerges at the bottom where it is wound around a presser finger onto the take-up package. 2. See LOOM FLY.

**FLYER SPINNING:** A method of spinning by means of a driven flyer. It is used primarily for spinning worsted and coarser yarns. (Also see FLYER, 1.)


Flyer Spinning



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**KNITTING:** A method of constructing fabric by interlocking series of loops of one or more yarns. The two major classes of knitting are warp knitting and weft knitting, as follows:

**1. Warp Knitting:** A type of knitting in which the yarns generally run lengthwise in the fabric. The yarns are prepared as warps on beams with one or more yarns for each needle. Examples of this type of knitting are tricot, milanese, and raschel knitting.

**Milanese Knitting:** A type of run-resistant warp knitting with a diagonal rib effect using several sets of yarns.

**Raschel Knitting:** A versatile type of warp knitting made in plain and Jacquard patterns; the latter can be made with intricate eyelet and lacy patterns and is often used for underwear fabrics. Raschel fabrics are coarser than other warp-knit fabrics, but a wide range of fabrics can be made. Raschel knitting machines have one or two sets of latch needles and up to thirty sets of guides.

**Tricot Knitting:** A run-resistant type of warp knitting in which either single or double sets of yarn are used. (Also see TRICOT.)

**2. Weft Knitting:** A common type of knitting, in which one continuous thread runs crosswise in the fabric making all of the loops in one course. Weft knitting types are circular and flat knitting.

**Circular Knitting:** The fabric is produced on the knitting machine in the form of a tube, the threads running continuously around the fabric.

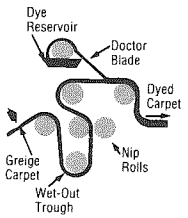
**Flat Knitting:** The fabric is produced on the knitting machine in flat form, the threads alternating back and forth across the fabric. The fabric can be given shape in the knitting process by increasing or decreasing loops. Full-fashioned garments are made on a flat-knitting machine. (Also see FLAT-KNIT FABRIC.)

**KRAFTCORD:** This yarn produced by tightly twisting plant fiber is sometimes used in carpet backings.

**KRAFT PULPS:** Pulps prepared in the alkaline liquor consisting of sodium hydroxide, sodium carbonate, and sodium sulfide. Also called sulfate pulp.

**KRAFT YARN:** A yarn made by twisting a strip of paper manufactured from kraft pulp.

**KÜSTERS DYEING RANGE:** Continuous dye range for carpets. The unit wets the carpet, applies dyes and auxiliary chemicals by means of a doctor blade, fixes the dyes in a festoon steamer, and washes and dries the carpet in one pass through the range. An optional auxiliary unit may be installed to randomly drip selected dyes onto the background shade for special styling effects. This process is called TAK dyeing.




**Küster Carpet Dyeing Range**

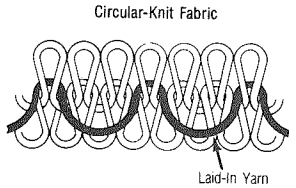


# L

**LACE:** Ornamental openwork fabric, made in a variety of designs by intricate manipulation of the fiber by machine or by hand.

**LACE STITCH:** In this knitting stitch structure, loops are transferred from the needles on which they are made to adjacent needles to create a fabric with an open or a raised effect.

**LAID-IN FABRIC:** A knit fabric in which an effect yarn is tucked in, not knitted in, the fabric structure. The laid-in yarns are held in position by the knitted yarns.

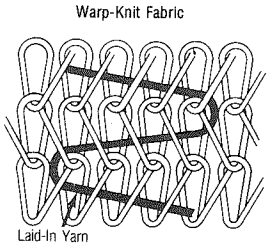



**LAMÉ:** A fabric woven with flat metal threads, usually silver or gold, which form either the background or the pattern.

**LAMINAR FLOW:** Streamline flow in a viscous fluid, such as molten polymer, near a solid boundary.

**LAMINATED FABRIC:** See BONDED FABRIC, 1.

**LAP:** A continuous, considerably compressed sheet of fibers which is rolled under pressure into a cylindrical package, usually weighing between 40 and 50 pounds. The lap is used to supply the card.




**Laid-In Constructions**

**LAPPING:** A term describing the movement of yarn guides between needles, at right angles to the needle bar, or laterally in relation to the needle bar during warp knitting.

**LAP SPLITTING:** A condition caused by a lap which will not unwind in carding in the same thickness as it was wound in picking. This splitting of the sheet of fiber can result in either a thicker or thinner sheet being fed into the card.

**LASE:** An acronym for load at specified elongation: the load required to produce a given elongation of a yarn or cord.

**LASER:** A device for producing an intense beam of coherent light. It is used for cutting, spectroscopy, photography, biomedical investigations, etc.

**LASHED-IN FILLING:** See PULLED-IN FILLING.

**LASTRILE FIBER:** A manufactured fiber in which the fiber-forming substance is a copolymer of acrylonitrile and a diene composed of at least 10% by weight but not more than 50% by weight of acrylonitrile ($-CH_2-CHCN-$) units (FTC definition).



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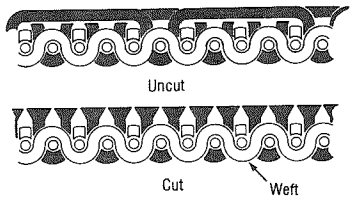
inverted V. Each needlebed is at a 45° angle to the horizontal. These machines are used primarily to produce collars, sleeves, sweater strips, and rib trims.

**VEGETABLE FIBER:** A textile fiber of vegetable origin, such as cotton, kapok, jute, ramie, and flax.

**VELOUR: 1.** Generally, a soft, closely woven fabric with a short, thick pile, weighing about 10 to 20 ounces per yard and made in a plain or satin weave. Velour is usually made of cotton or wool, or with a cotton warp in wool, silk, or mohair velour. It is also made in blends of spun man-made fiber and wool. Velours are used for coats, draperies, upholstery, powder puffs, and other pile items. **2.** A felt with velvet-like texture used for men's and women's hats.

**VELVET CARPET:** A woven carpet in which the pile ends are lifted over wires which are inserted in the same manner as the filling and which cut the pile as they are withdrawn.

**VELVETEEN:** A fabric with a low filling pile made by cutting an extra set of filling yarns woven in a float formation and bound to the back of the material at intervals by weaving over and under one or more warp ends.



Velveteen: Section Through Warp

**VELVET FABRIC:** A warp-pile woven fabric with short, dense cut pile which produces a rich fabric appearance and soft texture. Two methods are used for weaving velvets. In the double-cloth method, two fabrics are woven face to face with the pile ends interlocking. A reciprocating knife cuts through these pile ends to produce two separate pieces of velvet. In the second method, pile ends are lifted over cutting wires which are inserted with the filling and which are withdrawn to cut the pile. Velvet is produced in a wide range of constructions and types. It was originally made of silk but now also of cotton or man-made fiber; the latter are sometimes washable. They may be specially finished to make them crush-resistant and water-repellent or may be embossed or patterned by burn-out printing.

**VERTICAL FLAME TEST:** See FLAMMABILITY TESTS.

**VIBROSCOPE:** An instrument for determining the mass per unit length of a fiber.

**VINAL FIBER:** A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 50% by weight of vinyl alcohol units and in which the total of the vinyl alcohol units and any one or more of the various acetal units is at least 85% by weight of the fiber (FTC definition). Vinal fibers show good chemical resistance but soften at comparatively low temperatures. Vinal fibers are used for apparel, industrial goods, and fishnets.



**VINYL:** A univalent radical, $CH_2=CH-$, derived from ethylene.

**VINYLIDENE CHLORIDE:** A chemical material obtained from ethylene, a petroleum product, and from chlorine which is obtained from brine. It is used for the manufacture of textile monofilaments and film. It is more commonly identified in the U.S. as saran. (Also see SARAN FIBER.)

**VINYON FIBER:** A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of vinyl chloride units (FTC definition).

**VISCOSE PROCESS:** One of the methods of producing rayon. (Also see RAYON FIBER.) It is also the chemical process used in the manufacture of cellophane. (Also see VISCOSE SOLUTION.)

**VISCOSE RAYON:** One type of rayon. It is produced in far greater quantity than cuprammonium rayon, the other commercial type. (Also see RAYON FIBER.)

**VISCOSE SOLUTION:** The solution obtained by dissolving cellulose xanthate in caustic soda, from which viscose filaments are produced.

**VISCOSITY:** The internal flow resistance of a fluid. (Also see INTRINSIC VISCOSITY.)

**VOILE FABRIC:** A sheer spun cloth which is lightweight and soft. It is usually made with cylindrical, combed yarn. Voile is used for blouses, children's wear, draperies, bedspreads, etc.

**VOLATILE:** Readily vaporized at a relatively low temperature.

**VOLUME RESISTIVITY:** The ratio of the potential gradient parallel to the direction of current flow in a compound to the current density after a specified time of voltage application.

**VULCANIZATION:** See CURING, 2.

## W

**WALE: 1.** In knit fabrics, a column of loops lying lengthwise in the fabric. The number of wales per inch is a measure of the fineness of the fabric. **2.** In woven fabrics, one of a series of ribs, cords, etc., running either warpwise or fillingwise.

**WARP: 1.** The set of yarn in all woven fabrics, that runs lengthwise and parallel to the selvage and is interwoven with the filling. **2.** The sheet of yarns wound together on a beam for the purpose of weaving or warp knitting. (Also see WARP SHEET.)

**WARP BEAM:** A large spool or flanged cylinder around which the warp threads, or ends, are wound in a uniform and parallel arrangement. (Also see BEAM.)

**WARP HOLDING PLACE:** See STICKER, 1.

**WARPING:** See BEAMING.



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**WARP-KNIT FABRIC:** A fabric that is knit with the yarns running lengthwise, e.g., tricot, milanese, and raschel.

**WARP KNITTING:** See KNITTING, 1.

**WARP PILE:** The extra set of warp yarns that forms the surface in a double-woven pile fabric, including types such as velvet and velour. Upholstery fabrics such as mohair, plush and friezé are produced by this method. (Also see PILE and VELVET FABRIC.)

**WARP PRINTING:** See PRINTING.

**WARP SHEET:** A sheet comprising several thousand ends which are combined to make up the warp during preparation for weaving or warp knitting. (Also see WARP.)

**WARP SIZING:** See SLASHING.

**WARP STREAKS:** A fabric fault which shows as bands or streaks running warpwise. Warp streaks should not be confused with reed marks.

**WASH-AND-USE:** A term applied to fabrics and household textiles which can be washed and placed in normal service repeatedly with little or no ironing. (Also see WASH-AND-WEAR.)

**WASH-AND-WEAR:** A generic term applied to garments which satisfactorily retain their original neat appearance after repeated wear and suitable home laundering with little or no pressing or ironing. Thus, a wash-and-wear garment will be essentially free from undesirable wrinkles both during wear and after laundering and will retain any original pressed-in creases or pleats. The garments should meet normal consumer demands for such properties as durability, color, stability, and shrinkage.

The wash-and-wear performance of a fabric or garment depends on several factors, including the types and amounts (percentages) of fibers used, the fabric construction, the finishing treatment, the presence of a colored pattern (either woven or printed), and the methods used for washing and drying. All of these factors contribute to the overall performance and determine, in any specific instance, how closely a fabric or garment will approach acceptance. This situation shows up in the variable behavior of a specific fabric or garment under different conditions and is reflected in the use of specific commercial terms. (Also see EASE-OF-CARE and PERMANENT PRESS.)

**WASH-CREASE RESISTANT:** See WASH-WRINKLE RESISTANT.

**WASHFASTNESS:** The resistance of a dyed fabric to loss of color or change in properties during home or commercial laundering.

**WASH-WRINKLE RESISTANT:** A term applied to textile fabrics which satisfactorily maintain their appearance by recovery from sharp folds imposed during laundering.

**WASTE:** By-products created in the manufacture of fibers, yarns, and fabrics.

**WATER IMBIBITION:** See IMBIBITION.

**WATER-JET LOOM:** See JET LOOM.



**WATERLESS DYEING:** See DYEING, Solvent Dyeing.

**WATERPROOF:** A term applied to materials that are impermeable to water; waterproof fabrics have had all their pores closed and are also impermeable to air and very uncomfortable.

**WATER-REPELLENT:** A term applied to fabrics that can shed water but are permeable to air and comfortable to wear. These fabrics are produced by treating the material with a resin, wax, or plastic finish which is not completely permanent.

**WAVY CLOTH:** See BAGGY CLOTH.

**WAVY SELVAGE:** See SLACK SELVAGE.

**WEAK WEB:** A web of fiber which, when being transferred from the card doffer to the calender rolls to form sliver, does not have sufficient strength from fiber cohesion or clinging entanglement to hold itself together while forming a continuous bridge in processing.

**WEAK YARN:** A yarn which is found to be either below standard breaking specifications or to be weak enough to cause an abnormally high degree of stops in textile processing.

**WEAR TRIAL:** A test for fabric wear, abrasion, flexibility, washing, crushing, creasing, etc., in which the fabric is made into a garment and actually worn for a specific time, then assessed for performance.

**WEATHER-OMETER:** An instrument used in measuring the weather resistance of textiles. It can simulate various weather conditions such as sunlight, rain, dew, and thermal shock. Weathering is accelerated to the degree that the effects of years under normal conditions are attained in only a few days.

**WEAVE:** A system or pattern of intersecting warp and filling yarns. There are three basic weaves: plain, twill, and satin. All other weaves are derived from one or more of these types. (Also see PLAIN WEAVE, TWILL WEAVE, and SATIN WEAVE.)

**WEAVING:** The method or process of interlacing two yarns of similar materials so that they cross each other at right angles to produce woven fabric. The warp yarns, or ends, run lengthwise in the fabric, and the filling threads (weft), or picks, run from side to side. Weaving may be done on a power or hand loom or by several hand methods. (Also see LOOM and WOVEN FABRIC.)

**WEB: 1.** The wide film of fibers that is delivered from the card. **2.** A similar product of other web-forming equipment, such as that formed by air deposition and used to make nonwoven fabrics. **3.** A term loosely used for lightweight nonwoven fabrics. **4.** See WEBBING.

**WEBBING:** Strong, narrow fabric, closely woven in a variety of weaves and principally used for belts and straps which will have to withstand strain (e.g., automobile seat belts, reinforcement of upholstery, suspenders, etc.). Elastic webbing is made with spandex or rubber yarns in part of the warp or filling, or both. (Also see WEB, 2.)

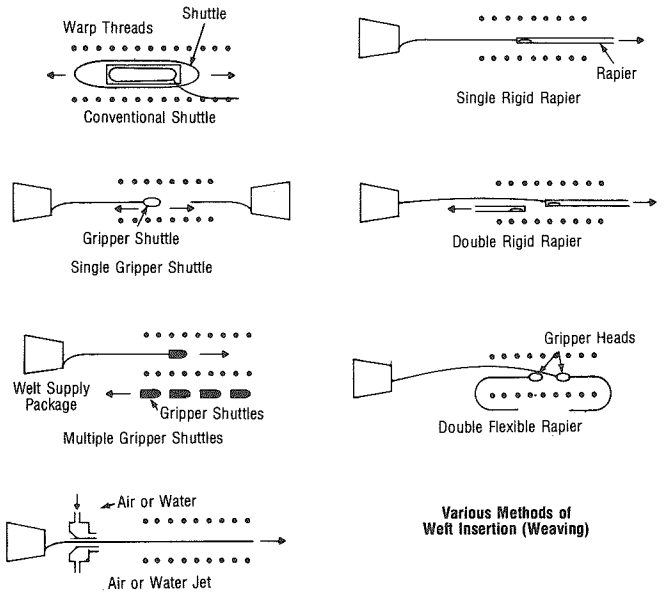
**WEFT:** See FILLING.



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**WEFT INSERTION: 1.** Any one of the various methods, shuttle, rapier, water jet, etc., for making a pick during weaving. **2.** A marriage of warp knitting and weaving brought about by inserting a length of yarn across the width of the knitting elements and fastening the weft yarn between the needle loop and the underlap. Also see METAP WEAVE-KNIT PROCESS.

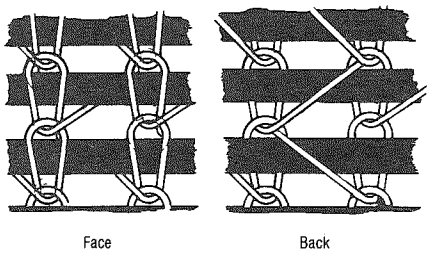



**Various Methods of Weft Insertion (Weaving)**

**WEFT-KNIT FABRIC:** See CIRCULAR-KNIT FABRIC and FLAT-KNIT FABRIC, 1.

**WEFT KNITTING:** See KNITTING, 2.

**WEIGHTED SILK:** Silk that has been treated with metallic salts during dyeing and finishing to increase the fabric's weight and improve its drape. Over-weighting can cause deterioration of the fabric.




**Fabrics Produced by Weft Insertion during Warp Knitting**

**WELT: 1.** A finished edge on knit goods, especially hosiery. In women's stockings, it is a wide band knitted from heavier yarn than the leg and



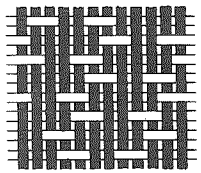
folded on itself. **2.** A small cord covered with fabric and sewn along a seam or border to add strength. **3.** A seam made by folding the fabric double, generally over a cord, and sewing it. **4.** A term sometimes used for pique.

**WET FORMING:** The production of a nonwoven fabric web from an aqueous suspension of fibers.

**WET SPINNING:** See SPINNING, 2.

**WET STRENGTH:** The measurement of the strength of a material when it is saturated with water, normally relative to the dry strength.

**WHIPCORD:** A compact woven fabric having a very steep twill on the face of the goods. Whipcord is used in dress woolens, worsteds, or wool blends and in many types of uniforms.



**Whipcord**

**WHIPPED CREAM:** A type of crepe fabric produced from false-twist-textured polyester yarn.

**WHIPPED-IN FILLING:** See PULLED-IN FILLING.

**WHISKERS:** Fine fibrils or crystals from polymers, metals, etc.

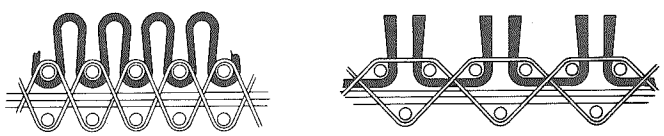
**WHITE GOODS:** A broad term describing any goods that have been finished in the white condition.

**WICKING: 1.** Cord, loosely woven or braided tape, or tubing to be cut into wicks. **2.** Dispersing or spreading of moisture or liquid through a given area, vertically or horizontally; capillary action in material.

**WIDTH:** A horizontal measurement of a material. In woven fabric, it is the distance from selvage to selvage, and in flat-knit fabric, the distance from edge to edge.

**WILLIAMS UNIT:** A wet-processing unit for open-width processing of fabric. The fabric passes up and down over rollers in the liquor. The unit is widely used for dyeing, washing, pretreating, and aftertreating.

**WILTON CARPET:** A type of woven carpet in which the pile yarns are woven in as an integral part of the carpet, being held in place by the filling, usually made on a loom with a Jacquard head. The pile may be formed by wires and hooks or by weaving between two backings, in which case, the pile ends are cut to form two separate carpets. Wilton carpets are made in two types: (1) cut pile, e.g., tournia, wilton moquette, plush, velvet, and mottled, and (2) loop pile, e.g., Brussels.




**Wilton Carpets**



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**WORSTED SYSTEM:** A system of textile processing for manufacturing spun yarns from staple fibers usually over 3 inches in length. The main operations are carding, combing, drafting, and spinning. There are three basic systems of worsted yarn spinning: the Bradford (or English system), the French (Alsatian or Continental system), and the American system.

**WOVEN FABRIC:** A fabric composed of two sets of yarns, warp and filling, and formed by weaving, which is the interlacing of these sets of yarns to form a fabric. There may be two or more warps and fillings in a fabric, depending on the complexity of the construction. The manner in which the two sets of yarns are interlaced determines the weave. By using various combinations of the three basic weaves, plain, twill, and satin, it is possible to produce an almost unlimited variety of constructions. Other effects may be obtained by varying the type of yarns, filament or spun, and the fiber types, twist levels, etc.

**WRINKLE MARK:** See SEAM MARK.

**WRINKLE RECOVERY:** That property of a fabric which enables it to recover from folding deformations.

**WRINKLE RESISTANCE:** That property of a fabric which enables it to resist the formation of wrinkles when subjected to a folding deformation. Wrinkle resistance in a fabric is a desirable attribute, but it is not easily measured quantitatively. Wrinkle resistance varies from quite low in many fabrics to very high in resilient fabrics. In order to form a wrinkle, a fabric's wrinkle resistance must be overcome. The fabric may, however, produce strains and store potential energy that can become evident as wrinkle recovery under suitable conditions.

**WRONG COLOR PICK:** See MIXED END or FILLING.

**WRONG PICK:** See MISPICK.

## X

**XANTHATING:** A process in rayon manufacture in which carbon disulfide is reacted with alkali cellulose to produce bright orange cellulose xanthate.

**XENON-ARC LAMP:** A type of light source used in fading lamps. It is an electric discharge in an atmosphere of xenon gas at a little below atmospheric pressure, contained in a quartz tube.

## Y

**YARDAGE:** The amount or length of a fabric expressed in yards.

**YARD GOODS:** Fabric sold on a retail basis by the running yard.

**YARN:** A generic term for a continuous strand of textile fibers, filaments, or material in a form suitable for knitting, weaving, or otherwise intertwining to form a textile fabric. Yarn occurs in the following forms:



(1) a number of fibers twisted together (spun yarn), (2) a number of filaments laid together without twist (a zero-twist yarn), (3) a number of filaments laid together with a degree of twist, (4) a single filament with or without twist (a monofilament), or (5) a narrow strip of material, such as paper, plastic film, or metal foil, with or without twist, intended for use in a textile construction.

**YARN CONSTRUCTION:** A term used to indicate the number of single yarns and the number of strands combined to form each successive unit of a plied yarn or cord.

**YARN DYEING:** See DYEING.

**YARN DYEING DIFFERENCES:** Variations in take-up of dyes by yarns, resulting in streaks in finished fabrics.

**YARN INTERMEDIATE:** A generic term for products obtained during the conversion of fibers to yarns, including card webs, laps, slivers, rovings, and tops.

**YARN NUMBER:** A relative measure of the fineness of yarns. Two classes of systems are in use: (1) Direct yarn number (equal to linear density) is the mass per unit length of yarn. This system is used for silk and man-made filament yarns. (2) Indirect yarn number (equal to the reciprocal of linear density) is the length per unit mass of yarn. This system is used for cotton, linen, and wool-type spun yarns. (Also see COTTON COUNT.)

**YARN NUMBER, EQUIVALENT SINGLE:** The number of a plied yarn or cord determined by the standard methods used for single yarns.

**YARN QUALITY:** Various grades of yarn designated by the producer with respect to performance characteristics, e.g., first quality, second quality, etc.

**YARN VARIATION:** See RING.

**YELLOWNESS COEFFICIENT:** Measure of the color of a molded acetate disc or dope solution. $Cy = \frac{1-T4400}{T6400}$ where Cy is the yellowness coefficient; T4400 is the transmission at 4400Å (blue); and T6400 is the transmission at 6400Å (orange).

**YIELD:** 1. Number of linear or square yards of fabric per pound of fiber or yarn. 2. The number of finished square yards per pound of greige fabric.

**YOUNG'S MODULUS:** A property of perfectly elastic materials, it is the ratio of change in stress to change in strain within the elastic limits of the material. The ratio is calculated from the stress expressed in force per unit cross-sectional area, and the strain expressed as a fraction of the original length. Modulus so calculated is equivalent to the force required to strain the sample 100% of its original length, at the rate prevailing below the elastic limit.



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# RANDOM HOUSE WEBSTER'S UNABRIDGED DICTIONARY

Second Edition



RANDOM HOUSE
NEW YORK

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**a•pa•pa•ne** (ä′pä pä′nā), *n.* a small, deep crimson Hawaiian honeycreeper, *Himatione sanguinea,* having black wings, tail, and bill. [< Hawaiian *ʻapapane*]

**a•pa•ra•vid•ya** (ə pär′ə vid′yä), *n. Hinduism.* intellectual knowledge. Cf. **paravidya.** [< Skt]

**a•pa•re•jo** (ap′ə rā′hō, -rā′hō, ä′pə-; *Sp.* ä′pä re′hô), *n., pl.* **-jos** (-ōz, -hōz; *Sp.* -hōs). *Spanish.* a Mexican packsaddle formed of stuffed leather cushions. [lit., preparation (i.e., equipment)]

**A•par•ri** (ä pär′rē), *n.* a seaport on N Luzon, in the N Philippines. 45,070.

**a•part** (ə pärt′), *adv.* **1.** into pieces or parts; to pieces: *to take a watch apart; an old barn falling apart from decay.* **2.** separately in place, time, motion, etc.: *New York and Tokyo are thousands of miles apart. Our birthdays are three days apart.* **3.** to or at one side, with respect to place, purpose, or function: *to put money apart for education; to keep apart from the group out of pride.* **4.** separately or individually in consideration: *each factor viewed apart from the others.* **5.** aside (used with a gerund or noun): *Joking apart, what do you think?* **6. apart from,** aside from; in addition to; besides: *Apart from other considerations, time is a factor.* **7. take apart, a.** to disassemble: *to take a clock apart.* **b.** *Informal.* to criticize; attack: *She was taken apart for her controversial stand.* **c.** to subject to intense examination: *He will take your feeble excuses apart.* —*adj.* **8.** having independent or unique qualities, features, or characteristics (usually used following the noun it modifies): *a class apart.* [1350–1400; ME < OF *a part* to one side. See A-[5], PART] —**a•part′ness,** *n.*

**a•part•heid** (ə pärt′hāt, -hīt), *n.* **1.** (in the Republic of South Africa) a rigid policy of segregation of the nonwhite population. **2.** any system or practice that separates people according to race, caste, etc. [1945–50; < Afrik, equiv. to *apart* APART + *-heid* -HOOD]

**a•part•ment** (ə pärt′mənt), *n.* **1.** a room or a group of related rooms, among similar sets in one building, designed for use as a dwelling. **2.** a building containing or made up of such rooms. **3.** any separated room or group of rooms in a house or other dwelling: *We heard cries from an apartment at the back of the house.* **4. apartments,** *Brit.* a set of rooms used as a dwelling by one person or one family. [1635–45; < F *appartement* < It *appartamento,* equiv. to *apparta(re)* to separate, divide (v. deriv. of *a parte* APART, to one side) + *-mento* -MENT] —**a•part•men•tal** (ə pärt men′tl), *adj.*

—**Syn. 1.** APARTMENT, COMPARTMENT agree in denoting a space enclosed by partitions or walls. APARTMENT, however, emphasizes the idea of separateness or privacy: *one's own apartment.* COMPARTMENT suggests a section of a larger space: *compartments in a ship's hold, in an orange crate.*

**apart′ment hotel′,** a hotel that rents furnished apartments or suites suitable for housekeeping, on a weekly or more permanent basis, and usually supplies all hotel services. [1900–05, *Amer.*]

**apart′ment house′,** a building containing a number of residential apartments. Also called **apart′ment build′ing.** [1870–75, *Amer.* ]

**a•part•ment•ize** (ə pärt′mən tīz′), *v.t.,* **-ized, -iz•ing.** **1.** to build apartments on or in: *to apartmentize the downtown area.* **2.** to convert into apartments: *The old mansion has recently been apartmentized.* Also, *esp. Brit.,* **a•part′ment•ise′.** [APARTMENT + -IZE]

**a•past** (ə past′, ə päst′), *prep. Chiefly South Midland U.S. and Newfoundland.* past; beyond. [1890–95; *a-* (semantically empty, perh. a generalization of adverbial A-[1]) + PAST; cf. ANEAR, ANIGH]

**ap•as•tron** (ə pas′trən, -tron), *n., pl.* **-tra** (-trə). *Astron.* the point at which the stars of a binary system are farthest apart (opposed to *periastron*). [< NL < Gk *ap-* AP-[2] + *ástron* star, constellation; on the model of APOGEE]

**ap•a•tet•ic** (ap′ə tet′ik), *adj. Zool.* assuming colors and forms that effect deceptive camouflage. [1885–90; < Gk *apatētikós* fallacious, equiv. to *apatē-* (var. s. of *apateúein* to deceive) + *-tikos* -TIC]

**ap•a•thet•ic** (ap′ə thet′ik), *adj.* **1.** having or showing little or no emotion: *apathetic behavior.* **2.** not interested or concerned; indifferent or unresponsive: *an apathetic audience.* Also, **ap′a•thet′i•cal.** [1735–45; APATH(Y) + (PATH)ETIC] —**ap′a•thet′i•cal•ly,** *adv.*

—**Syn. 1.** unfeeling, impassive, cool. **2.** uninterested, unconcerned. —**Ant. 1.** emotional. **2.** concerned.

**ap•a•thy** (ap′ə thē), *n., pl.* **-thies. 1.** absence or suppression of passion, emotion, or excitement. **2.** lack of interest in or concern for things that others find moving or exciting. **3.** Also, **ap•a•thei•a, ap•a•thi•a** (ap′ə thē′ə). *Stoicism.* freedom from emotion of any kind. [1595–1605; (< F) < L *apathia* < Gk *apátheia* insensibility to suffering, equiv. to *apathe-* (s. of *apathḗs*) unfeeling (*a-* A-[6] + *pathe-,* var. s. of *páthos* PATHOS) + *-ia* -IA]

—**Syn. 1.** coolness. **2.** See **indifference.** —**Ant. 1.** ardor, fervor.

**ap•a•tite** (ap′ə tīt′), *n.* a common mineral, calcium fluorophosphate, $Ca_5FP_3O_{12}$, occurring in individual crystals and in masses and varying in color, formerly used in the manufacture of phosphate fertilizers. [1795–1805; < Gk *apát(ē)* trickery, fraud, deceit + -ITE[1]]

**APB,** See **all-points bulletin.**

**APC,** **1.** *Pharm.* aspirin, phenacetin, and caffeine: a compound formerly used in headache and cold remedies. **2.** *Facetious.* any all-purpose cure. **3.** See **armored personnel carrier.** Also, **A.P.C.** (for defs. 1, 2).

**ape** (āp), *n., v.,* **aped, ap•ing.** —*n.* **1.** any of a group of anthropoid primates characterized by long arms, a broad chest, and the absence of a tail, comprising the family Pongidae **(great ape),** which includes the chimpanzee, gorilla, and orangutan, and the family Hylobatidae **(lesser ape),** which includes the gibbon and siamang. **2.** (loosely) any primate except humans. **3.** an imitator; mimic. **4.** *Informal.* a big, ugly, clumsy person. —*v.t.* **5.** to imitate; mimic: *to ape another's style of writing.* **6. go ape,** *Slang.* to become violently emotional: *When she threatened to leave him, he went ape.* **7. go ape over,** *Slang.* to be extremely enthusiastic about: *They go ape over old rock music.* [bef. 900; ME; OE *apa;* c. OS *apo,* ON *api,* OHG *affo* (G *Affe*)] —**ape′like′,** *adj.*

**a•peak** (ə pēk′), *Naut.* —*adj.* **1.** more or less vertical. **2.** (of a dropped anchor) as nearly vertical as possible without being free of the bottom. **3.** (of an anchored vessel) having the anchor cable as nearly vertical as possible without freeing the anchor. —*adv.* **4.** vertically. Also, **a•peek′.** [1590–1600; A-[1] + PEAK[1]]

**ape′ hang′ers,** *Slang.* a pair of very high, angled handlebars on some customized motorcycles. [1960–65]

**A•pel•doorn** (ä′pəl dōrn′, -dôrn′), *n.* a city in central Netherlands. 140,769.

**A•pel•les** (ə pel′ēz), *n.* 360?–315? B.C., Greek painter.

**ape-man** (āp′man′), *n., pl.* **-men. 1.** a hypothetical primate representing a transitional form between true humans and the anthropoid apes, considered by some as constituting the genus *Australopithecus.* **2.** a human assumed to have been reared by apes. [1875–80]

**Ap′en•nine Moun′tains** (ap′ə nīn′), Apennines.

**Ap•en•nines** (ap′ə nīnz′), *n.* (*used with a plural v.*) a mountain range in Italy, extending across the length of the entire peninsula from NW to SW. Highest peak, Monte Corno, 9585 ft. (2922 m).

**A•pe•pi** (ä pe′pē), *n. Egyptian Myth.* Apophis. [vocalization of Egyptian *"pp;* cf. Coptic *apho:ph*]

***a•per•çu*** (A PER SY′), *n., pl.* ***-çus*** (-SY′). *French.* **1.** a hasty glance; a glimpse. **2.** an immediate estimate or judgment; understanding; insight. **3.** an outline or summary. [lit., perceived]

**a•per•i•ent** (ə pēr′ē ənt), *Med.* —*adj.* **1.** having a mild purgative or laxative effect. —*n.* **2.** a medicine or food that acts as a mild laxative. Also called **aperitive.** [1620–30; < L *aperient-* (s. of *aperiēns* opening, prp. of *aperīre* to open), equiv. to *aperi-* (appar. *ap-,* var. of *ab-* AB- + *-eri-*) + *-ent-* -ENT; the base *-eri-,* perh. with an earlier shape **wery-* or **twery-,* occurs only in this verb and *operīre* to close (see COVER, OPERCULUM)]

**a•pe•ri•od•ic** (ā′pēr ē od′ik), *adj.* **1.** not periodic; irregular. **2.** *Physics.* of or pertaining to vibrations or oscillations with no apparent period. [1875–80; A-[6] + PERIODIC] —**a′pe•ri•od′i•cal•ly,** *adv.* —**a•pe•ri•o•dic•i•ty** (ā pēr′ē ə dis′i tē), *n.*

**a•pé•ri•tif** (ä per′i tēf′, ə per′-, *Fr.* A pā rē tēf′), *n., pl.* **-tifs** (-tēfs′; *Fr.* -tēf′). **1.** a small drink of alcoholic liquor taken to stimulate the appetite before a meal. **2.** Also called **apé′ritif wine′,** a wine served as an appetizer or cocktail. [1890–95; < F (*vin*) *apéritif;* see APERITIVE]

**a•per•i•tive** (ə per′i tiv), *Med.* —*adj.* **1.** aperient. **2.** having a stimulating effect on the appetite. —*n.* **3.** an aperient. **4.** an appetite stimulant. [1575–85; < ML *aperitīvus,* var. of LL *apertīvus,* equiv. to L *apert-* (see APERTURE) + *-īvus* -IVE]

**ap•er•tom•e•ter** (ap′ər tom′i tər), *n. Optics.* an instrument for measuring the angular and numerical aperture of the objective lens of a microscope. [1875–80; APERT(URE) + -O- + -METER]

**ap•er•ture** (ap′ər chər), *n.* **1.** an opening, as a hole, slit, crack, gap, etc. **2.** Also called **ap′erture stop′.** *Optics.* an opening, usually circular, that limits the quantity of light that can enter an optical instrument. [1400–50; late ME < L *apertūra* an opening, equiv. to *apert(us)* opened (ptp. of *aperīre; aper(i)-* (see APERIENT) + *-tus* ptp. suffix) + *-ūra* -URE] —**ap•er•tur•al** (ap′ər chŏŏr′əl), *adj.* —**ap′er•tured,** *adj.*

**ap′erture mask′,** *Television.* See **shadow mask.**

**ap•er•ture-pri•or•i•ty** (ap′ər chər prī or′i tē, -ôr′-), *adj. Photog.* of or pertaining to a semiautomatic exposure system in which the photographer presets the aperture and the camera selects the shutter speed. Also, **ap•er•ture-pre•ferred** (ap′ər chər pri fûrd′). Cf. **shutter-priority.**

**ap′erture ra′tio,** *Optics.* See **relative aperture.** [1885–90]

**ap′erture syn′thesis,** (in radio astronomy) a technique that combines the inputs of a set of radio telescopes to obtain a greater resolution of images than is possible with a single member of the set. [1960–65]

**ap•er•y** (ā′pə rē), *n., pl.* **-er•ies. 1.** apish behavior; mimicry. **2.** a silly trick. [1610–20; APE + -ERY]

**a•pet•al•ous** (ā pet′l əs), *adj. Bot.* having no petals. [1700–10; < NL *apetalus.* See A-[6], PETALOUS] —**a•pet′a•lous•ness, a•pet′a•ly,** *n.*

**a•pex** (ā′peks), *n., pl.* **a•pex•es, a•pi•ces** (ā′pə sēz′, ap′ə-). **1.** the tip, point, or vertex; summit. **2.** climax; peak; acme: *His election to the presidency was the apex of his career.* **3.** *Astron.* See **solar apex.** [1595–1605; < L]

**APEX** (ā′peks), *n.* a type of international air fare offering reduced rates for extended stays that are booked in advance. [1970–75; *A(dvance) P(urchase) Ex(cursion)*]

**Ap•gar** (ap′gär), *n.* **Virginia,** 1909–74, U.S. physician: developed test to evaluate health of newborns.

**Ap′gar score′,** a numerical measure of the physical health of a newborn infant derived by evaluating heart rate, muscle tone, respiratory effort, response to stimulation, skin color, and other physiological indicators. [named after V. APGAR]

**aph.,** aphetic.

**a•phaer•e•sis** (ə fer′ə sis), *n.* apheresis. —**aph•ae•ret•ic** (af′ə ret′ik), *adj.*

**a•pha•gi•a** (ə fā′jē ə), *n. Pathol.* difficulty or pain in swallowing. [1865–70; A-[6] + -PHAGIA]

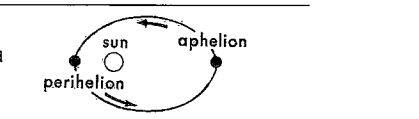
**a•pha•ki•a** (ə fā′kē ə), *n. Ophthalm.* lack or loss of the lens of the eye. Also, **a•pha•cia** (ə fā′shə, -shē ə, -sē ə). [1860–65; < NL, equiv. to *a-* A-[6] + Gk *phak(ós)* lentil (for sense see LENS) + -IA] —**a•pha′kic, a•pha•cic** (ə fā′sik), **a•pha•cial** (ə fā′shəl), *adj.*

**aph•a•nite** (af′ə nīt′), *n. Petrog.* a fine-grained igneous rock having such compact texture that the constituent minerals cannot be detected with the naked eye. [1860–65; < Gk *aphan(ḗs)* unseen, hidden, invisible (*a-* A-[6] + *phanēs,* adj. deriv. of *phaínein* to bring to light, disclose) + -ITE[1]] —**aph•a•nit•ic** (af′ə nit′ik), *adj.*

**a•pha•sia** (ə fā′zhə), *n. Pathol.* the loss of a previously held ability to speak or understand spoken or written language, due to disease or injury of the brain. [1865–70; < Gk: speechlessness, equiv. to *a-* A-[6] + *phat(ós)* spoken (deriv. of *phánai* to speak) + *-ia* -IA]

**a•pha•sic** (ə fā′zik, -sik), *Pathol.* —*adj.* **1.** pertaining to or affected with aphasia. —*n.* **2.** Also, **a•pha•si•ac** (ə fā′zē ak′). a person affected with aphasia. [1865–70; APHAS(IA) + -IC]

**a•phe•li•on** (ə fē′lē ən, ə fēl′yən, ap hē′lē ən), *n., pl.* **a•phe•li•a** (ə fē′lē ə, ə fēl′yə, ap hē′lē ə). *Astron.* the point in the orbit of a planet or a comet at which it is farthest from the sun. Cf. **perihelion.** [1650–60; Hellenized form of NL *aphēlium* < Gk **aphḗlion* (*diástēma*) off-sun (distance), neut. of **aphḗlios* (adj.), equiv. to *ap-* AP-[2] + *hḗli(os)* sun + *-os* adj. suffix. See APOGEE] —**a•phe′li•an,** *adj.*




**a•phe•li•o•trop•ic** (ə fē′lē ə trop′ik, -trō′pik, ap hē′-), *adj. Bot.* turning or growing away from the sun. [1875–80; AP-[2] + HELIOTROPIC] —**a•phe′li•o•trop′i•cal•ly,** *adv.*

**a•phe•li•ot•ro•pism** (ə fē′lē o′trə piz′əm, ap hē′lē-), *n.* apheliotropic tendency or type of growth. [1875–80; APHELIOTROP(IC) + -ISM]

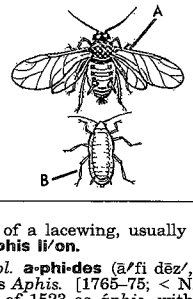
**a•phe•mi•a** (ə fē′mē ə), *n. Med.* a type of aphasia characterized by the inability to express ideas in spoken words. [1860–65; < Gk *a-* A-[6] + *phḗm(ē)* speech + *-ia* -IA]

**a•pher•e•sis** (ə fer′ə sis *for 1;* af′ə rē′sis *for 2*), *n.* **1.** Also, **aphaeresis.** the loss or omission of one or more letters or sounds at the beginning of a word, as in *squire* for *esquire,* or *count* for *account.* **2.** *Med.* the withdrawal of whole blood from the body, separation of one or more components, and return by transfusion of remaining blood to the donor. [1605–15; < LL *aphaeresis* < Gk *aphaíresis* a taking away, equiv to *aphaire(în)* to take away (*ap-* AP-[2] + *haireîn* to snatch) + *-sis* -SIS] —**aph•e•ret•ic** (af′ə ret′ik), *adj.*

**aph•e•sis** (af′ə sis), *n. Historical Ling.* the disappearance or loss of an unstressed initial vowel or syllable. [1880; < Gk *áphesis* a letting go, equiv. to *aphe-* (var. s. of *aphiénai* to let go, set free; *ap-* AP-[2] + *hiénai* to send) + *-sis* -SIS]

**a•phet•ic** (ə fet′ik), *adj.* pertaining to or due to aphesis. [1875–80; < Gk *áphet(os)* freed, discharged (*aphe-* (see APHESIS) + *-tos* ptp. suffix) + -IC] —**a•phet′i•cal•ly,** *adv.*

**a•phid** (ā′fid, af′id), *n.* any of numerous tiny soft-bodied insects of the family Aphididae of worldwide distribution, that suck the sap from the stems and leaves of various plants, some developing wings when overcrowding occurs: an important pest of many fruit trees and vegetable crops. Also called **plant louse.** [1880–85; back formation from APHIDES, pl. of APHIS] —**a•phid•i•an** (ə fid′ē ən), *adj., n.* —**a•phid′i•ous,** *adj.*




**apple aphid,** *Aphis pomi,* A, male; B, female, length ⅛ in. (0.3 cm)

**a′phid li′on,** the larva of a lacewing, usually predaceous on aphids. Also, **a′phis li′on.**

**a•phis** (ā′fis, af′is), *n., pl.* **a•phi•des** (ā′fi dēz′, af′i-). an aphid, esp. of the genus *Aphis.* [1765–75; < NL, first recorded in a Gk lexicon of 1523 as *áphis,* with the L gloss *cimex* bedbug; perh. orig. a misreading of Gk *kóris* bug]

**APHIS,** Animal and Plant Health Inspection Service.

**a•pho•ni•a** (ā fō′nē ə), *n. Pathol.* loss of voice, esp. due to an organic or functional disturbance of the vocal organs. [1770–80; < NL < Gk: speechlessness. See A-[6], PHON-, -IA]

**a•phon•ic** (ā fon′ik, ā fō′nik), *adj.* **1.** mouthed but not spoken; noiseless; silent. **2.** *Phonet.* **a.** lacking phonation; unvoiced. **b.** without voice; voiceless. **3.** *Pathol.* affected with aphonia. —*n.* **4.** *Pathol.* a person who is affected with aphonia. [1820–30; < Gk *áphōn(os)* voiceless (see APHONIA) + -IC]

**aph•o•rism** (af′ə riz′əm), *n.* a terse saying embodying a general truth, or astute observation, as "Power tends to corrupt, and absolute power corrupts absolutely" (Lord Acton). [1520–30; F *aphorisme* < LL *aphorismus* < Gk *aphorismós* definition, equiv. to *aphor(ízein)* to

CONCISE PRONUNCIATION KEY: *act, cāpe, dâre, pärt; set, ēqual; if, īce; ox, ōver, ôrder, oil, bo͝ok, bo͞ot, out; up, ûrge; child; sing; shoe; thin, ŧhat;* zh as in *treasure.* ə = *a* as in *alone, e* as in *system, i* as in *easily, o* as in *gallop, u* as in *circus;* ˚ as in *fire* (fī˚r), *hour* (ou˚r). l and n can serve as syllabic consonants, as in *cradle* (krād′l), and *button* (but′n). See the full key inside the front cover.

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Errata Sheet - Deposition of E C Frederick 23 July 2013

| Page | Line | Change | Reason |
|---|---|---|---|
| 32 | 22 | Geoffrey replacing Jeffrey | spelling error |
| 62 | 11 | lining not Li Ning | transcription error |
| 70 | 6 | "yards" in place of "yarns" | transcription error |
| 81 | 18 | "claimed" in place of "claim" | transcription error |
| 98 | 3-5 | "...to invent something that by itself, or to create something that by itself wouldn't be patentable." | transcription error |
| 167 | 6 | "important to us" | missed "to" |
| 185 | 14 | "sought" replacing "south" | typo |

Edward C Frederick

8/23/13
23 August 2013

# MAN-MADE FIBER AND TEXTILE DICTIONARY

CELANESE CORPORATION

**NOTE: This exhibit is identical to exhibit no. 2015 marked during the December 3, 2013, cross-examination deposition of Sabit Adanur, <u>except</u> for the inclusion of this note and the addition of a footer to comply with 37 CFR §42.63(d).**

NIKE EXHIBIT 2015 IPR 2013-00067



Skechers v Nike

**KNITTING:** A method of constructing fabric by interlocking series of loops of one or more yarns. The two major classes of knitting are warp knitting and weft knitting, as follows:

1. **Warp Knitting:** A type of knitting in which the yarns generally run lengthwise in the fabric. The yarns are prepared as warps on beams with one or more yarns for each needle. Examples of this type of knitting are tricot, milanese, and raschel knitting.

   **Milanese Knitting:** A type of run-resistant warp knitting with a diagonal rib effect using several sets of yarns.

   **Raschel Knitting:** A versatile type of warp knitting made in plain and Jacquard patterns; the latter can be made with intricate eyelet and lacy patterns and is often used for underwear fabrics. Raschel fabrics are coarser than other warp-knit fabrics, but a wide range of fabrics can be made. Raschel knitting machines have one or two sets of latch needles and up to thirty sets of guides.

   **Tricot Knitting:** A run-resistant type of warp knitting in which either single or double sets of yarn are used. (Also see TRICOT.)

2. **Weft Knitting:** A common type of knitting, in which one continuous thread runs crosswise in the fabric making all of the loops in one course. Weft knitting types are circular and flat knitting.

   **Circular Knitting:** The fabric is produced on the knitting machine in the form of a tube, the threads running continuously around the fabric.

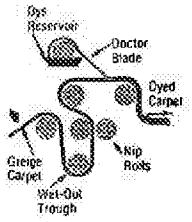
   **Flat Knitting:** The fabric is produced on the knitting machine in flat form, the threads alternating back and forth across the fabric. The fabric can be given shape in the knitting process by increasing or decreasing loops. Full-fashioned garments are made on a flat-knitting machine. (Also see FLAT-KNIT FABRIC.)

**KRAFTCORD:** This yarn produced by tightly twisting plant fiber is sometimes used in carpet backings.

**KRAFT PULPS:** Pulps prepared in the alkaline liquor consisting of sodium hydroxide, sodium carbonate, and sodium sulfide. Also called sulfate pulp.

**KRAFT YARN:** A yarn made by twisting a strip of paper manufactured from kraft pulp.

**KÜSTERS DYEING RANGE:** Continuous dye range for carpets. The unit wets the carpet, applies dyes and auxiliary chemicals by means of a doctor blade, fixes the dyes in a festoon steamer, and washes and dries the carpet in one pass through the range. An optional auxiliary unit may be installed to randomly drip selected dyes onto the background shade for special styling effects. This process is called TAK dyeing.



Köster Carpet Dyeing Range

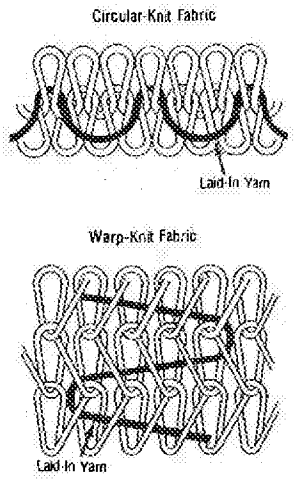


## L

**LACE:** Ornamental openwork fabric, made in a variety of designs by intricate manipulation of the fiber by machine or by hand.

**LACE STITCH:** In this knitting stitch structure, loops are transferred from the needles on which they are made to adjacent needles to create a fabric with an open or a raised effect.

**LAID-IN FABRIC:** A knit fabric in which an effect yarn is tucked in, not knitted in, the fabric structure. The laid-in yarns are held in position by the knitted yarns.



Laid-In Constructions

**LAMÉ:** A fabric woven with flat metal threads, usually silver or gold, which form either the background or the pattern.

**LAMINAR FLOW:** Streamline flow in a viscous fluid, such as molten polymer, near a solid boundary.

**LAMINATED FABRIC:** See BONDED FABRIC, 1.

**LAP:** A continuous, considerably compressed sheet of fibers which is rolled under pressure into a cylindrical package, usually weighing between 40 and 50 pounds. The lap is used to supply the card.

**LAPPING:** A term describing the movement of yarn guides between needles, at right angles to the needle bar, or laterally in relation to the needle bar during warp knitting.

**LAP SPLITTING:** A condition caused by a lap which will not unwind in carding in the same thickness as it was wound in picking. This splitting of the sheet of fiber can result in either a thicker or thinner sheet being fed into the card.

**LASE:** An acronym for load at specified elongation: the load required to produce a given elongation of a yarn or cord.

**LASER:** A device for producing an intense beam of coherent light. It is used for cutting, spectroscopy, photography, biomedical investigations, etc.

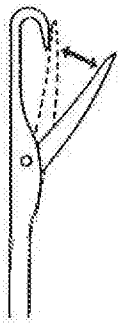
**LASHED-IN FILLING:** See PULLED-IN FILLING.

**LASTRILE FIBER:** A manufactured fiber in which the fiber-forming substance is a copolymer of acrylonitrile and a diene composed of at least 10% by weight but not more than 50% by weight of acrylonitrile ($-CH_2-CHCN-$) units (FTC definition).



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**LATCH NEEDLE:** One of the two types of knitting machine needles. The latch needle has a small terminal hook with a latch which pivots automatically in knitting to close the hook. The fabric loop is cast off. The latch then opens, allowing a new loop to be formed by the hook, and loop-forming and casting-off proceed simultaneously. (Also see SPRING NEEDLE.)



Head of Latch Needle

**LATENT CRIMP:** Crimp in fibers that can be developed by a specific treatment. Fibers are prepared specially to crimp when subjected to specific conditions, e.g., tumbling in a heated chamber or wet processing.

**LATEX:** A milky fluid found in certain cells of some families of seed plants. Latex is the raw material from which rubber is made.

**LAWN:** A light thin cloth made of carded or combed yarns, this fabric is given a crease-resistant, crisp finish. Lawn is crisper than voile but not as crisp as organdy.

**LEA:** 1. One-seventh of a 840-yard cotton hank, i.e., 120 yards. 2. A standard skein with 80 revolutions of 1.5 yards each (total length of 120 yards). It is used for strength tests. 3. A unit of measure, 300 yards, used to determine the yarn number of linen yarn. The number of leas in one pound is the yarn number.

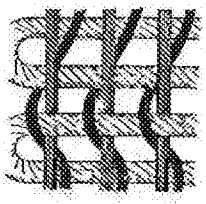
**LEACHING:** The removal of any substance or dye from textiles by the percolating action of a suitable liquid.

**LEA COUNT CONSTANT:** See BREAK FACTOR.

**LEADER MARK:** See DECATING MARK.

**LEA PRODUCT:** See BREAK FACTOR.

**LENO WEAVE:** A weave in which the warp yarns are arranged in pairs with one twisted around the other between picks of filling yarn as in marquisette. This type of weave gives firmness and strength to an open-weave fabric and prevents slippage and displacement of warp and filling yarns.



Full Leno Weave

**LET-OFF MOTION:** A device for controlling the delivery and tension of the warp during weaving.

**LEVELING:** Migration leading to uniform distribution of dye in a dyed material. Leveling may be a property of the dye or it may require chemical assistance.

**LEVEL LOOP:** A term describing a tufted or woven carpet with uncut, equal-length loops composing the pile surface.



**LICKERIN:** A part of the feed mechanism of the card. It consists of a hollow, metal roll with a spirally grooved surface containing a special saw-toothed wire. The lickerin opens up the tufts of the picker lap as it is fed to the card and transfers the fibers to the main cylinder.

**LICKERIN LOADING:** A condition whereby fibers are imbedded in the lickerin wire clothing so as to resist transfer to the cylinder clothing.

**LIGHT END:** 1. See FINE END, 1. 2. The lower boiling fraction in distillation.

**LIGHTFASTNESS:** The degree of resistance of dyed textile materials to the color-destroying influence of sunlight. Two methods of testing are in use: (1) exposure to sunlight, either directly or under glass, and (2) accelerated testing in a laboratory apparatus equipped with any of several types of artificial light sources.

**LIGNIN:** The major noncarbohydrate portion of wood. It is an amorphous polymeric substance that cements the fibrous portions together.

**LIMITING OXYGEN INDEX:** A relative measure of flammability that is determined as follows: A sample is ignited in an oxygen/nitrogen atmosphere. The oxygen content is adjusted until the minimum required to sustain steady burning is found. The higher the value, the lower the flammability.

**LINEAR DENSITY:** Mass per unit length expressed as grams per centimeter, pounds per foot, or equivalent units. It is the quotient obtained by dividing the mass of a fiber or yarn by its length.

**LINEN:** Cellulosic fibers derived from the stem of the flax plant or a fabric made from these fibers. Linen fibers are much stronger and more lustrous than cotton; they yield cool, absorbent fabrics that wrinkle easily. Fabrics with linen-like texture and coolness but with good wrinkle resistance can be produced from man-made fibers and blends.

**LINEN LEA:** The number of 300-yard hanks contained in one pound.

**LINET:** A French-made lining fabric of unbleached linen.

**LINK-AND-LINK:** See PURL.

**LINON À JOUR:** A gauze-like linen fabric used as dress goods.

**LINT BALL:** See BALLING UP.

**LINTERS:** The short cotton fibers which are not removed from the seed during the first ginning. The linters are cut from the seed and used as a source for cellulose derivatives such as nitrocellulose or viscose rayon.

**LIQUOR RATIO:** In wet processing the ratio of the weight of liquid used to the weight of goods treated.

**LISLE YARN:** A high-quality cotton yarn made by plying yarns spun from long combed staple. Lisle is singed to give it a smooth finish.

**LIVING RING:** See REVOLVING SPINNING RING.

**LOAD-DEFORMATION CURVE:** A graphical representation of the relationship between the change in dimension (in the direction of the



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Skechers v Nike

**WARP-KNIT FABRIC:** A fabric that is knit with the yarns running lengthwise, e.g., tricot, milanese, and raschel.

**WARP KNITTING:** See KNITTING, 1.

**WARP PILE:** The extra set of warp yarns that forms the surface in a double-woven pile fabric, including types such as velvet and velour. Upholstery fabrics such as mohair, plush and friezé are produced by this method. (Also see PILE and VELVET FABRIC.)

**WARP PRINTING:** See PRINTING.

**WARP SHEET:** A sheet comprising several thousand ends which are combined to make up the warp during preparation for weaving or warp knitting. (Also see WARP.)

**WARP SIZING:** See SLASHING.

**WARP STREAKS:** A fabric fault which shows as bands or streaks running warpwise. Warp streaks should not be confused with reed marks.

**WASH-AND-USE:** A term applied to fabrics and household textiles which can be washed and placed in normal service repeatedly with little or no ironing. (Also see WASH-AND-WEAR.)

**WASH-AND-WEAR:** A generic term applied to garments which satisfactorily retain their original neat appearance after repeated wear and suitable home laundering with little or no pressing or ironing. Thus, a wash-and-wear garment will be essentially free from undesirable wrinkles both during wear and after laundering and will retain any original pressed-in creases or pleats. The garments should meet normal consumer demands for such properties as durability, color, stability, and shrinkage.

The wash-and-wear performance of a fabric or garment depends on several factors, including the types and amounts (percentages) of fibers used, the fabric construction, the finishing treatment, the presence of a colored pattern (either woven or printed), and the methods used for washing and drying. All of these factors contribute to the overall performance and determine, in any specific instance, how closely a fabric or garment will approach acceptance. This situation shows up in the variable behavior of a specific fabric or garment under different conditions and is reflected in the use of specific commercial terms. (Also see EASE-OF-CARE and PERMANENT PRESS.)

**WASH-CREASE RESISTANT:** See WASH-WRINKLE RESISTANT.

**WASHFASTNESS:** The resistance of a dyed fabric to loss of color or change in properties during home or commercial laundering.

**WASH-WRINKLE RESISTANT:** A term applied to textile fabrics which satisfactorily maintain their appearance by recovery from sharp folds imposed during laundering.

**WASTE:** By-products created in the manufacture of fibers, yarns, and fabrics.

**WATER IMBIBITION:** See IMBIBITION.

**WATER-JET LOOM:** See JET LOOM.



**WATERLESS DYEING:** See DYEING, Solvent Dyeing.

**WATERPROOF:** A term applied to materials that are impermeable to water; waterproof fabrics have had all their pores closed and are also impermeable to air and very uncomfortable.

**WATER-REPELLENT:** A term applied to fabrics that can shed water but are permeable to air and comfortable to wear. These fabrics are produced by treating the material with a resin, wax, or plastic finish which is not completely permanent.

**WAVY CLOTH:** See BAGGY CLOTH.

**WAVY SELVAGE:** See SLACK SELVAGE.

**WEAK WEB:** A web of fiber which, when being transferred from the card doffer to the calender rolls to form sliver, does not have sufficient strength from fiber cohesion or clinging entanglement to hold itself together while forming a continuous bridge in processing.

**WEAK YARN:** A yarn which is found to be either below standard breaking specifications or to be weak enough to cause an abnormally high degree of stops in textile processing.

**WEAR TRIAL:** A test for fabric wear, abrasion, flexibility, washing, crushing, creasing, etc., in which the fabric is made into a garment and actually worn for a specific time, then assessed for performance.

**WEATHER-OMETER:** An instrument used in measuring the weather resistance of textiles. It can simulate various weather conditions such as sunlight, rain, dew, and thermal shock. Weathering is accelerated to the degree that the effects of years under normal conditions are attained in only a few days.

**WEAVE:** A system or pattern of intersecting warp and filling yarns. There are three basic weaves: plain, twill, and satin. All other weaves are derived from one or more of these types. (Also see PLAIN WEAVE, TWILL WEAVE, and SATIN WEAVE.)

**WEAVING:** The method or process of interlacing two yarns of similar materials so that they cross each other at right angles to produce woven fabric. The warp yarns, or ends, run lengthwise in the fabric, and the filling threads (weft), or picks, run from side to side. Weaving may be done on a power or hand loom or by several hand methods. (Also see LOOM and WOVEN FABRIC.)

**WEB:** 1. The wide film of fibers that is delivered from the card. 2. A similar product of other web-forming equipment, such as that formed by air deposition and used to make nonwoven fabrics. 3. A term loosely used for lightweight nonwoven fabrics. 4. See WEBBING.

**WEBBING:** Strong, narrow fabric, closely woven in a variety of weaves and principally used for belts and straps which will have to withstand strain (e.g., automobile seat belts, reinforcement of upholstery, suspenders, etc.). Elastic webbing is made with spandex or rubber yarns in part of the warp or filling, or both. (Also see WEB, 2.)

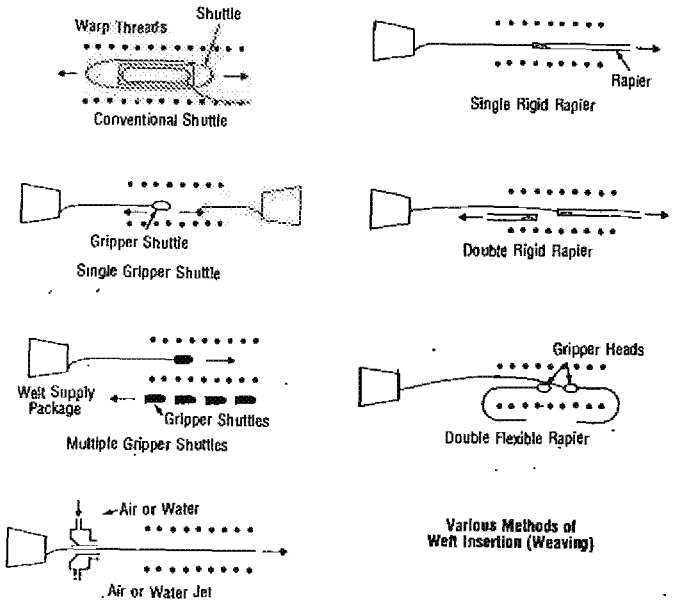
**WEFT:** See FILLING.



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**WEFT INSERTION:** 1. Any one of the various methods, shuttle, rapier, water jet, etc., for making a pick during weaving. 2. A marriage of warp knitting and weaving brought about by inserting a length of yarn across the width of the knitting elements and fastening the weft yarn between the needle loop and the underlap. Also see METAP WEAVE-KNIT PROCESS.

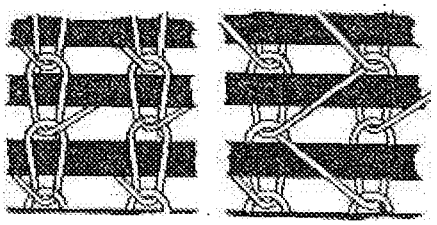



Various Methods of Weft Insertion (Weaving)

**WEFT-KNIT FABRIC:** See CIRCULAR-KNIT FABRIC and FLAT-KNIT FABRIC, 1.

**WEFT KNITTING:** See KNITTING, 2.

**WEIGHTED SILK:** Silk that has been treated with metallic salts during dyeing and finishing to increase the fabric's weight and improve its drape. Over-weighting can cause deterioration of the fabric.




Fabrics Produced by Weft Insertion during Warp Knitting

**WELT:** 1. A finished edge on knit goods, especially hosiery. In women's stockings, it is a wide band knitted from heavier yarn than the leg and



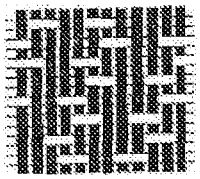
folded on itself. 2. A small cord covered with fabric and sewn along a seam or border to add strength. 3. A seam made by folding the fabric double, generally over a cord, and sewing it. 4. A term sometimes used for pique.

**WET FORMING:** The production of a nonwoven fabric web from an aqueous suspension of fibers.

**WET SPINNING:** See SPINNING, 2.

**WET STRENGTH:** The measurement of the strength of a material when it is saturated with water, normally relative to the dry strength.

**WHIPCORD:** A compact woven fabric having a very steep twill on the face of the goods. Whipcord is used in dress woolens, worsteds, or wool blends and in many types of uniforms.



Whipcord

**WHIPPED CREAM:** A type of crepe fabric produced from false-twist-textured polyester yarn.

**WHIPPED-IN FILLING:** See PULLED-IN FILLING.

**WHISKERS:** Fine fibrils or crystals from polymers, metals, etc.

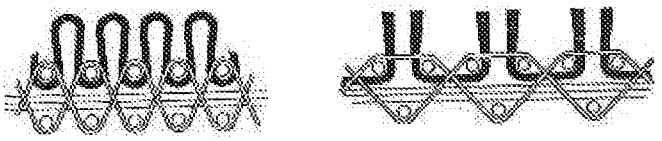
**WHITE GOODS:** A broad term describing any goods that have been finished in the white condition.

**WICKING:** 1. Cord, loosely woven or braided tape, or tubing to be cut into wicks. 2. Dispersing or spreading of moisture or liquid through a given area, vertically or horizontally; capillary action in material.

**WIDTH:** A horizontal measurement of a material. In woven fabric, it is the distance from selvage to selvage, and in flat-knit fabric, the distance from edge to edge.

**WILLIAMS UNIT:** A wet-processing unit for open-width processing of fabric. The fabric passes up and down over rollers in the liquor. The unit is widely used for dyeing, washing, pretreating, and aftertreating.

**WILTON CARPET:** A type of woven carpet in which the pile yarns are woven in as an integral part of the carpet, being held in place by the filling, usually made on a loom with a Jacquard head. The pile may be formed by wires and hooks or by weaving between two backings, in which case, the pile ends are cut to form two separate carpets. Wilton carpets are made in two types: (1) cut pile, e.g., tournia, wilton moquette, plush, velvet, and mottled, and (2) loop pile, e.g., Brussels.



Wilton Loop Pile

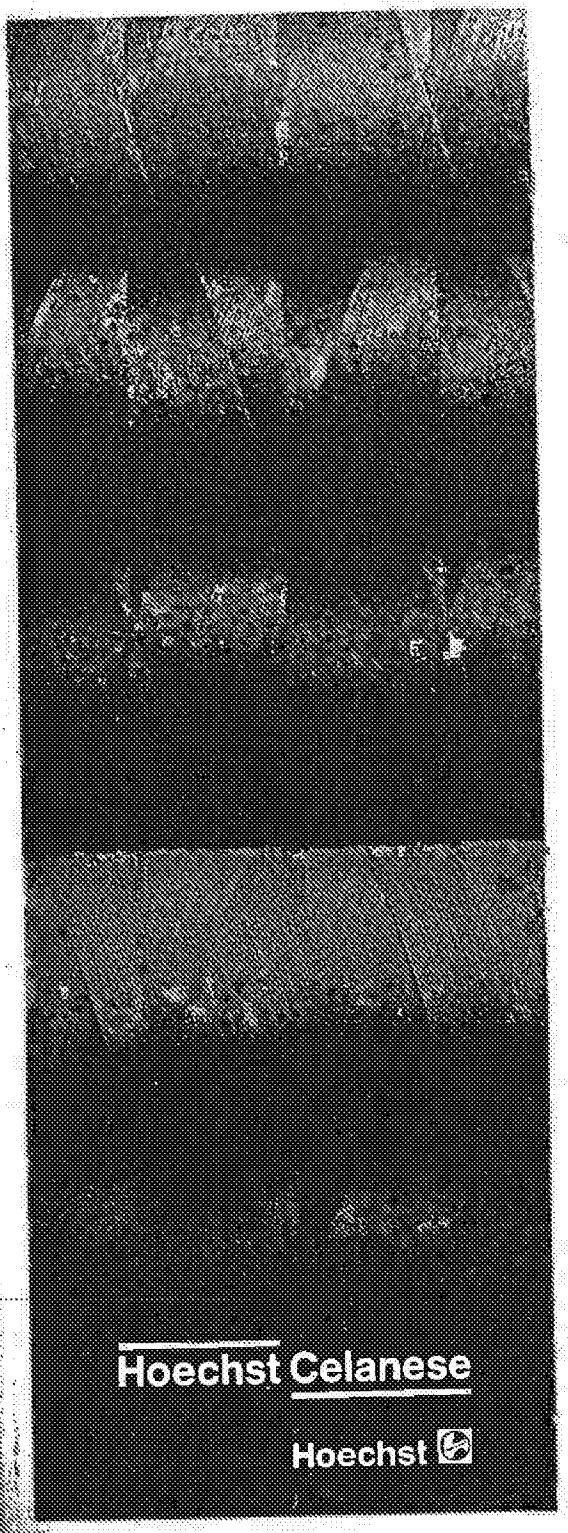
Wilton Cut Pile

Wilton Carpets



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# Dictionary of Fiber & Textile Technology

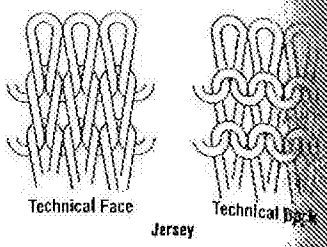



**NOTE: This exhibit is identical to exhibit no. 2016 marked during the December 3, 2013, cross-examination deposition of Sabit Adanur, except for the inclusion of this note and the addition of a footer to comply with 37 CFR §42.63(d).**

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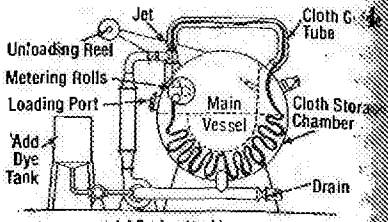
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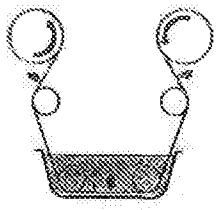


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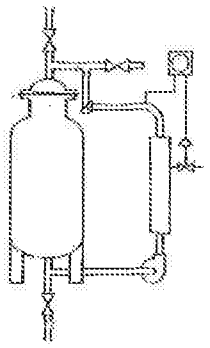


**KERATIN:** The basic protein constituent of wool and other hair fibers.

**KERSEY:** A heavily fulled or milled woolen fabric having a high lustrous nap and a "grainy" face, kersey is frequently used in overcoats.

**KHAKI: 1.** A light yellowish brown. **2.** A khaki-colored cloth of cotton, wool, or combinations of these fibers with manufactured fibers used primarily in military uniforms and workclothes.

**KIER:** A large metal tank, capable of being heated uniformly, used for wet processing.


Kier

**KIER BOILING:** Process of boiling cellulosic materials in alkaline liquors in a kier at or above atmospheric pressure.

**KINK: 1.** In fabrics, a place where a short length of yarn has spontaneously doubled back on itself. **2.** In yarn, see SNARL.

**KINKING:** The doubling back of a yarn on itself to relieve torque imparted by twisting or texturing.

**KINKY THREAD:** See KINK.

**KNEE BREAK-OUT TEST:** A method to evaluate the performance of fabrics, especially boys' wear, when subjected to abrasion, stretch, and impact forces under conditions which simulate ordinary-wear at the knee.

**KNEEING:** Abnormal behavior of a spinning threadline (especially in melt spinning) in which one or more filaments form an angle (knee).

**KNIT-DE-KNIT:** See TEXTURING, Knit-de-Knit Method.

**KNIT FABRIC:** A structure produced by interlooping one or more ends of yarn or comparable material. (Also see KNITTING.)

**KNIT-MISS:** A form of tricot knitting in which yarns on each bar of a two-bar machine are knit at alternate courses only. This type of knitting permits the use of heavy-denier yarns without creating undesirable bulkiness in the fabric.

**KNITTING:** A method of constructing fabric by interlocking series of loops of one or more yarns. The two major classes of knitting are warp knitting and weft knitting, as follows:

**1. Warp Knitting:** A type of knitting in which the yarns generally run lengthwise in the fabric. The yarns are prepared as warps on beams with one or more yarns for each needle. Examples of this type of knitting are tricot, milanese, and raschel knitting.

**Milanese Knitting:** A type of run-resistant warp knitting with a diagonal rib effect using several sets of yarns.

**Raschel Knitting:** A versatile type of warp knitting made in plain and Jacquard patterns; the latter can be made with intricate eyelet and lacy



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patterns and is often used for underwear fabrics. Raschel fabrics are coarser than other warp-knit fabrics, but a wide range of fabrics can be made. Raschel knitting machines have one or two sets of latch needles and up to thirty sets of guides.

**Tricot Knitting:** A run-resistant type of warp knitting in which either single or double sets of yarn are used. (Also see TRICOT.)

**2. Weft Knitting:** A common type of knitting, in which one continuous thread runs crosswise in the fabric making all of the loops in one course. Weft knitting types are circular and flat knitting.

**Circular Knitting:** The fabric is produced on the knitting machine in the form of a tube, the threads running continuously around the fabric.

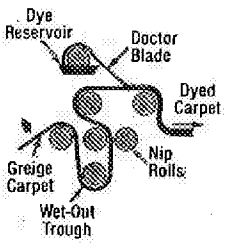
**Flat Knitting:** The fabric is produced on the knitting machine in flat form, the threads alternating back and forth across the fabric. The fabric can be given shape in the knitting process by increasing or decreasing loops. Full-fashioned garments are made on a flat-knitting machine. (Also see FLAT-KNIT FABRIC.)

**KRAFTCORD:** This yarn produced by tightly twisting plant fiber is sometimes used in carpet backings.

**KRAFT PULPS:** Pulps prepared in the alkaline liquor consisting of sodium hydroxide, sodium carbonate, and sodium sulfide. Also called sulfate pulp.

**KRAFT YARN:** A yarn made by twisting a strip of paper manufactured from kraft pulp.

**KROY® SHRINKPROOFING PROCESS:** Continuous process for shrinkproofing wool tops in which there is a direct chlorination step with no intervening chemical reaction followed by anti-chlorination and neutralization. Provides better hand and strength than does conventional shrinkproofing.



Köster Carpet Dyeing Range

**KUSTERS DYEING RANGE:** Continuous dye range for carpets. The unit wets the carpet, applies dyes and auxiliary chemicals by means of a doctor blade, fixes the dyes in a festoon steamer, and washes and dries the carpet in one pass through the range. An optional auxiliary unit may be installed to randomly drip selected dyes onto the background shade for special styling effects. This process is called TAK dyeing.

**LACE:** Ornamental openwork fabric, m manipulation of the fiber by machine

**LACE STITCH:** In this knitting stitch str needles on which they are made to adj an open or a raised effect.

**LAID-IN FABRIC:** A knit fabric in whic effect yarn is tucked in, not knitted into fabric structure. The laid-in yarns are he position by the knitted yarns.

**LAID-IN YARN:** See AXIAL YARN.

**LAMÉ:** A fabric woven with flat metal thre usually silver or gold, that form either background or the pattern.

**LAMINAR FLOW:** Streamline flow in a cous fluid, such as molten polymer, ne solid boundary.

**LAMINATED FABRIC:** 1. Fabric compo of a high-strength reinforcing scrim or l fabric between two plies of flexible the plastic film. Usually open scrims are use permit the polymer to flow through the i stices and bond during calendering. **2.** BONDED FABRIC, 1.

**LAP:** A continuous, considerably compre sheet of fibers that is rolled under pres into a cylindrical package, usually weigl between 40 and 50 pounds. The lap is to supply the card.

**LAPPING:** A term describing the moven of yarn guides between needles, at angles to the needle bar, or laterall relation to the needle bar during warp ting.

**LAP SPLITTING:** A condition caused l lap that will not unwind in carding in same thickness as it was wound in pick This splitting of the sheet of fiber can re in either a thicker or thinner sheet being into the card.


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Skechers EXP13-p. 6565
Skechers v Nike

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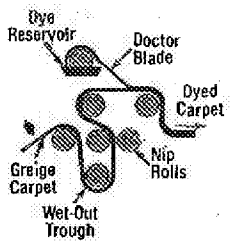
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ıg effects. This process is called TAK



Köster Carpet Dyeing Range



# L

**LACE:** Ornamental openwork fabric, made in a variety of designs by intricate manipulation of the fiber by machine or by hand.

**LACE STITCH:** In this knitting stitch structure, loops are transferred from the needles on which they are made to adjacent needles to create a fabric with an open or a raised effect.

**LAID-IN FABRIC:** A knit fabric in which an effect yarn is tucked in, not knitted into, the fabric structure. The laid-in yarns are held in position by the knitted yarns.

**LAID-IN YARN:** See AXIAL YARN.

**LAMÉ:** A fabric woven with flat metal threads, usually silver or gold, that form either the background or the pattern.

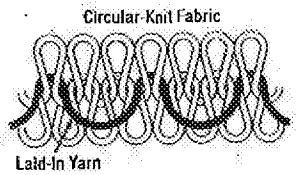
**LAMINAR FLOW:** Streamline flow in a viscous fluid, such as molten polymer, near a solid boundary.

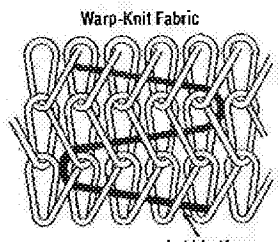
**LAMINATED FABRIC: 1.** Fabric composed of a high-strength reinforcing scrim or base fabric between two plies of flexible thermoplastic film. Usually open scrims are used to permit the polymer to flow through the interstices and bond during calendering. **2.** See BONDED FABRIC, 1.

**LAP:** A continuous, considerably compressed sheet of fibers that is rolled under pressure into a cylindrical package, usually weighing between 40 and 50 pounds. The lap is used to supply the card.

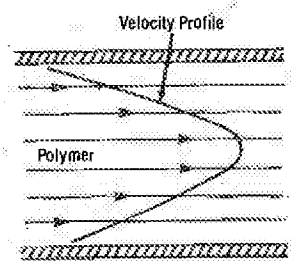
**LAPPING:** A term describing the movement of yarn guides between needles, at right angles to the needle bar, or laterally in relation to the needle bar during warp knitting.

**LAP SPLITTING:** A condition caused by a lap that will not unwind in carding in the same thickness as it was wound in picking. This splitting of the sheet of fiber can result in either a thicker or thinner sheet being fed into the card.

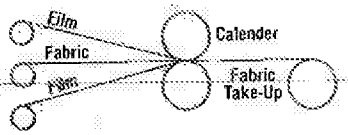


Laid-In Constructions



Laminar Flow



Laminated Fabric Formation



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**NOTE: This exhibit is identical to exhibit no. 2017 marked during the December 3, 2013, cross-examination deposition of Sabit Adanur, except for the inclusion of this note and the addition of a footer to comply with 37 CFR §42.63(d).**

# MAN-MADE FIBER AND TEXTILE DICTIONARY

CELANESE CORPORATION

# MAN-MADE FIBER AND TEXTILE DICTIONARY

CELANESE CORPORATION

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First Edition issued December 1965
Second Edition issued October 1967
Third Edition issued December 1974
Reprinted November 1975
Fourth Edition issued December 1978
Reprinted April 1981

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# FOREWORD

This Man-Made Fiber and Textile Dictionary is presented to you as a convenient reference for textile terminology, with special emphasis on man-made fibers. It attempts to convey as much basic information as is possible without making the book cumbersome. The first and second editions were published to provide a source for Celanese personnel. The third edition was published in response to numerous requests from our customers and others in the textile industry for an up-to-date glossary of terms encountered in the man-made fiber and textile trades. To enhance its usefulness, the dictionary has been revised, expanded, and illustrated.

Generic terms such as *dyeing* and *knitting* are handled comprehensively with specific terms presented under one heading. The more widely used man-made fibers are listed by their Federal Trade Commission generic names and definitions, in most cases followed by a brief description of their manufacture, characteristics, and applications. Our more familiar fiber and fabric trademarks, along with those of Fiber Industries, our subsidiary, are listed in the Appendix. Also given in the Appendix are abbreviations, equivalent weights and measures, and various conversion tables and formulas needed by the textile technologist.

We hope that this dictionary will familiarize the reader with the language of textiles. Only through you, the user, can we determine its value, and we therefore invite your comments.

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**CHELATING AGENT:** A compound that will inactivate a metallic ion by making it an integral part of an inner ring structure. The metal is attached by coordinate links to two or more nonmetal atoms in the same molecule.

**CHEMICAL CRIMPING:** A crinkled or puckered effect in fabric obtained by printing sodium hydroxide onto the goods in a planned design. When the material is washed, the part to which the paste has been applied will shrink and cause untreated areas to pucker. The same effect is obtained with a caustic resist print and a sodium hydroxide bath.

**CHEMICAL FIBER:** See MAN-MADE FIBER.

**CHEMICAL STABILITY:** Degree of resistance of a material to chemicals, such as acids, bases, solvents, oils, and oxidizing agents, and to chemical reactions, including those catalyzed by light.

**CHENILLE: 1.** A yarn with a fuzzy pile protruding from all sides, cut from a woven chenille weft fabric. Chenille yarns are made from all fibers, and they are used as filling in fabrics and for embroidery, fringes, and tassels. **2.** Fabric woven with chenille yarns. (Also see TUFTED FABRIC.)

**CHEVIOT:** A rugged tweed made from uneven yarn, this fabric usually has a rather harsh hand.

**CHEVRON:** A broad term applied to prints in zigzag stripes or to herringbone weaves.

**CHIFFON:** A plain-weave, lightweight, sheer, transparent fabric made from fine, highly twisted yarns. It is usually a square fabric, i.e., having approximately the same number of ends and picks and the same count in both warp and filling.

**CHINCHILLA CLOTH:** A heavy, twill-weave fabric with a napped surface that is rolled into little tufts or nubs. The material is frequently double faced with a knitted or woven plaid back. Chinchilla cloth is used primarily in coats.

**CHINO:** A cotton or cotton blend twill used by armies throughout the world for summer-weight uniforms. Chino is frequently dyed khaki.

**CHINTZ:** A glazed fabric produced by friction calendering. Unglazed chintz is called cretonne.

**CHIPS: 1.** The form of polymer feedstock used in fiber production. Also see FLAKE. **2.** The feedstock for a pulp digestor. **3.** A defect in a nonwoven fabric.

**CHLORINE RETENTION:** A characteristic of several resins and textile finishes whereby they retain some of the chlorine from bleach. On heating of the goods, the chlorine forms hydrochloric acid, causing tendering of the cloth. This is especially true of certain wrinkle resistant finishes for cotton and rayon.

**CHOKED COILER:** A condition in carding or drawing in which sliver is either puffy, badly condensed, or very uneven, leading to overloading of the coiler trumpets and causing work stoppage.



**CHOKED FLYERS:** A situation in which roving will not pass through the flyer channels because of heavy or cockled conditions caused by such factors as uneven drafting, waste, overcut fibers, and improper finish.

**CHROMATICITY:** The quality of color expressed as a function of wavelength and purity.

**CHROMATOGRAPHY:** The generic name of a group of processes for separating and analyzing mixtures of chemical compounds. The separation depends on the redistribution of molecules of the mixture between phases, one of which is thin, often reaching molecular dimensions. For this reason, molecular size and shape are important in the separation and extremely subtle separations are possible.

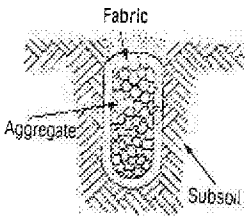
**CIRCULAR-KNIT FABRIC:** A tubular weft-knit fabric made on a circular-knitting machine.

**CIRCULAR KNITTING:** See KNITTING.

**CIRE:** A brilliant patent leather effect produced by application of wax, heat, and pressure.

**CIVIL ENGINEERING FABRICS:** A broad term referring to a variety of fabrics used in construction.

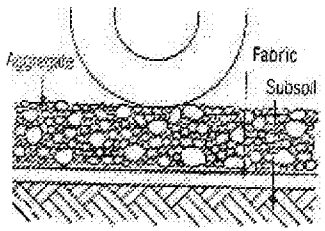
**Drainage Fabrics:** Fabrics used as the filter medium in subgrade drainage structures. The fabric can be wrapped around a drain pipe or coarse stone to from a subsurface drain; the fabric allows water to pass freely from the soil into the drain but prevents soil particles from migrating into the drain system.



Drainage Fabric

**Erosion Control Fabrics:** Fabrics used in the stabilization of embankments and the containment of silt run-off from erodible slopes. In embankment stabilization, the fabric functions as a filter medium behind stabilizing rip-rap revetments. In siltation control, the fabric acts as a filter to contain silt while allowing excess water to drain freely from the site.

**Ground Stabilization Fabrics:** Fabrics used in the construction of access roads, railroads, parking and storage areas over soft, unstable soils. The fabric is placed between the subgrade and the stabilizing fill material where it provides separation of subsoil and fill, filtration of moisture at the subsoil/fill interface and added tensile reinforcement of the compacted fill.



Ground Stabilization Fabric

**CLAMPS:** The parts of a testing machine which are used to hold a specimen while it is subjected to force. (Also called jaws.)

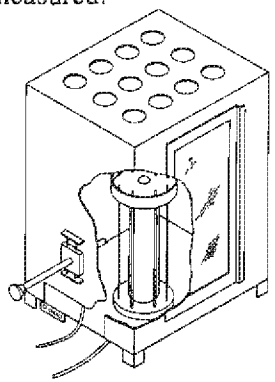
**CLARITY: 1.** In general, the optical property of being clear. **2.** In acetate manufacture, a measure of the appearance of dope solutions, indicating



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**Methenamine Pill Test:** A test for the flame resistance of carpets or rugs in which a methenamine tablet is ignited on a test sample under controlled conditions and the size of the burn hole is measured.

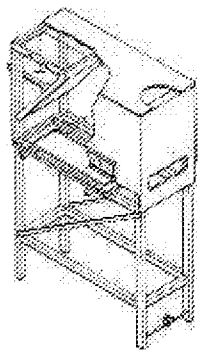
**Mushroom Apparel Flammability Test:** This test method involves igniting a cylinder of fabric around a core containing heat sensors. The rate of heat transfer from the burning material to the sensors is measured.



Mushroom Apparel Flammability Tester

**Radiant Panel Test:** A test for the flammability of carpets or rugs in which the specimen is mounted on the floor of the test chamber and exposed to intense radiant heat from above. The rate of flame spread is assessed.

**Smoke Chamber Test:** This method assesses the smoke generating characteristics of a sample due to pyrolysis and combustion by measuring the attenuation of a light beam by smoke accumulating in a closed chamber under controlled conditions. Results are expressed in terms of specific optical density.



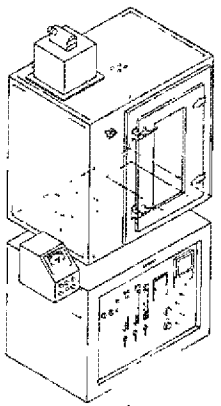
Radiant Panel Test Apparatus

**Tablet Test:** See FLAMMABILITY TESTS, Methenamine Pill Test.

**Thermo-Man:** This instrumented mannequin system, interfaced with a computer, allows full-scale testing of garments for protection capability or degree of flammability. The system was developed by Accurex Corporation for the U. S. Air Force and is exceedingly expensive.

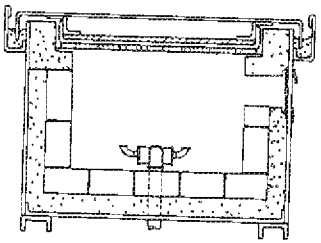
**Tunnel Test:** Test for the flammability of floor coverings in which a sample is placed on the ceiling of a tunnel of specified dimensions and ignited under controlled conditions to determine the extent to which it will burn. (Also sometimes called Steiner tunnel test.)

**Vertical Flame Test:** A test for flame resistance in which a specimen is mounted in a vertical holder and exposed to an open flame for a specific time. Flaming time and char length after the flame extinguishes are measured.

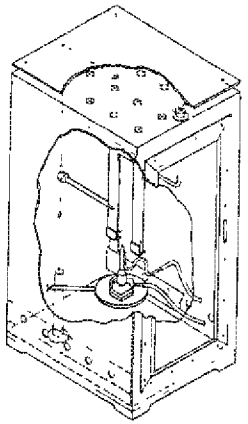


Smoke Chamber Test Apparatus





Tunnel Test Apparatus



Vertical Flame Test Apparatus

**FLANGE CRIMPING:** Simultaneous crimping of two ends of yarn by using heated snubber pins, then combining both ends on a draw roll after they contact a rubber flange on the draw roll.

**FLANNEL:** Medium weight plain or twill weave, slightly napped fabric, usually of wool, but may be made of other fibers.

**FLAPPER:** The movable side of a fiber-crimping chamber which periodically opens or flaps to permit crimped fiber to be expelled from the chamber.

**FLASH AGEING:** A process for rapid reduction and fixation of vat dyes obtained when the printed fabric is padded with caustic soda and sodium hydrosulfite and immediately steamed in air-free steam.

**FLASH SPINNING:** See SPINNING, 5.

**FLAT:** In carding, one of the parts forming an endless chain which partially surrounds the upper portion of the cylinder and gives the name to a revolving flat card. Flats are made of cast iron, T-shaped in section, about 1 inch wide, and as long as the width of the cylinder. One side of the flat is nearly covered with fine card clothing, and the flats are set close to the teeth of the cylinder so as to work point against point. A chain of flats contains approximately 110 flats and operates at a surface speed of about 3 inches per minute.

**FLAT ABRASION TESTER:** See STOLL-QUARTERMASTER UNIVERSAL WEAR TESTER.

**FLAT DUCK:** See DUCK.

**FLAT-KNIT FABRIC:** 1. A fabric made on a flat-knitting machine, as distinguished from tubular fabrics made on a circular-knitting machine. While tricot and milanese warp-knit fabrics (non-run) are knit in flat form, the trade uses the term flat-knit fabric to refer to weft-knit fabrics made on a flat machine, rather than warp-knit fabrics. 2. A term used in the underwear trade for plain-stitch fabrics made on a circular-knitting machine. These fabrics have a flat surface and are often called flat-knit



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fabrics to differentiate them from ribbed-knit or Swiss rib fabrics. In this case, the term refers to the texture, not the type of machine on which the fabric was knit.

**FLAT KNITTING:** See KNITTING.

**FLAT-KNITTING MACHINE:** A weft-knitting machine with needles arranged in a straight line in a flat plate called the bed. The yarn travels alternately back and forth, and the fabric may be shaped or varied in width, as desired, during the knitting process. Lengthwise edges are selvages. Flat-knitting machines may be divided into two types: latch-needle machines for sweaters, scarves, and similar articles and fine spring-needle machines for full-fashioned hosiery.

**FLATSPOTTING:** A characteristic of certain tire cords. It occurs with all materials but is more noticeable with nylon cord and is associated with nylon cord by users. Nylon exerts a shrinkage force as it becomes heated in tire operation. When the tire is stopped under load, the cord in the road-contact portion of the tire is under less tension than that in other portions of the tire, and it shrinks to conform to the flat surface of the road. When cooled in this position, the cord maintains the flat spot until it reaches its glass transition temperature as it will in use.

**FLAT-TOP CARD:** See REVOLVING FLAT CARD.

**FLAX:** The plant from which the cellulosic fiber linen is obtained.

**FLEECE FABRIC:** A fabric with a thick, heavy surface resembling sheep's wool. It may be a pile or napped fabric of either woven or knit construction.

**FLEX ABRASION TESTER:** See STOLL-QUARTERMASTER UNIVERSAL WEAR TESTER.

**FLEXIBILITY:** **1.** The ability to be flexed or bowed repeatedly without rupturing. **2.** A term relating to the hand of fabric, referring to ease of bending and ranging from pliable (high) to stiff (low).

**FLEXURAL FATIGUE:** A physical property expressed by the number of times a material can be bent on itself through a prescribed angle before it ruptures or loses its ability to recover.

**FLEXURAL RIGIDITY:** This measure of a material's resistance to bending is calculated by multiplying the material's weight per unit area by the cube of its bending length.

**FLOAT:** **1.** The portion of a warp or filling yarn that extends over two or more adjacent filling picks or warp ends in weaving for the purpose of forming certain designs. **2.** In a knit fabric, a portion of yarn which extends for some length without being knitted in. **3.** A fabric defect consisting of an end lying or floating on the cloth surface instead of being woven in properly. Floats are usually caused by slubs, knot-tails, knots, or fly waste, or sometimes by ends being drawn in heddle eyes incorrectly or being twisted around heddle wires.

**FLOATING ENDS:** See FLOAT, 3.

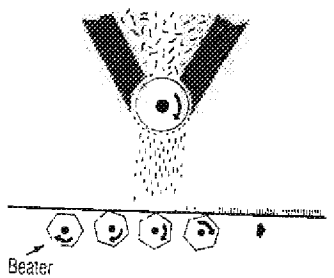
**FLOAT STITCH:** See MISS-STITCH.



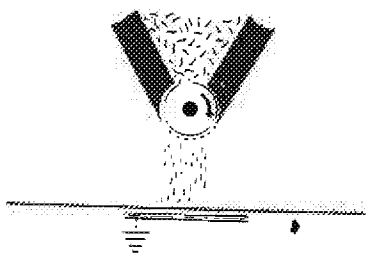
**FLOCCULATING:** Coagulating or coalescing a material into a small, loosely aggregated mass.

**FLOCK:** The material obtained by reducing textile fibers to fragments by cutting or grinding. There are two main types: precision cut flock, where all fiber lengths are approximately equal, and random cut flock, where the fibers are ground or chopped to produce a broad range of lengths.

**FLOCKING:** A method of cloth ornamentation in which adhesive is printed or coated on a fabric, and finely chopped fibers are applied all over by means of dusting, air-blasting, or electrostatic attraction. In flock printing, the fibers adhere only to the printed areas and are removed from the unprinted areas by mechanical action.



Mechanical Flocking


Electrostatic Flocking

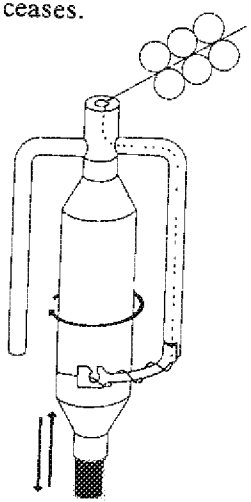
**FLUFFING:** A term describing the appearance of a carpet after loose fiber fragments left during manufacture have worked their way to the surface. Fluffing is not a defect; it is simply a characteristic of new carpets which disappears with vacuuming.

**FLUORESCENCE:** Emission of electromagnetic radiation, usually as visible light, that is caused by the flow of energy into the emitting body. The emission ceases abruptly when the excitation ceases.

**FLY:** The short, waste fibers that are released into the air in textile processing operations such as picking, carding, spinning, and weaving.

**FLYER:** **1.** A device used to insert twist into slubbing, roving, or yarn, and to serve as a guide for winding it onto a bobbin. The flyer is shaped like an inverted U that fits on the top of the spindle and revolves with it. One arm of the U is solid and the other is hollow. The yarn enters through the top of the hollow arm, travels downward, and emerges at the bottom where it is wound around a presser finger onto the take-up package. **2.** See LOOM FLY.

**FLYER SPINNING:** A method of spinning by means of a driven flyer. It is used primarily for spinning worsted and coarser yarns. (Also see FLYER, 1.)


Flyer Spinning



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**KNITTING:** A method of constructing fabric by interlocking series of loops of one or more yarns. The two major classes of knitting are warp knitting and weft knitting, as follows:

**1. Warp Knitting:** A type of knitting in which the yarns generally run lengthwise in the fabric. The yarns are prepared as warps on beams with one or more yarns for each needle. Examples of this type of knitting are tricot, milanese, and raschel knitting.

**Milanese Knitting:** A type of run-resistant warp knitting with a diagonal rib effect using several sets of yarns.

**Raschel Knitting:** A versatile type of warp knitting made in plain and Jacquard patterns; the latter can be made with intricate eyelet and lacy patterns and is often used for underwear fabrics. Raschel fabrics are coarser than other warp-knit fabrics, but a wide range of fabrics can be made. Raschel knitting machines have one or two sets of latch needles and up to thirty sets of guides.

**Tricot Knitting:** A run-resistant type of warp knitting in which either single or double sets of yarn are used. (Also see TRICOT.)

**2. Weft Knitting:** A common type of knitting, in which one continuous thread runs crosswise in the fabric making all of the loops in one course. Weft knitting types are circular and flat knitting.

**Circular Knitting:** The fabric is produced on the knitting machine in the form of a tube, the threads running continuously around the fabric.

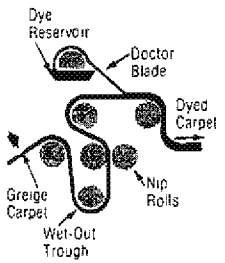
**Flat Knitting:** The fabric is produced on the knitting machine in flat form, the threads alternating back and forth across the fabric. The fabric can be given shape in the knitting process by increasing or decreasing loops. Full-fashioned garments are made on a flat-knitting machine. (Also see FLAT-KNIT FABRIC.)

**KRAFTCORD:** This yarn produced by tightly twisting plant fiber is sometimes used in carpet backings.

**KRAFT PULPS:** Pulps prepared in the alkaline liquor consisting of sodium hydroxide, sodium carbonate, and sodium sulfide. Also called sulfate pulp.

**KRAFT YARN:** A yarn made by twisting a strip of paper manufactured from kraft pulp.

**KÜSTERS DYEING RANGE:** Continuous dye range for carpets. The unit wets the carpet, applies dyes and auxiliary chemicals by means of a doctor blade, fixes the dyes in a festoon steamer, and washes and dries the carpet in one pass through the range. An optional auxiliary unit may be installed to randomly drip selected dyes onto the background shade for special styling effects. This process is called TAK dyeing.



Küster Carpet Dyeing Range



# L

**LACE:** Ornamental openwork fabric, made in a variety of designs by intricate manipulation of the fiber by machine or by hand.

**LACE STITCH:** In this knitting stitch structure, loops are transferred from the needles on which they are made to adjacent needles to create a fabric with an open or a raised effect.

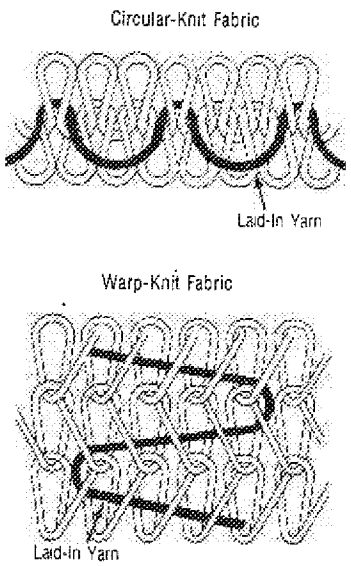
**LAID-IN FABRIC:** A knit fabric in which an effect yarn is tucked in, not knitted in, the fabric structure. The laid-in yarns are held in position by the knitted yarns.

**LAMÉ:** A fabric woven with flat metal threads, usually silver or gold, which form either the background or the pattern.

**LAMINAR FLOW:** Streamline flow in a viscous fluid, such as molten polymer, near a solid boundary.

**LAMINATED FABRIC:** See BONDED FABRIC, 1.

**LAP:** A continuous, considerably compressed sheet of fibers which is rolled under pressure into a cylindrical package, usually weighing between 40 and 50 pounds. The lap is used to supply the card.



Laid-In Constructions

**LAPPING:** A term describing the movement of yarn guides between needles, at right angles to the needle bar, or laterally in relation to the needle bar during warp knitting.

**LAP SPLITTING:** A condition caused by a lap which will not unwind in carding in the same thickness as it was wound in picking. This splitting of the sheet of fiber can result in either a thicker or thinner sheet being fed into the card.

**LASE:** An acronym for load at specified elongation: the load required to produce a given elongation of a yarn or cord.

**LASER:** A device for producing an intense beam of coherent light. It is used for cutting, spectroscopy, photography, biomedical investigations, etc.

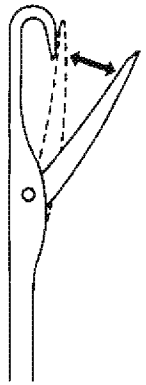
**LASHED-IN FILLING:** See PULLED-IN FILLING.

**LASTRILE FIBER:** A manufactured fiber in which the fiber-forming substance is a copolymer of acrylonitrile and a diene composed of at least 10% by weight but not more than 50% by weight of acrylonitrile (—$CH_2$—CHCN—) units (FTC definition).



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**LATCH NEEDLE:** One of the two types of knitting machine needles. The latch needle has a small terminal hook with a latch which pivots automatically in knitting to close the hook. The fabric loop is cast off. The latch then opens, allowing a new loop to be formed by the hook, and loop-forming and casting-off proceed simultaneously. (Also see SPRING NEEDLE.)



Head of Latch Needle

**LATENT CRIMP:** Crimp in fibers that can be developed by a specific treatment. Fibers are prepared specially to crimp when subjected to specific conditions, e.g., tumbling in a heated chamber or wet processing.

**LATEX:** A milky fluid found in certain cells of some families of seed plants. Latex is the raw material from which rubber is made.

**LAWN:** A light thin cloth made of carded or combed yarns, this fabric is given a crease-resistant, crisp finish. Lawn is crisper than voile but not as crisp as organdy.

**LEA:** **1.** One-seventh of a 840-yard cotton hank, i.e., 120 yards. **2.** A standard skein with 80 revolutions of 1.5 yards each (total length of 120 yards). It is used for strength tests. **3.** A unit of measure, 300 yards, used to determine the yarn number of linen yarn. The number of leas in one pound is the yarn number.

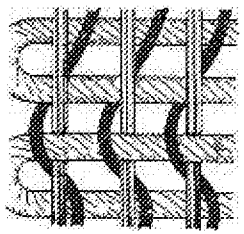
**LEACHING:** The removal of any substance or dye from textiles by the percolating action of a suitable liquid.

**LEA COUNT CONSTANT:** See BREAK FACTOR.

**LEADER MARK:** See DECATING MARK.

**LEA PRODUCT:** See BREAK FACTOR.

**LENO WEAVE:** A weave in which the warp yarns are arranged in pairs with one twisted around the other between picks of filling yarn as in marquisette. This type of weave gives firmness and strength to an open-weave fabric and prevents slippage and displacement of warp and filling yarns.



Full Leno Weave

**LET-OFF MOTION:** A device for controlling the delivery and tension of the warp during weaving.

**LEVELING:** Migration leading to uniform distribution of dye in a dyed material. Leveling may be a property of the dye or it may require chemical assistance.

**LEVEL LOOP:** A term describing a tufted or woven carpet with uncut, equal-length loops composing the pile surface.



**LICKERIN:** A part of the feed mechanism of the card. It consists of a hollow, metal roll with a spirally grooved surface containing a special saw-toothed wire. The lickerin opens up the tufts of the picker lap as it is fed to the card and transfers the fibers to the main cylinder.

**LICKERIN LOADING:** A condition whereby fibers are imbedded in the lickerin wire clothing so as to resist transfer to the cylinder clothing.

**LIGHT END:** **1.** See FINE END, 1. **2.** The lower boiling fraction in distillation.

**LIGHTFASTNESS:** The degree of resistance of dyed textile materials to the color-destroying influence of sunlight. Two methods of testing are in use: (1) exposure to sunlight, either directly or under glass, and (2) accelerated testing in a laboratory apparatus equipped with any of several types of artificial light sources.

**LIGNIN:** The major noncarbohydrate portion of wood. It is an amorphous polymeric substance that cements the fibrous portions together.

**LIMITING OXYGEN INDEX:** A relative measure of flammability that is determined as follows: A sample is ignited in an oxygen/nitrogen atmosphere. The oxygen content is adjusted until the minimum required to sustain steady burning is found. The higher the value, the lower the flammability.

**LINEAR DENSITY:** Mass per unit length expressed as grams per centimeter, pounds per foot, or equivalent units. It is the quotient obtained by dividing the mass of a fiber or yarn by its length.

**LINEN:** Cellulosic fibers derived from the stem of the flax plant or a fabric made from these fibers. Linen fibers are much stronger and more lustrous than cotton; they yield cool, absorbent fabrics that wrinkle easily. Fabrics with linen-like texture and coolness but with good wrinkle resistance can be produced from man-made fibers and blends.

**LINEN LEA:** The number of 300-yard hanks contained in one pound.

**LINET:** A French-made lining fabric of unbleached linen.

**LINK-AND-LINK:** See PURL.

**LINON À JOUR:** A gauze-like linen fabric used as dress goods.

**LINT BALL:** See BALLING UP.

**LINTERS:** The short cotton fibers which are not removed from the seed during the first ginning. The linters are cut from the seed and used as a source for cellulose derivatives such as nitrocellulose or viscose rayon.

**LIQUOR RATIO:** In wet processing the ratio of the weight of liquid used to the weight of goods treated.

**LISLE YARN:** A high-quality cotton yarn made by plying yarns spun from long combed staple. Lisle is singed to give it a smooth finish.

**LIVING RING:** See REVOLVING SPINNING RING.

**LOAD-DEFORMATION CURVE:** A graphical representation of the relationship between the change in dimension (in the direction of the



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**WARP-KNIT FABRIC:** A fabric that is knit with the yarns running lengthwise, e.g., tricot, milanese, and raschel.

**WARP KNITTING:** See KNITTING, 1.

**WARP PILE:** The extra set of warp yarns that forms the surface in a double-woven pile fabric, including types such as velvet and velour. Upholstery fabrics such as mohair, plush and friezé are produced by this method. (Also see PILE and VELVET FABRIC.)

**WARP PRINTING:** See PRINTING.

**WARP SHEET:** A sheet comprising several thousand ends which are combined to make up the warp during preparation for weaving or warp knitting. (Also see WARP.)

**WARP SIZING:** See SLASHING.

**WARP STREAKS:** A fabric fault which shows as bands or streaks running warpwise. Warp streaks should not be confused with reed marks.

**WASH-AND-USE:** A term applied to fabrics and household textiles which can be washed and placed in normal service repeatedly with little or no ironing. (Also see WASH-AND-WEAR.)

**WASH-AND-WEAR:** A generic term applied to garments which satisfactorily retain their original neat appearance after repeated wear and suitable home laundering with little or no pressing or ironing. Thus, a wash-and-wear garment will be essentially free from undesirable wrinkles both during wear and after laundering and will retain any original pressed-in creases or pleats. The garments should meet normal consumer demands for such properties as durability, color, stability, and shrinkage.

The wash-and-wear performance of a fabric or garment depends on several factors, including the types and amounts (percentages) of fibers used, the fabric construction, the finishing treatment, the presence of a colored pattern (either woven or printed), and the methods used for washing and drying. All of these factors contribute to the overall performance and determine, in any specific instance, how closely a fabric or garment will approach acceptance. This situation shows up in the variable behavior of a specific fabric or garment under different conditions and is reflected in the use of specific commercial terms. (Also see EASE-OF-CARE and PERMANENT PRESS.)

**WASH-CREASE RESISTANT:** See WASH-WRINKLE RESISTANT.

**WASHFASTNESS:** The resistance of a dyed fabric to loss of color or change in properties during home or commercial laundering.

**WASH-WRINKLE RESISTANT:** A term applied to textile fabrics which satisfactorily maintain their appearance by recovery from sharp folds imposed during laundering.

**WASTE:** By-products created in the manufacture of fibers, yarns, and fabrics.

**WATER IMBIBITION:** See IMBIBITION.

**WATER-JET LOOM:** See JET LOOM.



**WATERLESS DYEING:** See DYEING, Solvent Dyeing.

**WATERPROOF:** A term applied to materials that are impermeable to water; waterproof fabrics have had all their pores closed and are also impermeable to air and very uncomfortable.

**WATER-REPELLENT:** A term applied to fabrics that can shed water but are permeable to air and comfortable to wear. These fabrics are produced by treating the material with a resin, wax, or plastic finish which is not completely permanent.

**WAVY CLOTH:** See BAGGY CLOTH.

**WAVY SELVAGE:** See SLACK SELVAGE.

**WEAK WEB:** A web of fiber which, when being transferred from the card doffer to the calender rolls to form sliver, does not have sufficient strength from fiber cohesion or clinging entanglement to hold itself together while forming a continuous bridge in processing.

**WEAK YARN:** A yarn which is found to be either below standard breaking specifications or to be weak enough to cause an abnormally high degree of stops in textile processing.

**WEAR TRIAL:** A test for fabric wear, abrasion, flexibility, washing, crushing, creasing, etc., in which the fabric is made into a garment and actually worn for a specific time, then assessed for performance.

**WEATHER-OMETER:** An instrument used in measuring the weather resistance of textiles. It can simulate various weather conditions such as sunlight, rain, dew, and thermal shock. Weathering is accelerated to the degree that the effects of years under normal conditions are attained in only a few days.

**WEAVE:** A system or pattern of intersecting warp and filling yarns. There are three basic weaves: plain, twill, and satin. All other weaves are derived from one or more of these types. (Also see PLAIN WEAVE, TWILL WEAVE, and SATIN WEAVE.)

**WEAVING:** The method or process of interlacing two yarns of similar materials so that they cross each other at right angles to produce woven fabric. The warp yarns, or ends, run lengthwise in the fabric, and the filling threads (weft), or picks, run from side to side. Weaving may be done on a power or hand loom or by several hand methods. (Also see LOOM and WOVEN FABRIC.)

**WEB:** 1. The wide film of fibers that is delivered from the card. 2. A similar product of other web-forming equipment, such as that formed by air deposition and used to make nonwoven fabrics. 3. A term loosely used for lightweight nonwoven fabrics. 4. See WEBBING.

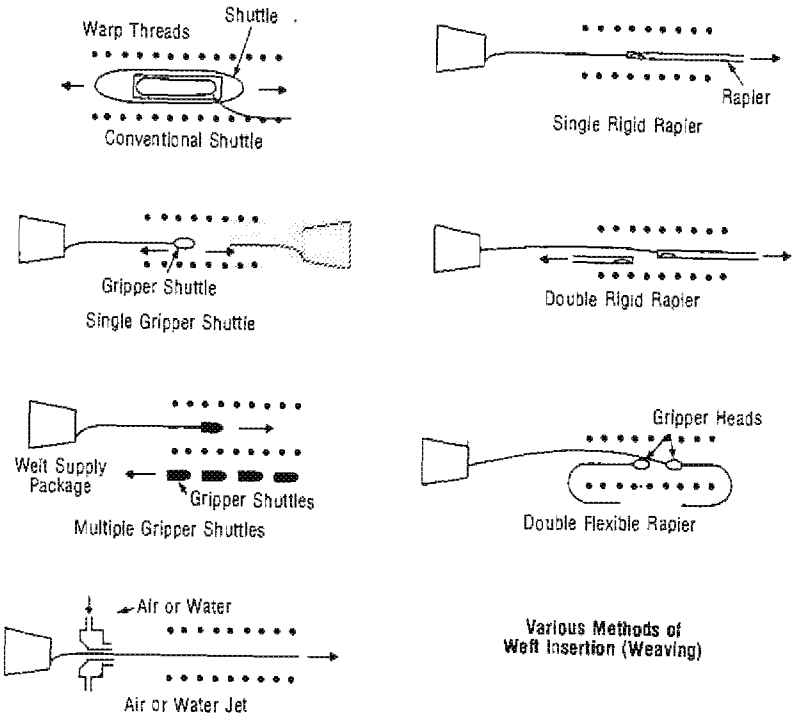
**WEBBING:** Strong, narrow fabric, closely woven in a variety of weaves and principally used for belts and straps which will have to withstand strain (e.g., automobile seat belts, reinforcement of upholstery, suspenders, etc.). Elastic webbing is made with spandex or rubber yarns in part of the warp or filling, or both. (Also see WEB, 2.)

**WEFT:** See FILLING.



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**WEFT INSERTION:** 1. Any one of the various methods, shuttle, rapier, water jet, etc., for making a pick during weaving. 2. A marriage of warp knitting and weaving brought about by inserting a length of yarn across the width of the knitting elements and fastening the weft yarn between the needle loop and the underlap. Also see METAP WEAVE-KNIT PROCESS.

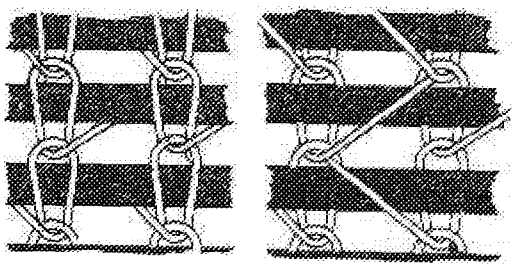



Various Methods of Weft Insertion (Weaving)

**WEFT-KNIT FABRIC:** See CIRCULAR-KNIT FABRIC and FLAT-KNIT FABRIC, 1.

**WEFT KNITTING:** See KNITTING, 2.

**WEIGHTED SILK:** Silk that has been treated with metallic salts during dyeing and finishing to increase the fabric's weight and improve its drape. Over-weighting can cause deterioration of the fabric.




Fabrics Produced by Weft Insertion during Warp Knitting

**WELT:** 1. A finished edge on knit goods, especially hosiery. In women's stockings, it is a wide band knitted from heavier yarn than the leg and



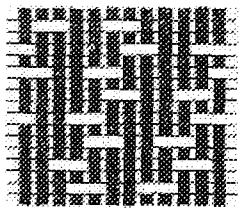
folded on itself. 2. A small cord covered with fabric and sewn along a seam or border to add strength. 3. A seam made by folding the fabric double, generally over a cord, and sewing it. 4. A term sometimes used for pique.

**WET FORMING:** The production of a nonwoven fabric web from an aqueous suspension of fibers.

**WET SPINNING:** See SPINNING, 2.

**WET STRENGTH:** The measurement of the strength of a material when it is saturated with water, normally relative to the dry strength.

**WHIPCORD:** A compact woven fabric having a very steep twill on the face of the goods. Whipcord is used in dress woolens, worsteds, or wool blends and in many types of uniforms.



Whipcord

**WHIPPED CREAM:** A type of crepe fabric produced from false-twist-textured polyester yarn.

**WHIPPED-IN FILLING:** See PULLED-IN FILLING.

**WHISKERS:** Fine fibrils or crystals from polymers, metals, etc.

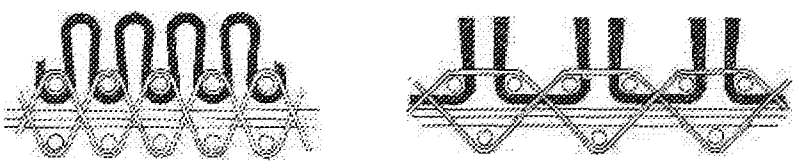
**WHITE GOODS:** A broad term describing any goods that have been finished in the white condition.

**WICKING:** 1. Cord, loosely woven or braided tape, or tubing to be cut into wicks. 2. Dispersing or spreading of moisture or liquid through a given area, vertically or horizontally; capillary action in material.

**WIDTH:** A horizontal measurement of a material. In woven fabric, it is the distance from selvage to selvage, and in flat-knit fabric, the distance from edge to edge.

**WILLIAMS UNIT:** A wet-processing unit for open-width processing of fabric. The fabric passes up and down over rollers in the liquor. The unit is widely used for dyeing, washing, pretreating, and aftertreating.

**WILTON CARPET:** A type of woven carpet in which the pile yarns are woven in as an integral part of the carpet, being held in place by the filling, usually made on a loom with a Jacquard head. The pile may be formed by wires and hooks or by weaving between two backings, in which case, the pile ends are cut to form two separate carpets. Wilton carpets are made in two types: (1) cut pile, e.g., tournia, wilton moquette, plush, velvet, and mottled, and (2) loop pile, e.g., Brussels.



Wilton Loop Pile

Wilton Cut Pile

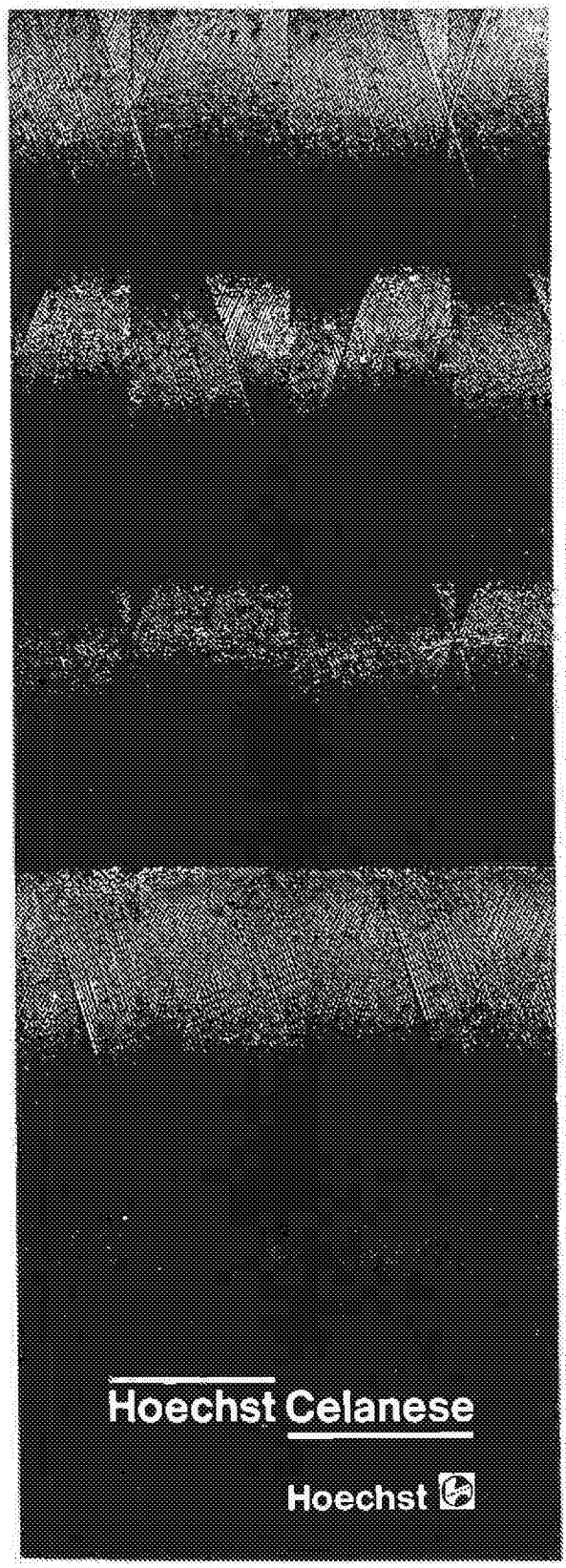
Wilton Carpets



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# Dictionary of Fiber & Textile Technology




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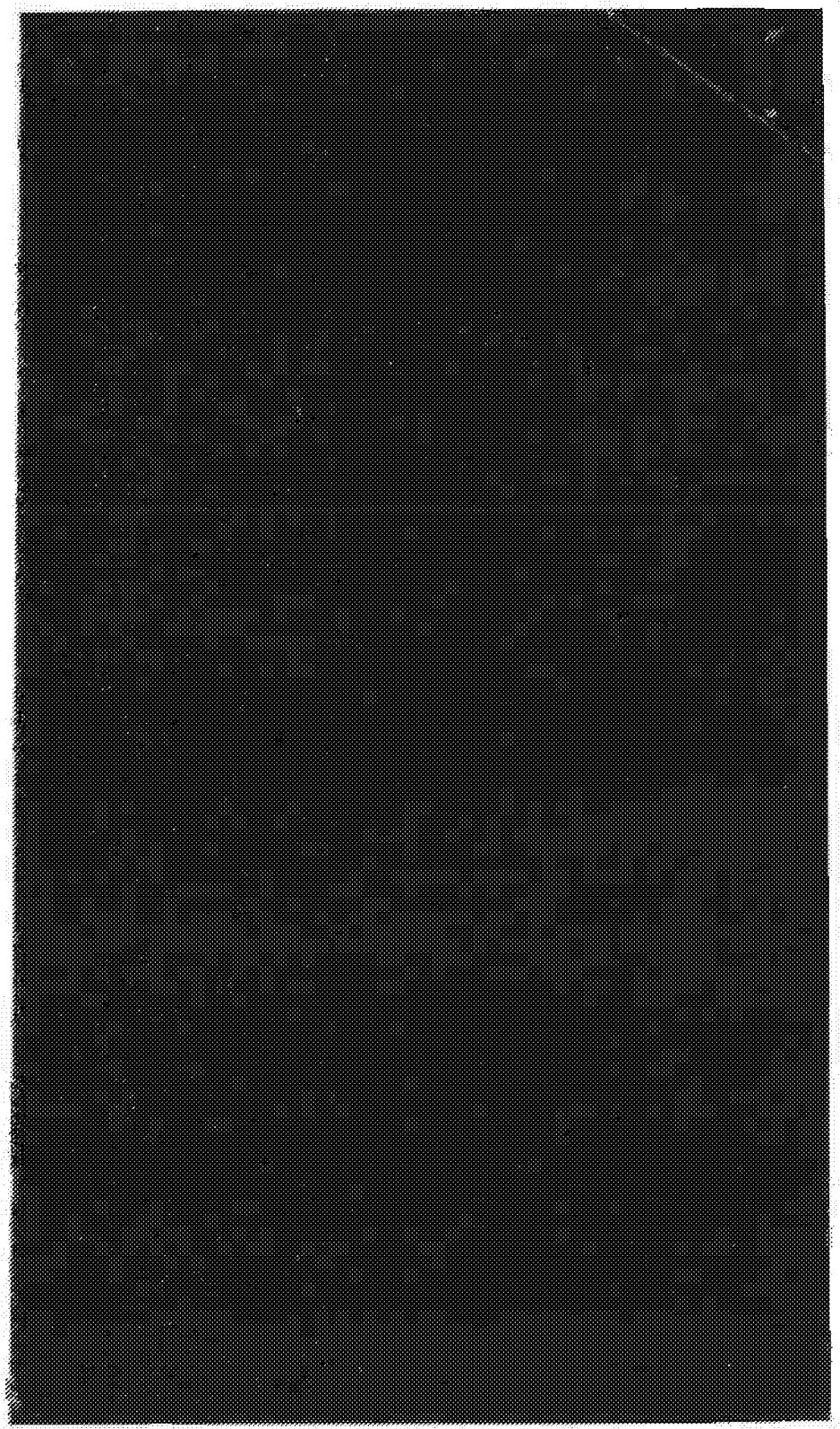
**NOTE: This exhibit is identical to exhibit no. 2018 marked during the December 3, 2013, cross-examination deposition of Sabit Adanur, except for the inclusion of this note and the addition of a footer to comply with 37 CFR §42.63(d).**



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DR. SABIT ADANUR

# Dictionary
## Of Fiber & Textile Technology



Hoechst Celanese

Hoechst

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# Foreword

This *Dictionary of Fiber and Textile Technology* is intended to be a convenient reference for textile terminology. Although it covers all types of textile terms broadly, its special emphasis is on manufactured fibers—what they are, how they are made, and how they are used.

Formerly the *Man-Made Fiber and Textile Dictionary*, the first and second editions were published by the former Celanese Corporation* to provide a source for employees. The third edition was published in response to numerous requests from customers and others in the textile industry for an up-to-date glossary of terms encountered in the manufactured fiber and textile trades. To enhance its usefulness, the dictionary was expanded and illustrated.

This current edition has been updated and further expanded to cover recent developments in fiber-forming polymers, new commercially manufactured fibers, textile equipment advances, and new applications for textile materials such as geotextiles and advanced composites. New diagrams have been added to illustrate these developments. We have attempted to convey as much basic information as is possible without making the book cumbersome.

As in previous editions, generic terms such as dyeing and knitting are handled comprehensively with specific terms presented under one heading. The more widely used manufactured fibers are listed by their Federal Trade Commission generic names and definitions, in most cases followed by a brief description of their manufacture, characteristics, and applications. In the Appendix are abbreviations, equivalent weights and measures, and various conversion tables and formulas needed by the textile technologist.

We hope that this dictionary will help to familiarize you with the language of textiles. Only through you, can we determine its value, and we therefore invite your comments.

*In 1987, Celanese Corporation merged with American Hoechst Corporation to form Hoechst Celanese Corporation.

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**CHUTE-FEED SYSTEM:** Pneumatic fiber transport system used in linking textile processing equipment or operations, especially opening, blending, and carding.

**CIRCULAR-KNIT FABRIC:** A tubular weft-knit fabric made on a circular-knitting machine.

**CIRCULAR KNITTING:** See KNITTING.

**CIRÉ:** A brilliant patent leather effect produced by application of wax, heat, and pressure.

**CLAMPS:** The parts of a testing machine that are used to hold a specimen while it is subjected to force. (Also called jaws.)

**CLARITY: 1.** In general, the optical property of being clear. **2.** In acetate manufacture, a measure of the appearance of dope solutions, indicating the quality of the acetylation mixture. **3.** In printing, the sharpness or definition of a print pattern.

**CLEARING:** The treatment of printed fabrics with a chemical solution to improve the appearance of the whites. In many cases the treatment also brightens the printed areas. (Also see REDUCTION CLEARING.)

**CLIP MARK:** Visible deformation of selvage due to pressure from a tenter clip.

**CLO:** A unit of thermal resistance. The insulation needed to keep an individual producing heat at the rate of 58 $W/m^2$ comfortable at 21°C air temperature with air movement of 0.1 m/s. One clo is roughly equal to the insulation value of typical indoor clothing.

**CLOQUÉ FABRIC:** From the French term for blistered, it refers to any fabric whose surface exhibits an irregularly raised blister effect.

**CLOTH:** A generic term embracing all textile fabrics and felts. Cloth may be formed of any textile fiber, wire, or other material, and it includes any pliant fabric woven, knit, felted, needled, sewn, or otherwise formed.

**CLOUDY WEB:** An uneven or irregular web from the doffer of a card.

**CLUMPS:** In nonwoven fabrics, an irregularly shaped grouping of fibers caused by insufficient fiber separation.

**COACERVATION:** The collection of colloidal particles into droplets held together by electrostatic attraction. This term for the equilibrium state of colloidal systems was introduced in 1929.

**COAGULATION:** The precipitation of particles from a suspension in a liquid, usually resulting in formation of a gel.

**COAGULATION BATH:** A liquid bath that serves to harden viscous polymer strands into solid fibers after extrusion through a spinneret. Used in wet-spinning processes such as in rayon or acrylic fiber manufacture.

**COALESCED FILAMENTS:** Filaments stuck together by design or accident during the extrusion process.



**COALESCENCE:** Merging of two or more substances into a larger substance, i.e., coalesced filaments.

**COARSE END:** See COARSE THREAD.

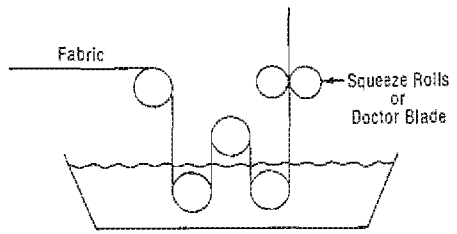
**COARSE FILLING:** See COARSE THREAD.

**COARSE PICK:** See COARSE THREAD.

**COARSE THREAD:** A yarn larger in diameter than other yarns being used in the fabric.

**COATED FABRIC:** A fabric to which a substance such as lacquer, plastic, resin, rubber, or varnish has been applied in firmly adhering layers to provide certain properties, such as water impermeability.

**COATING:** The application of a semi-liquid material such as rubber, polyvinyl chloride, or polyurethane to one or both sides of a textile material. Once the coating has been dried (and cured, if necessary), it forms a bond with the fabric.

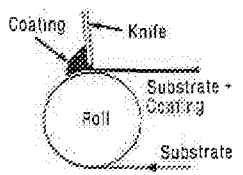


Dip Coating

**Calender Coating:** A type of roller coating that is actually a laminating operation. The coating is formed into a sheet, then joined with the fabric.

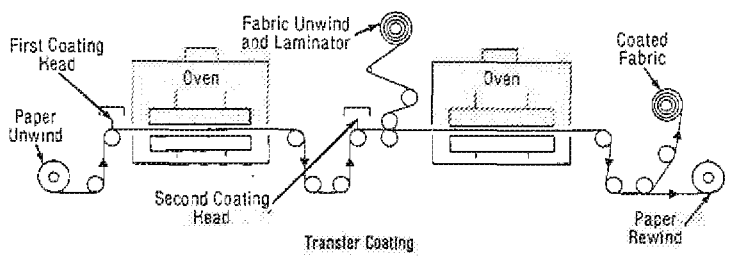
**Cast Coating:** A method by which resinous materials such as vinyl are coated onto a fabric and cured by heated casting drums.

**Dip Coating:** The process of passing a fabric through a solution of resin or elastomer, then through squeeze rolls to remove excess and leave a thin surface layer on the base fabric. In this process, both sides can be coated in one pass. (Also see DIP TREATING.)



Direct Coating

**Direct Coating:** The simplest method of coating, this procedure involves spreading the coating with a knife. The moving fabric substrate is usually supported by a roller or a sleeve. The gap between the knife and the fabric determines coating thickness.



Transfer Coating



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the test chamber and exposed to intense radiant heat from above. The rate of flame spread is assessed.

**Smoke Chamber Test:** This method assesses the smoke generating characteristics of a sample due to pyrolysis and combustion by measuring the attenuation of a light beam by smoke accumulating in a closed chamber under controlled conditions. Results are expressed in terms of specific optical density.

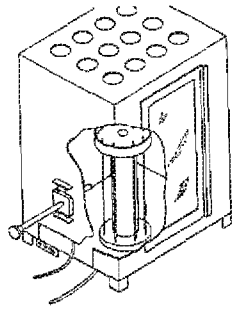
**Tablet Test:** See FLAMMABILITY TESTS, Methenamine Pill Test.

**Thermo-Man:** This instrumented mannequin system, interfaced with a computer, allows full-scale testing of garments for protection capability or degree of flammability. The system was developed by Accurex Corporation for the U.S. Air Force.

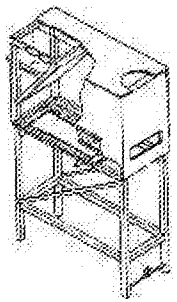
**Tunnel Test:** Test for the flammability of floor coverings in which a sample is placed on the ceiling of a tunnel of specific dimensions and ignited under controlled conditions to determine the extent to which it will burn. (Also called Steiner Tunnel Test.)

**Vertical Flame Test:** A test for flame resistance in which a specimen is mounted in a vertical holder and exposed to an open flame for a specific time. The open flame is then extinguished and continued flaming time and char length of the sample are measured.

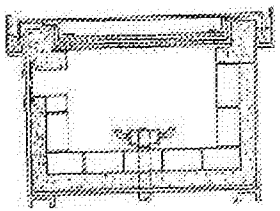
**FLANGE CRIMPING:** Simultaneous crimping of two ends of yarn by using heated snubber pins, then combining both ends on a draw roll after they contact a rubber flange on the draw roll.



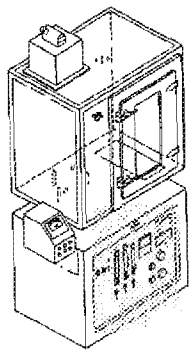
Mushroom Apparel Flammability Tester



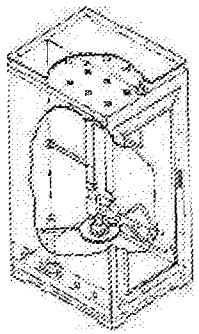
Radiant Panel Test Apparatus



Tunnel Test Apparatus



Smoke Chamber Test Apparatus



Vertical Flame Test Apparatus



**FLANNEL:** Mediumweight plain- or twill-weave, slightly napped fabric, usually of wool or cotton, but may be made of other fibers.

**FLAPPER:** The movable side of a fiber-crimping chamber that periodically opens or flaps to permit crimped fiber to be expelled from the chamber.

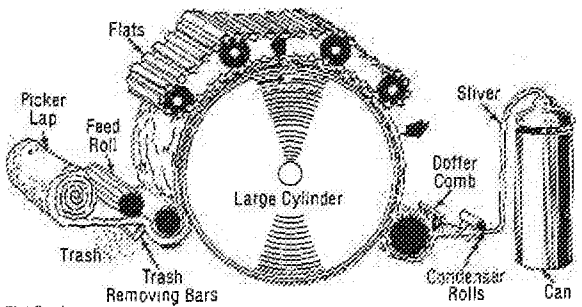
**FLASH AGEING:** A process for rapid reduction and fixation of vat dyes obtained when the printed fabric is padded with caustic soda and sodium hydrosulfite and immediately steamed in air-free steam.

**FLASH SPINNING:** See SPINNING, 5.

**FLAT:** In carding, one of the parts forming an endless chain that partially surrounds the upper portion of the cylinder and gives the name to a revolving flat card. Flats are made of cast iron, T-shaped in section, about 1 inch wide, and as long as the width of the cylinder. One side of the flat is nearly covered with fine card clothing, and the flats are set close to the teeth of the cylinder so as to work point against point. A chain of flats contains approximately 110 flats and operates at a surface speed of about 3 inches per minute.

**FLAT ABRASION TESTER:** See STOLL-QUARTERMASTER UNIVERSAL WEAR TESTER.

**FLAT CARD:** The type of card used for cotton fibers and for cotton-system processing. It is named for the flat wire brushes called flats that are assembled on an endless chain that partially surrounds the main cylinder. The staple is worked between the flats and cylinder, transferred to a doffer roll, and peeled off as a web that is condensed into a sliver. (Also see FLAT.)




Revolving Flat Card

Courtesy of Bibb Manufacturing Company

**FLAT DUCK:** See DUCK.

**FLAT-KNIT FABRIC: 1.** A fabric made on a flat-knitting machine, as distinguished from tubular fabrics made on a circular-knitting machine. While tricot and milanese warp-knit fabrics (non-run) are knit in flat form, the trade uses the term flat-knit fabric to refer to weft-knit fabrics made on a flat machine, rather than warp-knit fabrics. **2.** A term used in the underwear trade for plain-stitch fabrics made on a circular-knitting machine. These fabrics have a flat surface and are often called flat-knit fabrics to differentiate them from ribbed-knit or Swiss rib fabrics. In this case, the term refers to the texture, not the type of machine on which the fabric was knit.



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**FLAT KNITTING:** See KNITTING.

**FLAT-KNITTING MACHINE:** A weft-knitting machine with needles arranged in a straight line in a flat plate called the bed. The yarn travels alternately back and forth, and the fabric may be shaped or varied in width, as desired, during the knitting process. Lengthwise edges are selvages. Flat-knitting machines may be divided into two types: latch-needle machines for sweaters, scarves, and similar articles and fine spring-needle machines for full-fashioned hosiery.

**FLATSPOTTING:** A characteristic of certain tire cords. It occurs with all materials but is more noticeable with nylon cord and is associated with nylon cord by users. Nylon exerts a shrinkage force as it becomes heated in tire operation. When the tire is stopped under load, the cord in the road-contact portion of the tire is under less tension than that in other portions of the tire, and it shrinks to conform to the flat surface of the road. When cooled in this position, the cord maintains the flat spot until it again reaches its glass transition temperature in use.

**FLAT-TOP CARD:** See FLAT CARD.

**FLAX:** The plant from which the cellulosic fiber linen is obtained.

**FLEECE FABRIC:** A fabric with a thick, heavy surface resembling sheep's wool. It may be a pile or napped fabric of either woven or knit construction.

**FLEX ABRASION TESTER:** See STOLL-QUARTERMASTER. UNIVERSAL WEAR TESTER.

**FLEXIBILITY: 1.** The ability to be flexed or bowed repeatedly without rupturing. **2.** A term relating to the hand of fabric, referring to ease of bending and ranging from pliable (high) to stiff (low).

**FLEXURAL FATIGUE:** A physical property expressed by the number of times a material can be bent on itself through a prescribed angle before it ruptures or loses its ability to recover.

**FLEXURAL RIGIDITY:** This measure of a material's resistance to bending is calculated by multiplying the material's weight per unit area by the cube of its bending length.

**FLOAT: 1.** The portion of a warp or filling yarn that extends over two or more adjacent filling picks or warp ends in weaving for the purpose of forming certain designs. **2.** In a knit fabric, a portion of yarn that extends for some length without being knitted in. **3.** A fabric defect consisting of an end lying or floating on the cloth surface instead of being woven in properly. Floats are usually caused by slubs, knot-tails, knots, or fly waste, or sometimes by ends being drawn in heddle eyes incorrectly or being twisted around heddle wires.

**FLOATING ENDS:** See FLOAT, 3.

**FLOAT STITCH:** See MISS-STITCH.

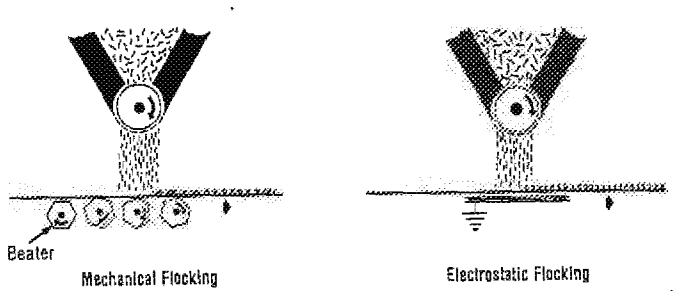


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**FLOCCULATING:** Coagulating or coalescing a material into a small, loosely aggregated mass.

**FLOCK:** The material obtained by reducing textile fibers to fragments by cutting or grinding. There are two main types: precision cut flock, where all fiber lengths are approximately equal, and random cut flock, where the fibers are ground or chopped to produce a broad range of lengths.

**FLOCKING:** A method of cloth ornamentation in which adhesive is printed or coated on a fabric, and finely chopped fibers are applied all over by means of dusting, air-blasting, or electrostatic attraction. In flock printing, the fibers adhere only to the printed areas and are removed from the unprinted areas by mechanical action.



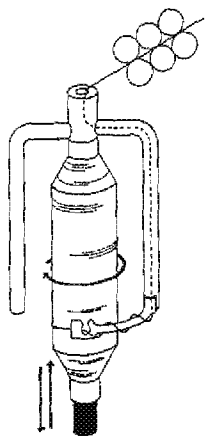

**FLUFFING:** A term describing the appearance of a carpet after loose fiber fragments left during manufacture have worked their way to the surface. Fluffing is not a defect; it is simply a characteristic of new carpets that disappears with vacuuming.

**FLUORESCENCE:** Emission of electromagnetic radiation, usually as visible light, that is caused by the flow of energy into the emitting body. The emission ceases abruptly when the excitation ceases.

**FLY:** The short, waste fibers that are released into the air in textile processing operations such as picking, carding, spinning, and weaving.

**FLYER: 1.** A device used to insert twist into slubbing, roving, or yarn, and to serve as a guide for winding it onto a bobbin. The flyer is shaped like an inverted U that fits on the top of the spindle and revolves with it. One arm of the U is solid and the other is hollow. The yarn enters through the top of the hollow arm, travels downward, and emerges at the bottom where it is wound around a presser finger onto the take-up package. **2.** See LOOM FLY.

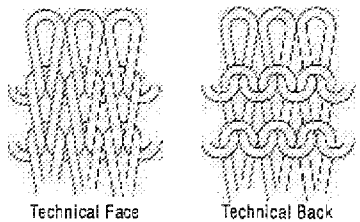
**FLYER SPINNING:** A method of spinning by means of a driven flyer. It is used primarily for spinning worsted and coarser yarns. (Also see FLYER, 1.)






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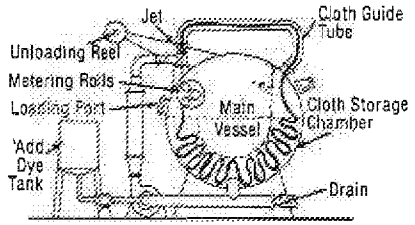
face and the back of a jersey fabric is wholly different. **2.** A tricot fabric made with a simple stitch, characterized by excellent drape and wrinkle recovery properties.



Jersey

**JET: 1.** A device used to bulk yarns by introducing curls, coils, and loops that are formed by the action of a high velocity stream, usually of air or steam. (Also see TEXTURING, Air Jet Method.) **2.** See SPINNERET.

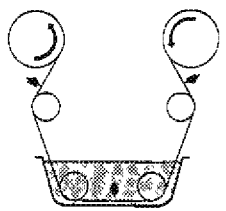
**JET DYEING MACHINE:** A high-temperature piece-dyeing machine that circulates the dye liquor through a Venturi jet, thus imparting a driving force to move the fabric. The fabric, in rope form, is sewn together to form a loop.



Jet Dyeing Machine

**JET LOOM:** A shuttleless loom that employs a jet of water or air to carry the filling yarn through the shed. (Also see WEFT INSERTION.)

**JIG:** A machine in which fabric in open-width form is transferred repeatedly from one roller to another, passing each time through a bath of relatively small volume. Jigs are used for scouring, dyeing, bleaching, and finishing.


Jig

**JUTE:** A bast fiber used for sacking, burlap, and twine as a backing material for tufted carpets.

**JUTE BUTT:** The flaggy lower end of jute fiber that is cut off in preparing jute for market. The fibers are 0.4 to 1 inch in length. Jute butts are used in twines and coarse bagging.

**JUTE COUNT:** The weight in pounds of a spindle of 14,400 yards of yarn.

# K

**KAPOK:** Short, lightweight cotton-like fibers from the seed pod of trees of the family *Bombacaceae*. A very brittle fiber, it is generally not spun. It is used for stuffing cushions, mattresses, etc., and for life jackets because of its buoyancy and moisture resistance.

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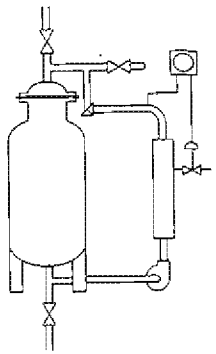


**KERATIN:** The basic protein constituent of wool and other hair fibers.

**KERSEY:** A heavily fulled or milled woolen fabric having a high lustrous nap and a "grainy" face, kersey is frequently used in overcoats.

**KHAKI: 1.** A light yellowish brown. **2.** A khaki-colored cloth of cotton, wool, or combinations of these fibers with manufactured fibers used primarily in military uniforms and workclothes.

**KIER:** A large metal tank, capable of being heated uniformly, used for wet processing.


Kier

**KIER BOILING:** Process of boiling cellulosic materials in alkaline liquors in a kier at or above atmospheric pressure.

**KINK: 1.** In fabrics, a place where a short length of yarn has spontaneously doubled back on itself. **2.** In yarn, see SNARL.

**KINKING:** The doubling back of a yarn on itself to relieve torque imparted by twisting or texturing.

**KINKY THREAD:** See KINK.

**KNEE BREAK-OUT TEST:** A method to evaluate the performance of fabrics, especially boys' wear, when subjected to abrasion, stretch, and impact forces under conditions which simulate ordinary wear at the knee.

**KNEEING:** Abnormal behavior of a spinning threadline (especially in melt spinning) in which one or more filaments form an angle (knee).

**KNIT-DE-KNIT:** See TEXTURING, Knit-de-Knit Method.

**KNIT FABRIC:** A structure produced by interlooping one or more ends of yarn or comparable material. (Also see KNITTING.)

**KNIT-MISS:** A form of tricot knitting in which yarns on each bar of a two-bar machine are knit at alternate courses only. This type of knitting permits the use of heavy-denier yarns without creating undesirable bulkiness in the fabric.

**KNITTING:** A method of constructing fabric by interlocking series of loops of one or more yarns. The two major classes of knitting are warp knitting and weft knitting, as follows:

**1. Warp Knitting:** A type of knitting in which the yarns generally run lengthwise in the fabric. The yarns are prepared as warps on beams with one or more yarns for each needle. Examples of this type of knitting are tricot, milanese, and raschel knitting.

**Milanese Knitting:** A type of run-resistant warp knitting with a diagonal rib effect using several sets of yarns.

**Raschel Knitting:** A versatile type of warp knitting made in plain and Jacquard patterns; the latter can be made with intricate eyelet and lacy



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patterns and is often used for underwear fabrics. Raschel fabrics are coarser than other warp-knit fabrics, but a wide range of fabrics can be made. Raschel knitting machines have one or two sets of latch needles and up to thirty sets of guides.

**Tricot Knitting:** A run-resistant type of warp knitting in which either single or double sets of yarn are used. (Also see TRICOT.)

**2. Weft Knitting:** A common type of knitting, in which one continuous thread runs crosswise in the fabric making all of the loops in one course. Weft knitting types are circular and flat knitting.

**Circular Knitting:** The fabric is produced on the knitting machine in the form of a tube, the threads running continuously around the fabric.

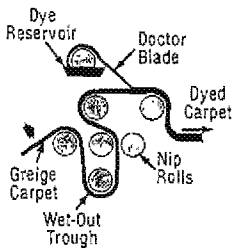
**Flat Knitting:** The fabric is produced on the knitting machine in flat form, the threads alternating back and forth across the fabric. The fabric can be given shape in the knitting process by increasing or decreasing loops. Full-fashioned garments are made on a flat-knitting machine. (Also see FLAT-KNIT FABRIC.)

**KRAFTCORD:** This yarn produced by tightly twisting plant fiber is sometimes used in carpet backings.

**KRAFT PULPS:** Pulps prepared in the alkaline liquor consisting of sodium hydroxide, sodium carbonate, and sodium sulfide. Also called sulfate pulp.

**KRAFT YARN:** A yarn made by twisting a strip of paper manufactured from kraft pulp.

**KROY® SHRINKPROOFING PROCESS:** Continuous process for shrinkproofing wool tops in which there is a direct chlorination step with no intervening chemical reaction followed by anti-chlorination and neutralization. Provides better hand and strength than does conventional shrinkproofing.



Köster Carpet Dyeing Range

**KUSTERS DYEING RANGE:** Continuous dye range for carpets. The unit wets the carpet, applies dyes and auxiliary chemicals by means of a doctor blade, fixes the dyes in a festoon steamer, and washes and dries the carpet in one pass through the range. An optional auxiliary unit may be installed to randomly drip selected dyes onto the background shade for special styling effects. This process is called TAK dyeing.

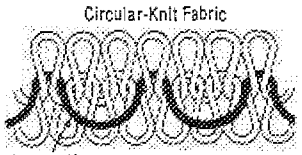


# L

**LACE:** Ornamental openwork fabric, made in a variety of designs by intrica manipulation of the fiber by machine or by hand.

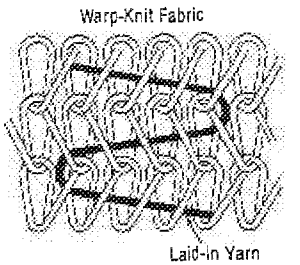
**LACE STITCH:** In this knitting stitch structure, loops are transferred from th needles on which they are made to adjacent needles to create a fabric wi an open or a raised effect.

**LAID-IN FABRIC:** A knit fabric in which an effect yarn is tucked in, not knitted into, the fabric structure. The laid-in yarns are held in position by the knitted yarns.




**LAID-IN YARN:** See AXIAL YARN.

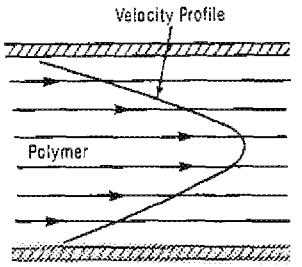
**LAMÉ:** A fabric woven with flat metal threads, usually silver or gold, that form either the background or the pattern.



Laid-In Constructions

**LAMINAR FLOW:** Streamline flow in a viscous fluid, such as molten polymer, near a solid boundary.

**LAMINATED FABRIC: 1.** Fabric composed of a high-strength reinforcing scrim or base fabric between two plies of flexible thermoplastic film. Usually open scrims are used to permit the polymer to flow through the interstices and bond during calendering. **2.** See BONDED FABRIC, 1.

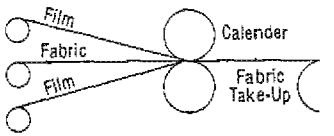


Laminar Flow

**LAP:** A continuous, considerably compressed sheet of fibers that is rolled under pressure into a cylindrical package, usually weighing between 40 and 50 pounds. The lap is used to supply the card.

**LAPPING:** A term describing the movement of yarn guides between needles, at right angles to the needle bar, or laterally in relation to the needle bar during warp knitting.

**LAP SPLITTING:** A condition caused by a lap that will not unwind in carding in the same thickness as it was wound in picking. This splitting of the sheet of fiber can result in either a thicker or thinner sheet being fed into the card.



Laminated Fabric Formation



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**VELVET FABRIC:** A warp-pile woven fabric with short, dense cut pile that produces a rich fabric appearance and soft texture. Two methods are used for weaving velvets. In the double-cloth method, two fabrics are woven face to face with the pile ends interlocking. A reciprocating knife cuts through these pile ends to produce two separate pieces of velvet. In the second method, pile ends are lifted over cutting wires that are inserted with the filling and that are withdrawn to cut the pile. Velvet is produced in a wide range of constructions and types. Originally made of silk, but now also of cotton or manufactured fibers giving fabrics that are sometimes washable. The fabric can be specially finished to make it crush-resistant and water-repellent or it may be embossed or patterned by burn-out printing.

**VERTICAL FLAME TEST:** See FLAMMABILITY TESTS.

**VIBROSCOPE:** An instrument for determining the mass per unit length of a fiber.

**VINAL FIBER:** A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 50% by weight of vinyl alcohol units and in which the total of the vinyl alcohol units and any one or more of the various acetal units is at least 85% by weight of the fiber (FTC definition). Vinal fibers show good chemical resistance but soften at comparatively low temperatures. Vinal fibers are used for apparel, industrial goods, and fishnets.

**VINYL:** A univalent radical, ($CH_2$=CH–), derived from ethylene.

**VINYLIDENE CHLORIDE:** A chemical material obtained from ethylene, a petroleum product, and from chlorine. It is used for the manufacture of textile monofilaments and film. It is more commonly identified in the U.S. as saran. (Also see SARAN FIBER.)

**VINYON FIBER:** A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of vinyl chloride units (FTC definition).

**VISCOMETER:** A device designed to measure the viscosity (resistance to flow) of a fluid. Many types exist from simple calibrated glass tubes to extensively instrumented, on-line shear viscometers.

**VISCOSE PROCESS: 1.** One of the methods of producing rayon. (Also see RAYON FIBER.) **2.** The chemical process used in the manufacture of cellophane. (Also see VISCOSE SOLUTION.)

**VISCOSE RAYON:** One type of rayon. It is produced in far greater quantity than cuprammonium rayon, the other commercial type. (Also see RAYON FIBER.)

**VISCOSE SOLUTION:** The solution obtained by dissolving cellulose xanthate in caustic soda, from which viscose filaments and cellophane are produced.

**VISCOSITY:** The internal flow resistance of a fluid. (Also see INTRINSIC VISCOSITY and RELATIVE VISCOSITY.)



**VOILE FABRIC:** A sheer spun cloth that is lightweight and soft. It is usually made with cylindrical, combed yarn. Voile is used for blouses, children's wear, draperies, bedspreads, etc.

**VOLATILE:** Readily vaporized at a relatively low temperature.

**VOLATILITY:** Property of having a low boiling point or temperature of sublimation at normal pressure. Likewise, having a high vapor pressure at ambient conditions.

**VOLUME RESISTIVITY:** The ratio of the potential gradient parallel to the direction of current flow in a compound to the current density after a specified time of voltage application.

**VULCANIZATION:** See CURING, 2.

# W

**WALE: 1.** In knit fabrics, a column of loops lying lengthwise in the fabric. The number of wales per inch is a measure of the fineness of the fabric. **2.** In woven fabrics, one of a series of ribs, cords, etc., running either warpwise or fillingwise.

**WARP: 1.** The set of yarn in all woven fabrics, that runs lengthwise and parallel to the selvage and is interwoven with the filling. **2.** The sheet of yarns wound together on a beam for the purpose of weaving or warp knitting. (Also see WARP SHEET.)

**WARP BEAM:** A large spool or flanged cylinder around which the warp threads, or ends, are wound in a uniform and parallel arrangement. (Also see BEAM.)

**WARP-DRAWING:** See DRAW-WARPING. Warp-drawn fibers may be taken up on packages other than beams.

**WARP HOLDING PLACE:** See STICKER, 1.

**WARPING:** See BEAMING.

**WARP-KNIT FABRIC:** A fabric that is knit with the yarns running lengthwise, e.g., tricot, milanese, and Raschel.

**WARP KNITTING:** See KNITTING, 1.

**WARP PILE:** The extra set of warp yarns that forms the surface in a double-woven pile fabric, including types such as velvet and velour. Upholstery fabrics such as mohair, plush, and friezé are produced by this method. (Also see PILE and VELVET FABRIC.)

**WARP PRINTING:** See PRINTING.



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**WARP SHEET:** A sheet comprising up to several thousand ends that are combined to make up the warp during preparation for weaving or warp knitting. (Also see WARP.)

**WARP SIZING:** See SLASHING.

**WARP STREAKS:** A fabric fault that shows as bands or streaks running warpwise. Warp streaks should not be confused with reed marks.

**WASH-AND-WEAR:** A generic term applied to garments that satisfactorily retain their original neat appearance after repeated wear and home laundering with little or no pressing or ironing. A wash-and-wear garment is essentially free from undesirable wrinkles both during wear and after laundering and retains any original pressed-in creases or pleats. The garments should meet normal consumer demands for durability, color, stability, and shrinkage. The performance of a wash-and-wear fabric or garment depends on several factors, including the types and amounts (percentages) of fibers used, the fabric construction, the finishing treatment, the presence of a colored pattern (either woven or printed), and the methods used for washing and drying. These factors determine, in any specific instance, if a fabric or garment's performance will meet customer requirements. Variable conditions result in the varying behavior of a specific fabric or garment. Garments are labelled to specify the appropriate care for optimal performance. (Also see EASE-OF-CARE and DURABLE PRESS.)

**WASHFASTNESS:** The resistance of a dyed fabric to loss of color or change in properties during home or commercial laundering.

**WASTE:** By-products created in the manufacture of fibers, yarns, and fabrics.

**WATER IMBIBITION:** See IMBIBITION.

**WATER-JET LOOM:** See JET LOOM.

**WATERLESS DYEING:** See DYEING, Solvent Dyeing.

**WATERPROOF:** A term applied to materials that are impermeable to water; waterproof fabrics have had all their pores closed and are also impermeable to air and very uncomfortable.

**WATER-REPELLENT:** A term applied to fabrics that can shed water but are permeable to air and comfortable to wear. These fabrics are produced by treating the material with a resin, wax, or plastic finish that is not completely permanent.

**WAVY CLOTH:** See BAGGY CLOTH.

**WAVY SELVAGE:** See SLACK SELVAGE.

**WEAK WEB:** A web of fiber that, when being transferred from the card doffer to the calender rolls to form sliver, does not have sufficient strength from fiber cohesion or clinging entanglement to hold itself together while forming a continuous bridge in processing.



**WEAK YARN:** A yarn that is found to be either below standard breaking specifications or to be weak enough to cause an abnormally high degree of stops in textile processing.

**WEAR TEST:** A test for fabric wear, abrasion, flexibility, washing, crushing, creasing, etc., in which the fabric is made into a garment, worn for a specific time, then assessed for performance.

**WEATHER-OMETER:** An instrument used in measuring the weather resistance of textiles. It can simulate various weather conditions such as sunlight, rain, dew, and thermal shock. Weathering is accelerated to the degree that the effects of years of normal use are attained in only a few days.

**WEAVE:** A system or pattern of intersecting warp and filling yarns. There are three basic two dimensional weaves: plain, twill, and satin. All other weaves are derived from one or more of these types. (Also see PLAIN WEAVE, TWILL WEAVE, and SATIN WEAVE.)

**WEAVING:** The method or process of interlacing two yarns of similar materials so that they cross each other at right angles to produce woven fabric. The warp yarns, or ends, run lengthwise in the fabric, and the filling threads (weft), or picks, run from side to side. Weaving can be done on a power or hand loom or by several hand methods. (Also see LOOM and WOVEN FABRIC.)

**WEB: 1.** The wide film of fibers that is delivered from the card. **2.** A similar product of other web-forming equipment, such as that formed by air deposition and used to make nonwoven fabrics. **3.** A term loosely used for lightweight nonwoven fabrics. **4.** See WEBBING.

**WEBBING:** Strong, narrow fabric, closely woven in a variety of weaves and principally used for belts and straps that have to withstand strain (e.g., automobile seat belts, reinforcement of upholstery, suspenders, etc.). Elastic webbing is made with spandex or rubber yarns in part of the warp or filling, or both. (Also see WEB, 2.)

**WEFT:** See FILLING.

**WEFT INSERTION: 1.** Any one of the various methods, shuttle, rapier, water jet, etc., for making a pick during weaving. **2.** A marriage of warp knitting and weaving brought about by inserting a length of yarn across the width of the knitting elements and fastening the weft yarn between the needle loop and the underlap. (Also see METAP WEAVE-KNIT PROCESS.) (See diagram on next page.)

**WEFT-KNIT FABRIC:** See CIRCULAR-KNIT FABRIC and FLAT-KNIT FABRIC.

**WEFT KNITTING:** See KNITTING, 2.

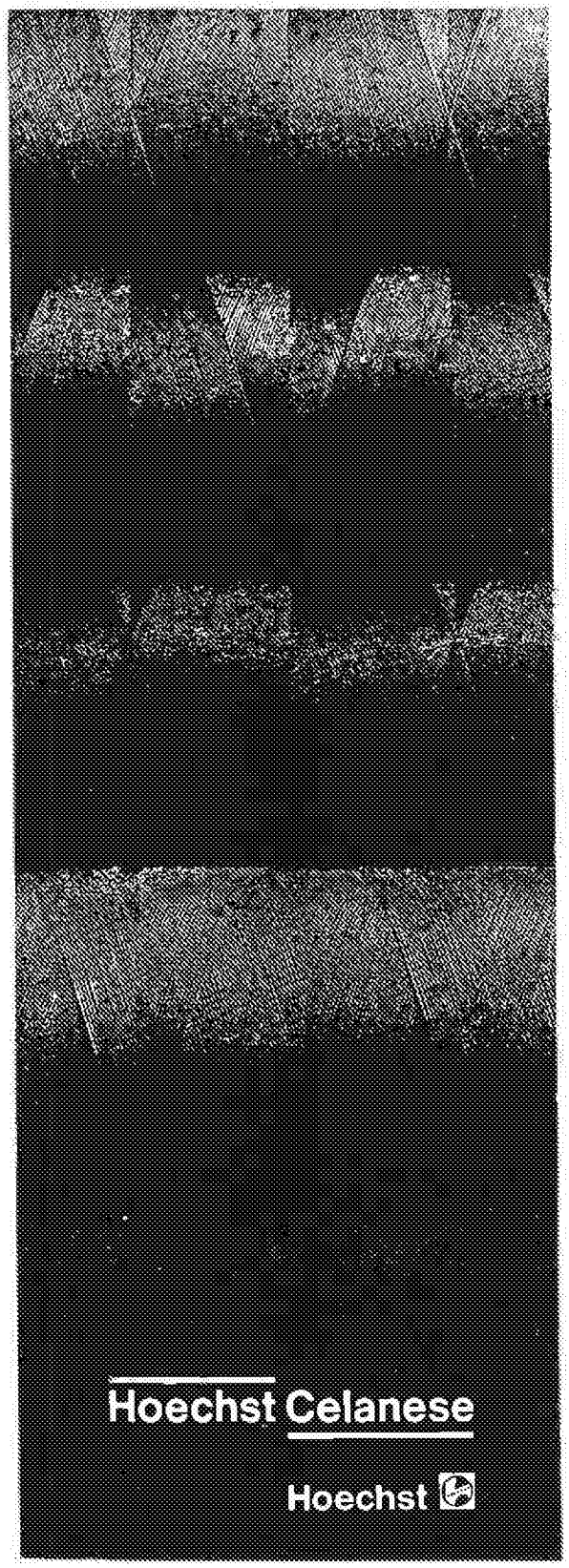
**WEIGHTED SILK:** Silk that has been treated with metallic salts during dyeing and finishing to increase the fabric's weight and improve its drape. Over-weighting can cause deterioration of the fabric.



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# Dictionary of Fiber & Textile Technology

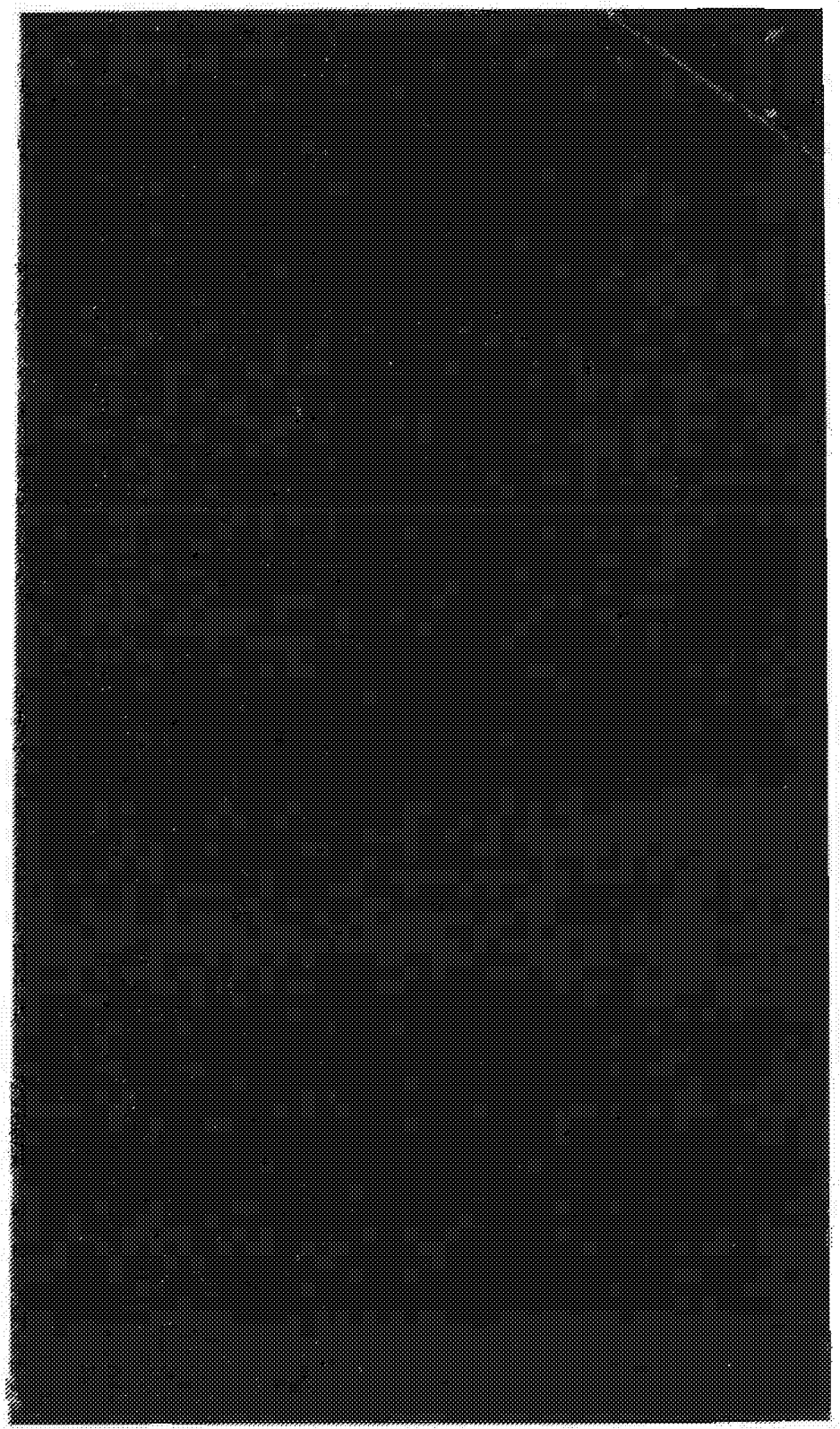



NIKE EXHIBIT 2018 IPR 2013-00067

**NOTE: This exhibit is identical to exhibit no. 2018 marked during the December 3, 2013, cross-examination deposition of Sabit Adanur, except for the inclusion of this note and the addition of a footer to comply with 37 CFR §42.63(d).**

DR. SABIT ADANUR

# Dictionary
## Of Fiber & Textile Technology



Hoechst Celanese

Hoechst

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**Hoechst Celanese Corporation**
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**FAX 704 554 3885**

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# Foreword

This *Dictionary of Fiber and Textile Technology* is intended to be a convenient reference for textile terminology. Although it covers all types of textile terms broadly, its special emphasis is on manufactured fibers—what they are, how they are made, and how they are used.

Formerly the *Man-Made Fiber and Textile Dictionary*, the first and second editions were published by the former Celanese Corporation* to provide a source for employees. The third edition was published in response to numerous requests from customers and others in the textile industry for an up-to-date glossary of terms encountered in the manufactured fiber and textile trades. To enhance its usefulness, the dictionary was expanded and illustrated.

This current edition has been updated and further expanded to cover recent developments in fiber-forming polymers, new commercially manufactured fibers, textile equipment advances, and new applications for textile materials such as geotextiles and advanced composites. New diagrams have been added to illustrate these developments. We have attempted to convey as much basic information as is possible without making the book cumbersome.

As in previous editions, generic terms such as dyeing and knitting are handled comprehensively with specific terms presented under one heading. The more widely used manufactured fibers are listed by their Federal Trade Commission generic names and definitions, in most cases followed by a brief description of their manufacture, characteristics, and applications. In the Appendix are abbreviations, equivalent weights and measures, and various conversion tables and formulas needed by the textile technologist.

We hope that this dictionary will help to familiarize you with the language of textiles. Only through you, can we determine its value, and we therefore invite your comments.

*In 1987, Celanese Corporation merged with American Hoechst Corporation to form Hoechst Celanese Corporation.

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**CHUTE-FEED SYSTEM:** Pneumatic fiber transport system used in mixing textile processing equipment or operations, especially opening, blending, and carding.

**CIRCULAR-KNIT FABRIC:** A tubular weft-knit fabric made on a circular-knitting machine.

**CIRCULAR KNITTING:** See KNITTING.

**CIRÉ:** A brilliant patent leather effect produced by application of wax, heat, and pressure.

**CLAMPS:** The parts of a testing machine that are used to hold a specimen while it is subjected to force. (Also called jaws.)

**CLARITY: 1.** In general, the optical property of being clear. **2.** In acetate manufacture, a measure of the appearance of dope solutions, indicating the quality of the acetylation mixture. **3.** In printing, the sharpness or definition of a print pattern.

**CLEARING:** The treatment of printed fabrics with a chemical solution to improve the appearance of the whites. In many cases the treatment also brightens the printed areas. (Also see REDUCTION CLEARING.)

**CLIP MARK:** Visible deformation of selvage due to pressure from a tenter clip.

**CLO:** A unit of thermal resistance. The insulation needed to keep an individual producing heat at the rate of 58 $W/m^2$ comfortable at 21°C air temperature with air movement of 0.1 m/s. One clo is roughly equal to the insulation value of typical indoor clothing.

**CLOQUÉ FABRIC:** From the French term for blistered, it refers to any fabric whose surface exhibits an irregularly raised blister effect.

**CLOTH:** A generic term embracing all textile fabrics and felts. Cloth may be formed of any textile fiber, wire, or other material, and it includes any pliant fabric woven, knit, felted, needled, sewn, or otherwise formed.

**CLOUDY WEB:** An uneven or irregular web from the doffer of a card.

**CLUMPS:** In nonwoven fabrics, an irregularly shaped grouping of fibers caused by insufficient fiber separation.

**COACERVATION:** The collection of colloidal particles into droplets held together by electrostatic attraction. This term for the equilibrium state of colloidal systems was introduced in 1929.

**COAGULATION:** The precipitation of particles from a suspension in a liquid, usually resulting in formation of a gel.

**COAGULATION BATH:** A liquid bath that serves to harden viscous polymer strands into solid fibers after extrusion through a spinneret. Used in wet-spinning processes such as in rayon or acrylic fiber manufacture.

**COALESCED FILAMENTS:** Filaments stuck together by design or accident during the extrusion process.



**COALESCENCE:** Merging of two or more substances into a larger substance, i.e., coalesced filaments.

**COARSE END:** See COARSE THREAD.

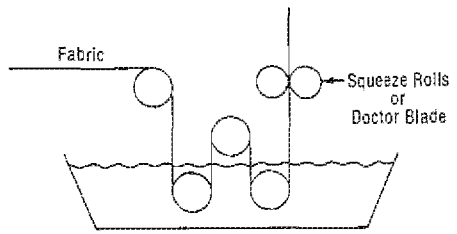
**COARSE FILLING:** See COARSE THREAD.

**COARSE PICK:** See COARSE THREAD.

**COARSE THREAD:** A yarn larger in diameter than other yarns being used in the fabric.

**COATED FABRIC:** A fabric to which a substance such as lacquer, plastic, resin, rubber, or varnish has been applied in firmly adhering layers to provide certain properties, such as water impermeability.

**COATING:** The application of a semi-liquid material such as rubber, polyvinyl chloride, or polyurethane to one or both sides of a textile material. Once the coating has been dried (and cured, if necessary), it forms a bond with the fabric.

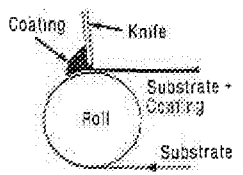


Dip Coating

**Calender Coating:** A type of roller coating that is actually a laminating operation. The coating is formed into a sheet, then joined with the fabric.

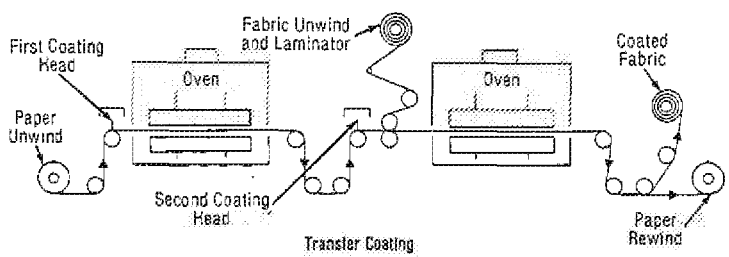
**Cast Coating:** A method by which resinous materials such as vinyl are coated onto a fabric and cured by heated casting drums.

**Dip Coating:** The process of passing a fabric through a solution of resin or elastomer, then through squeeze rolls to remove excess and leave a thin surface layer on the base fabric. In this process, both sides can be coated in one pass. (Also see DIP TREATING.)



Direct Coating

**Direct Coating:** The simplest method of coating, this procedure involves spreading the coating with a knife. The moving fabric substrate is usually supported by a roller or a sleeve. The gap between the knife and the fabric determines coating thickness.



Transfer Coating



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the test chamber and exposed to intense radiant heat from above. The rate of flame spread is assessed.

**Smoke Chamber Test:** This method assesses the smoke generating characteristics of a sample due to pyrolysis and combustion by measuring the attenuation of a light beam by smoke accumulating in a closed chamber under controlled conditions. Results are expressed in terms of specific optical density.

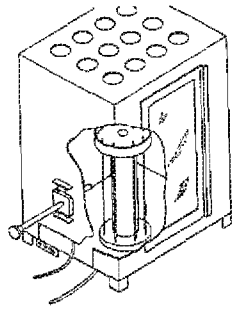
**Tablet Test:** See FLAMMABILITY TESTS, Methenamine Pill Test.

**Thermo-Man:** This instrumented mannequin system, interfaced with a computer, allows full-scale testing of garments for protection capability or degree of flammability. The system was developed by Accurex Corporation for the U.S. Air Force.

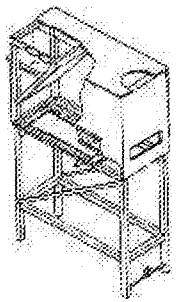
**Tunnel Test:** Test for the flammability of floor coverings in which a sample is placed on the ceiling of a tunnel of specific dimensions and ignited under controlled conditions to determine the extent to which it will burn. (Also called Steiner Tunnel Test.)

**Vertical Flame Test:** A test for flame resistance in which a specimen is mounted in a vertical holder and exposed to an open flame for a specific time. The open flame is then extinguished and continued flaming time and char length of the sample are measured.

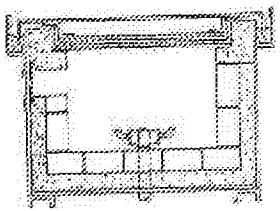
**FLANGE CRIMPING:** Simultaneous crimping of two ends of yarn by using heated snubber pins, then combining both ends on a draw roll after they contact a rubber flange on the draw roll.



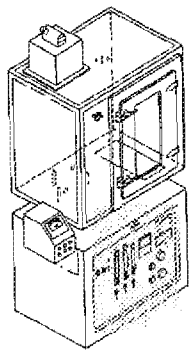
Mushroom Apparel Flammability Tester



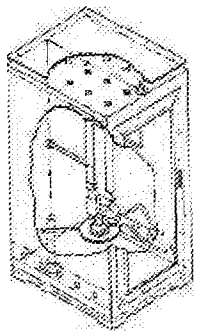
Radiant Panel Test Apparatus



Tunnel Test Apparatus



Smoke Chamber Test Apparatus



Vertical Flame Test Apparatus



**FLANNEL:** Mediumweight plain- or twill-weave, slightly napped fabric, usually of wool or cotton, but may be made of other fibers.

**FLAPPER:** The movable side of a fiber-crimping chamber that periodically opens or flaps to permit crimped fiber to be expelled from the chamber.

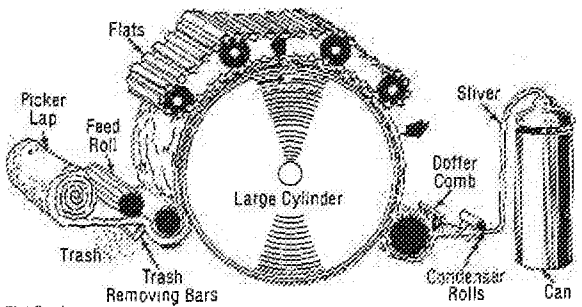
**FLASH AGEING:** A process for rapid reduction and fixation of vat dyes obtained when the printed fabric is padded with caustic soda and sodium hydrosulfite and immediately steamed in air-free steam.

**FLASH SPINNING:** See SPINNING, 5.

**FLAT:** In carding, one of the parts forming an endless chain that partially surrounds the upper portion of the cylinder and gives the name to a revolving flat card. Flats are made of cast iron, T-shaped in section, about 1 inch wide, and as long as the width of the cylinder. One side of the flat is nearly covered with fine card clothing, and the flats are set close to the teeth of the cylinder so as to work point against point. A chain of flats contains approximately 110 flats and operates at a surface speed of about 3 inches per minute.

**FLAT ABRASION TESTER:** See STOLL-QUARTERMASTER UNIVERSAL WEAR TESTER.

**FLAT CARD:** The type of card used for cotton fibers and for cotton-system processing. It is named for the flat wire brushes called flats that are assembled on an endless chain that partially surrounds the main cylinder. The staple is worked between the flats and cylinder, transferred to a doffer roll, and peeled off as a web that is condensed into a sliver. (Also see FLAT.)




Revolving Flat Card

Courtesy of Bibb Manufacturing Company

**FLAT DUCK:** See DUCK.

**FLAT-KNIT FABRIC: 1.** A fabric made on a flat-knitting machine, as distinguished from tubular fabrics made on a circular-knitting machine. While tricot and milanese warp-knit fabrics (non-run) are knit in flat form, the trade uses the term flat-knit fabric to refer to weft-knit fabrics made on a flat machine, rather than warp-knit fabrics. **2.** A term used in the underwear trade for plain-stitch fabrics made on a circular-knitting machine. These fabrics have a flat surface and are often called flat-knit fabrics to differentiate them from ribbed-knit or Swiss rib fabrics. In this case, the term refers to the texture, not the type of machine on which the fabric was knit.



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**FLAT KNITTING:** See KNITTING.

**FLAT-KNITTING MACHINE:** A weft-knitting machine with needles arranged in a straight line in a flat plate called the bed. The yarn travels alternately back and forth, and the fabric may be shaped or varied in width, as desired, during the knitting process. Lengthwise edges are selvages. Flat-knitting machines may be divided into two types: latch-needle machines for sweaters, scarves, and similar articles and fine spring-needle machines for full-fashioned hosiery.

**FLATSPOTTING:** A characteristic of certain tire cords. It occurs with all materials but is more noticeable with nylon cord and is associated with nylon cord by users. Nylon exerts a shrinkage force as it becomes heated in tire operation. When the tire is stopped under load, the cord in the road-contact portion of the tire is under less tension than that in other portions of the tire, and it shrinks to conform to the flat surface of the road. When cooled in this position, the cord maintains the flat spot until it again reaches its glass transition temperature in use.

**FLAT-TOP CARD:** See FLAT CARD.

**FLAX:** The plant from which the cellulosic fiber linen is obtained.

**FLEECE FABRIC:** A fabric with a thick, heavy surface resembling sheep's wool. It may be a pile or napped fabric of either woven or knit construction.

**FLEX ABRASION TESTER:** See STOLL-QUARTERMASTER UNIVERSAL WEAR TESTER.

**FLEXIBILITY: 1.** The ability to be flexed or bowed repeatedly without rupturing. **2.** A term relating to the hand of fabric, referring to ease of bending and ranging from pliable (high) to stiff (low).

**FLEXURAL FATIGUE:** A physical property expressed by the number of times a material can be bent on itself through a prescribed angle before it ruptures or loses its ability to recover.

**FLEXURAL RIGIDITY:** This measure of a material's resistance to bending is calculated by multiplying the material's weight per unit area by the cube of its bending length.

**FLOAT: 1.** The portion of a warp or filling yarn that extends over two or more adjacent filling picks or warp ends in weaving for the purpose of forming certain designs. **2.** In a knit fabric, a portion of yarn that extends for some length without being knitted in. **3.** A fabric defect consisting of an end lying or floating on the cloth surface instead of being woven in properly. Floats are usually caused by slubs, knot-tails, knots, or fly waste, or sometimes by ends being drawn in heddle eyes incorrectly or being twisted around heddle wires.

**FLOATING ENDS:** See FLOAT, 3.

**FLOAT STITCH:** See MISS-STITCH.

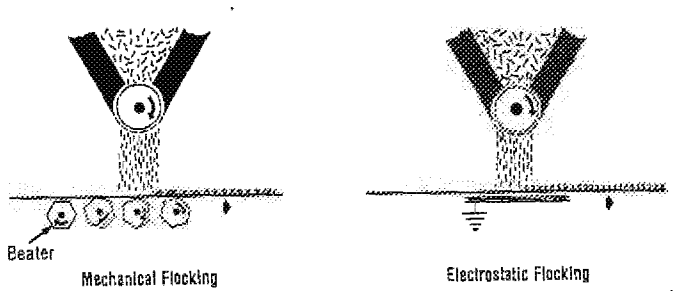


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**FLOCCULATING:** Coagulating or coalescing a material into a small, loosely aggregated mass.

**FLOCK:** The material obtained by reducing textile fibers to fragments by cutting or grinding. There are two main types: precision cut flock, where all fiber lengths are approximately equal, and random cut flock, where the fibers are ground or chopped to produce a broad range of lengths.

**FLOCKING:** A method of cloth ornamentation in which adhesive is printed or coated on a fabric, and finely chopped fibers are applied all over by means of dusting, air-blasting, or electrostatic attraction. In flock printing, the fibers adhere only to the printed areas and are removed from the unprinted areas by mechanical action.



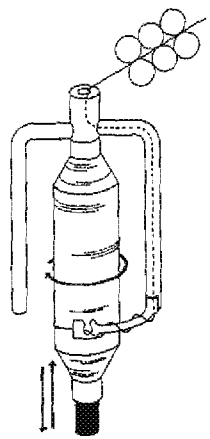

**FLUFFING:** A term describing the appearance of a carpet after loose fiber fragments left during manufacture have worked their way to the surface. Fluffing is not a defect; it is simply a characteristic of new carpets that disappears with vacuuming.

**FLUORESCENCE:** Emission of electromagnetic radiation, usually as visible light, that is caused by the flow of energy into the emitting body. The emission ceases abruptly when the excitation ceases.

**FLY:** The short, waste fibers that are released into the air in textile processing operations such as picking, carding, spinning, and weaving.

**FLYER: 1.** A device used to insert twist into slubbing, roving, or yarn, and to serve as a guide for winding it onto a bobbin. The flyer is shaped like an inverted U that fits on the top of the spindle and revolves with it. One arm of the U is solid and the other is hollow. The yarn enters through the top of the hollow arm, travels downward, and emerges at the bottom where it is wound around a presser finger onto the take-up package. **2.** See LOOM FLY.

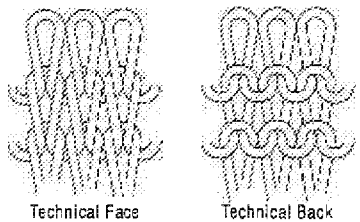
**FLYER SPINNING:** A method of spinning by means of a driven flyer. It is used primarily for spinning worsted and coarser yarns. (Also see FLYER, 1.)






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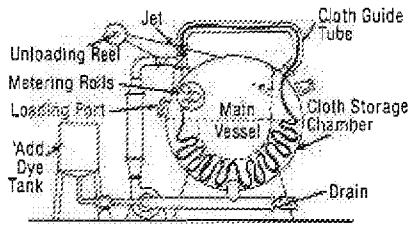
face and the back of a jersey fabric is wholly different. **2.** A tricot fabric made with a simple stitch, characterized by excellent drape and wrinkle recovery properties.



Jersey

**JET: 1.** A device used to bulk yarns by introducing curls, coils, and loops that are formed by the action of a high velocity stream, usually of air or steam. (Also see TEXTURING, Air Jet Method.) **2.** See SPINNERET.

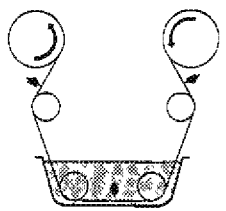
**JET DYEING MACHINE:** A high-temperature piece-dyeing machine that circulates the dye liquor through a Venturi jet, thus imparting a driving force to move the fabric. The fabric, in rope form, is sewn together to form a loop.



Jet Dyeing Machine

**JET LOOM:** A shuttleless loom that employs a jet of water or air to carry the filling yarn through the shed. (Also see WEFT INSERTION.)

**JIG:** A machine in which fabric in open-width form is transferred repeatedly from one roller to another, passing each time through a bath of relatively small volume. Jigs are used for scouring, dyeing, bleaching, and finishing.


Jig

**JUTE:** A bast fiber used for sacking, burlap, and twine as a backing material for tufted carpets.

**JUTE BUTT:** The flaggy lower end of jute fiber that is cut off in preparing jute for market. The fibers are 0.4 to 1 inch in length. Jute butts are used in twines and coarse bagging.

**JUTE COUNT:** The weight in pounds of a spindle of 14,400 yards of yarn.

# K

**KAPOK:** Short, lightweight cotton-like fibers from the seed pod of trees of the family *Bombacaceae*. A very brittle fiber, it is generally not spun. It is used for stuffing cushions, mattresses, etc., and for life jackets because of its buoyancy and moisture resistance.

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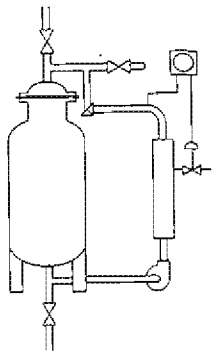


**KERATIN:** The basic protein constituent of wool and other hair fibers.

**KERSEY:** A heavily fulled or milled woolen fabric having a high lustrous nap and a "grainy" face, kersey is frequently used in overcoats.

**KHAKI: 1.** A light yellowish brown. **2.** A khaki-colored cloth of cotton, wool, or combinations of these fibers with manufactured fibers used primarily in military uniforms and workclothes.

**KIER:** A large metal tank, capable of being heated uniformly, used for wet processing.


Kier

**KIER BOILING:** Process of boiling cellulosic materials in alkaline liquors in a kier at or above atmospheric pressure.

**KINK: 1.** In fabrics, a place where a short length of yarn has spontaneously doubled back on itself. **2.** In yarn, see SNARL.

**KINKING:** The doubling back of a yarn on itself to relieve torque imparted by twisting or texturing.

**KINKY THREAD:** See KINK.

**KNEE BREAK-OUT TEST:** A method to evaluate the performance of fabrics, especially boys' wear, when subjected to abrasion, stretch, and impact forces under conditions which simulate ordinary wear at the knee.

**KNEEING:** Abnormal behavior of a spinning threadline (especially in melt spinning) in which one or more filaments form an angle (knee).

**KNIT-DE-KNIT:** See TEXTURING, Knit-de-Knit Method.

**KNIT FABRIC:** A structure produced by interlooping one or more ends of yarn or comparable material. (Also see KNITTING.)

**KNIT-MISS:** A form of tricot knitting in which yarns on each bar of a two-bar machine are knit at alternate courses only. This type of knitting permits the use of heavy-denier yarns without creating undesirable bulkiness in the fabric.

**KNITTING:** A method of constructing fabric by interlocking series of loops of one or more yarns. The two major classes of knitting are warp knitting and weft knitting, as follows:

**1. Warp Knitting:** A type of knitting in which the yarns generally run lengthwise in the fabric. The yarns are prepared as warps on beams with one or more yarns for each needle. Examples of this type of knitting are tricot, milanese, and raschel knitting.

**Milanese Knitting:** A type of run-resistant warp knitting with a diagonal rib effect using several sets of yarns.

**Raschel Knitting:** A versatile type of warp knitting made in plain and Jacquard patterns; the latter can be made with intricate eyelet and lacy



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patterns and is often used for underwear fabrics. Raschel fabrics are coarser than other warp-knit fabrics, but a wide range of fabrics can be made. Raschel knitting machines have one or two sets of latch needles and up to thirty sets of guides.

**Tricot Knitting:** A run-resistant type of warp knitting in which either single or double sets of yarn are used. (Also see TRICOT.)

**2. Weft Knitting:** A common type of knitting, in which one continuous thread runs crosswise in the fabric making all of the loops in one course. Weft knitting types are circular and flat knitting.

**Circular Knitting:** The fabric is produced on the knitting machine in the form of a tube, the threads running continuously around the fabric.

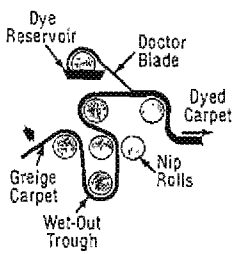
**Flat Knitting:** The fabric is produced on the knitting machine in flat form, the threads alternating back and forth across the fabric. The fabric can be given shape in the knitting process by increasing or decreasing loops. Full-fashioned garments are made on a flat-knitting machine. (Also see FLAT-KNIT FABRIC.)

**KRAFTCORD:** This yarn produced by tightly twisting plant fiber is sometimes used in carpet backings.

**KRAFT PULPS:** Pulps prepared in the alkaline liquor consisting of sodium hydroxide, sodium carbonate, and sodium sulfide. Also called sulfate pulp.

**KRAFT YARN:** A yarn made by twisting a strip of paper manufactured from kraft pulp.

**KROY® SHRINKPROOFING PROCESS:** Continuous process for shrinkproofing wool tops in which there is a direct chlorination step with no intervening chemical reaction followed by anti-chlorination and neutralization. Provides better hand and strength than does conventional shrinkproofing.



Köster Carpet Dyeing Range

**KUSTERS DYEING RANGE:** Continuous dye range for carpets. The unit wets the carpet, applies dyes and auxiliary chemicals by means of a doctor blade, fixes the dyes in a festoon steamer, and washes and dries the carpet in one pass through the range. An optional auxiliary unit may be installed to randomly drip selected dyes onto the background shade for special styling effects. This process is called TAK dyeing.

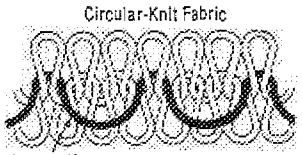


# L

**LACE:** Ornamental openwork fabric, made in a variety of designs by intrica manipulation of the fiber by machine or by hand.

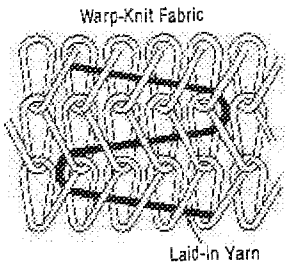
**LACE STITCH:** In this knitting stitch structure, loops are transferred from th needles on which they are made to adjacent needles to create a fabric wi an open or a raised effect.

**LAID-IN FABRIC:** A knit fabric in which an effect yarn is tucked in, not knitted into, the fabric structure. The laid-in yarns are held in position by the knitted yarns.




**LAID-IN YARN:** See AXIAL YARN.

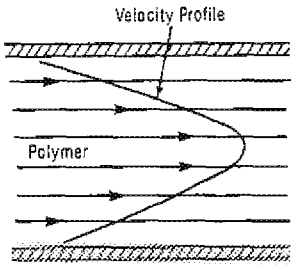
**LAMÉ:** A fabric woven with flat metal threads, usually silver or gold, that form either the background or the pattern.



Laid-In Constructions

**LAMINAR FLOW:** Streamline flow in a viscous fluid, such as molten polymer, near a solid boundary.

**LAMINATED FABRIC: 1.** Fabric composed of a high-strength reinforcing scrim or base fabric between two plies of flexible thermoplastic film. Usually open scrims are used to permit the polymer to flow through the interstices and bond during calendering. **2.** See BONDED FABRIC, 1.

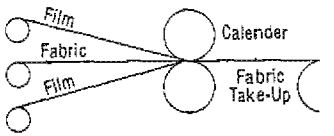


Laminar Flow

**LAP:** A continuous, considerably compressed sheet of fibers that is rolled under pressure into a cylindrical package, usually weighing between 40 and 50 pounds. The lap is used to supply the card.

**LAPPING:** A term describing the movement of yarn guides between needles, at right angles to the needle bar, or laterally in relation to the needle bar during warp knitting.

**LAP SPLITTING:** A condition caused by a lap that will not unwind in carding in the same thickness as it was wound in picking. This splitting of the sheet of fiber can result in either a thicker or thinner sheet being fed into the card.



Laminated Fabric Formation



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**VELVET FABRIC:** A warp-pile woven fabric with short, dense cut pile that produces a rich fabric appearance and soft texture. Two methods are used for weaving velvets. In the double-cloth method, two fabrics are woven face to face with the pile ends interlocking. A reciprocating knife cuts through these pile ends to produce two separate pieces of velvet. In the second method, pile ends are lifted over cutting wires that are inserted with the filling and that are withdrawn to cut the pile. Velvet is produced in a wide range of constructions and types. Originally made of silk, but now also of cotton or manufactured fibers giving fabrics that are sometimes washable. The fabric can be specially finished to make it crush-resistant and water-repellent or it may be embossed or patterned by burn-out printing.

**VERTICAL FLAME TEST:** See FLAMMABILITY TESTS.

**VIBROSCOPE:** An instrument for determining the mass per unit length of a fiber.

**VINAL FIBER:** A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 50% by weight of vinyl alcohol units and in which the total of the vinyl alcohol units and any one or more of the various acetal units is at least 85% by weight of the fiber (FTC definition). Vinal fibers show good chemical resistance but soften at comparatively low temperatures. Vinal fibers are used for apparel, industrial goods, and fishnets.

**VINYL:** A univalent radical, ($CH_2$=CH–), derived from ethylene.

**VINYLIDENE CHLORIDE:** A chemical material obtained from ethylene, a petroleum product, and from chlorine. It is used for the manufacture of textile monofilaments and film. It is more commonly identified in the U.S. as saran. (Also see SARAN FIBER.)

**VINYON FIBER:** A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of vinyl chloride units (FTC definition).

**VISCOMETER:** A device designed to measure the viscosity (resistance to flow) of a fluid. Many types exist from simple calibrated glass tubes to extensively instrumented, on-line shear viscometers.

**VISCOSE PROCESS: 1.** One of the methods of producing rayon. (Also see RAYON FIBER.) **2.** The chemical process used in the manufacture of cellophane. (Also see VISCOSE SOLUTION.)

**VISCOSE RAYON:** One type of rayon. It is produced in far greater quantity than cuprammonium rayon, the other commercial type. (Also see RAYON FIBER.)

**VISCOSE SOLUTION:** The solution obtained by dissolving cellulose xanthate in caustic soda, from which viscose filaments and cellophane are produced.

**VISCOSITY:** The internal flow resistance of a fluid. (Also see INTRINSIC VISCOSITY and RELATIVE VISCOSITY.)



**VOILE FABRIC:** A sheer spun cloth that is lightweight and soft. It is usually made with cylindrical, combed yarn. Voile is used for blouses, children's wear, draperies, bedspreads, etc.

**VOLATILE:** Readily vaporized at a relatively low temperature.

**VOLATILITY:** Property of having a low boiling point or temperature of sublimation at normal pressure. Likewise, having a high vapor pressure at ambient conditions.

**VOLUME RESISTIVITY:** The ratio of the potential gradient parallel to the direction of current flow in a compound to the current density after a specified time of voltage application.

**VULCANIZATION:** See CURING, 2.

# W

**WALE: 1.** In knit fabrics, a column of loops lying lengthwise in the fabric. The number of wales per inch is a measure of the fineness of the fabric. **2.** In woven fabrics, one of a series of ribs, cords, etc., running either warpwise or fillingwise.

**WARP: 1.** The set of yarn in all woven fabrics, that runs lengthwise and parallel to the selvage and is interwoven with the filling. **2.** The sheet of yarns wound together on a beam for the purpose of weaving or warp knitting. (Also see WARP SHEET.)

**WARP BEAM:** A large spool or flanged cylinder around which the warp threads, or ends, are wound in a uniform and parallel arrangement. (Also see BEAM.)

**WARP-DRAWING:** See DRAW-WARPING. Warp-drawn fibers may be taken up on packages other than beams.

**WARP HOLDING PLACE:** See STICKER, 1.

**WARPING:** See BEAMING.

**WARP-KNIT FABRIC:** A fabric that is knit with the yarns running lengthwise, e.g., tricot, milanese, and Raschel.

**WARP KNITTING:** See KNITTING, 1.

**WARP PILE:** The extra set of warp yarns that forms the surface in a double-woven pile fabric, including types such as velvet and velour. Upholstery fabrics such as mohair, plush, and friezé are produced by this method. (Also see PILE and VELVET FABRIC.)

**WARP PRINTING:** See PRINTING.



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**WARP SHEET:** A sheet comprising up to several thousand ends that are combined to make up the warp during preparation for weaving or warp knitting. (Also see WARP.)

**WARP SIZING:** See SLASHING.

**WARP STREAKS:** A fabric fault that shows as bands or streaks running warpwise. Warp streaks should not be confused with reed marks.

**WASH-AND-WEAR:** A generic term applied to garments that satisfactorily retain their original neat appearance after repeated wear and home laundering with little or no pressing or ironing. A wash-and-wear garment is essentially free from undesirable wrinkles both during wear and after laundering and retains any original pressed-in creases or pleats. The garments should meet normal consumer demands for durability, color, stability, and shrinkage. The performance of a wash-and-wear fabric or garment depends on several factors, including the types and amounts (percentages) of fibers used, the fabric construction, the finishing treatment, the presence of a colored pattern (either woven or printed), and the methods used for washing and drying. These factors determine, in any specific instance, if a fabric or garment's performance will meet customer requirements. Variable conditions result in the varying behavior of a specific fabric or garment. Garments are labelled to specify the appropriate care for optimal performance. (Also see EASE-OF-CARE and DURABLE PRESS.)

**WASHFASTNESS:** The resistance of a dyed fabric to loss of color or change in properties during home or commercial laundering.

**WASTE:** By-products created in the manufacture of fibers, yarns, and fabrics.

**WATER IMBIBITION:** See IMBIBITION.

**WATER-JET LOOM:** See JET LOOM.

**WATERLESS DYEING:** See DYEING, Solvent Dyeing.

**WATERPROOF:** A term applied to materials that are impermeable to water; waterproof fabrics have had all their pores closed and are also impermeable to air and very uncomfortable.

**WATER-REPELLENT:** A term applied to fabrics that can shed water but are permeable to air and comfortable to wear. These fabrics are produced by treating the material with a resin, wax, or plastic finish that is not completely permanent.

**WAVY CLOTH:** See BAGGY CLOTH.

**WAVY SELVAGE:** See SLACK SELVAGE.

**WEAK WEB:** A web of fiber that, when being transferred from the card doffer to the calender rolls to form sliver, does not have sufficient strength from fiber cohesion or clinging entanglement to hold itself together while forming a continuous bridge in processing.



**WEAK YARN:** A yarn that is found to be either below standard breaking specifications or to be weak enough to cause an abnormally high degree of stops in textile processing.

**WEAR TEST:** A test for fabric wear, abrasion, flexibility, washing, crushing, creasing, etc., in which the fabric is made into a garment, worn for a specific time, then assessed for performance.

**WEATHER-OMETER:** An instrument used in measuring the weather resistance of textiles. It can simulate various weather conditions such as sunlight, rain, dew, and thermal shock. Weathering is accelerated to the degree that the effects of years of normal use are attained in only a few days.

**WEAVE:** A system or pattern of intersecting warp and filling yarns. There are three basic two dimensional weaves: plain, twill, and satin. All other weaves are derived from one or more of these types. (Also see PLAIN WEAVE, TWILL WEAVE, and SATIN WEAVE.)

**WEAVING:** The method or process of interlacing two yarns of similar materials so that they cross each other at right angles to produce woven fabric. The warp yarns, or ends, run lengthwise in the fabric, and the filling threads (weft), or picks, run from side to side. Weaving can be done on a power or hand loom or by several hand methods. (Also see LOOM and WOVEN FABRIC.)

**WEB: 1.** The wide film of fibers that is delivered from the card. **2.** A similar product of other web-forming equipment, such as that formed by air deposition and used to make nonwoven fabrics. **3.** A term loosely used for lightweight nonwoven fabrics. **4.** See WEBBING.

**WEBBING:** Strong, narrow fabric, closely woven in a variety of weaves and principally used for belts and straps that have to withstand strain (e.g., automobile seat belts, reinforcement of upholstery, suspenders, etc.). Elastic webbing is made with spandex or rubber yarns in part of the warp or filling, or both. (Also see WEB, 2.)

**WEFT:** See FILLING.

**WEFT INSERTION: 1.** Any one of the various methods, shuttle, rapier, water jet, etc., for making a pick during weaving. **2.** A marriage of warp knitting and weaving brought about by inserting a length of yarn across the width of the knitting elements and fastening the weft yarn between the needle loop and the underlap. (Also see METAP WEAVE-KNIT PROCESS.) (See diagram on next page.)

**WEFT-KNIT FABRIC:** See CIRCULAR-KNIT FABRIC and FLAT-KNIT FABRIC.

**WEFT KNITTING:** See KNITTING, 2.

**WEIGHTED SILK:** Silk that has been treated with metallic salts during dyeing and finishing to increase the fabric's weight and improve its drape. Over-weighting can cause deterioration of the fabric.



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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

| | |
|---|---|
| ADIDAS AG,<br><br>Petitioner,<br><br>vs.<br><br>NIKE, INC.,<br><br>Patent Owner. | Patent No.<br><br>7,347,011 |

Inter Partes Review No. 2013-00067

VIDEOTAPE DEPOSITION OF

SABIT ADANUR

Tuesday, December 3, 2013
8:50 a.m.

Suite 2800
1100 Peachtree Street, N.E.
Atlanta, Georgia

Lisa A. Messina, RMR, CRR, CCR-A-421

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(Original Exhibits 2014 through 2018 have been attached to the original transcript.)

(Reporter disclosure made pursuant to Article 10.B of the Rules and Regulations of the Board of Court Reporting of the Judicial Council of Georgia.)

THE VIDEOGRAPHER: My name is Ben Jones on behalf of Veritext. Today's date is December 3rd, 2013, and the time is approximately 8:49 a.m. This deposition is being held in the office of Kilpatrick, Townsend & Stockton located at 1100 Peachtree Street, Atlanta, Georgia.

The caption of the case is adidas AG, Petitioner, versus Nike, Incorporated, Patent Owner. The name of the witness is Sabit Adanur.

At this time the attorneys will identify themselves and the parties they represent, after which our court reporter, Lisa Messina, will swear in the witness and we can proceed.

MS. WILLIAMS: Tiffany Williams for Petitioner, adidas AG.

MR. VAN ES: And this is Pieter van Es for the patent owner, Nike, Inc., and with me who doesn't have a microphone is Tom Pratt.

///

SABIT ADANUR,

having been first duly sworn, was examined and testified as follows:

CROSS-EXAMINATION

BY MR. VAN ES:

Q. Good morning, Dr. Adanur.

A. Good morning.

Q. Have you ever been deposed before?

A. Yes.

Q. How many times have you been deposed?

A. Three or four times, I believe.

Q. Were you deposed three or four times previously all in patent cases?

A. Yes.

Q. Okay. So you understand the general ground rules; that we need to each speak one at a time and that you need to provide yes or no answers to my questions and not nod your head?

A. Yes.

Q. And if you don't understand a question let me know. If you answer my question I'll assume you understand the question. Is that fair?

A. Fair.

Q. If you need a break just ask for one. And

when you do come back from a break I may ask you if you talked to the attorney at the break.

A. Okay.

Q. Understand? Okay.

MR. VAN ES: I'm going to mark Nike Exhibit 2104 which is the notice of cross-examination of you, Dr. Adanur.

(Nike Exhibit 2014 was marked.)

Q. (By Mr. van Es) Dr. Adanur, just a couple of background questions.

Have you ever been convicted of a crime?

A. No.

Q. Are you taking any medication today that would affect your ability to testify truthfully?

A. No.

Q. Okay. I'm going to put in front of you Exhibit 1016. Do you recognize this document?

A. Yes.

Q. Is this your declaration in the case?

A. Yes.

Q. And I first want to ask you about what would be the CV that's attached to Exhibit 1016.

A. Yes.

Q. And that's at Pages 18 through 57 of the

exhibit. Do you agree?

A. I go up to 40, Page 40.

Q. Yes. So let me -- take a look in the lower right-hand corner --

A. Oh, I'm sorry. Yes.

Q. So your CV is 40 pages long --

A. Okay.

Q. -- and this is marked Pages -- this is Pages 18 through 57 of Exhibit 1016. Do you see that?

A. Yes.

Q. And that's your CV?

A. Yes.

Q. Is it accurate?

A. Yes.

Q. Is it up to date?

A. Yes.

Q. Have you done work for this law firm prior to your involvement in this particular case?

A. Kilpatrick, you mean?

Q. Yes.

A. Yes.

Q. Explain the nature of that work, please.

A. There was a case involving fabrics and I gave a deposition and also I went to the court and

gave another deposition type of thing but I don't remember exactly what it is called, but I was questioned by the lawyers.

Q. In court?

A. Yes.

Q. Did you prepare an expert report in that case?

A. I don't recall that.

Q. Was that a patent case?

A. Yes.

Q. Have you done any other work for this law firm other than in that case you just described?

A. No.

Q. And you mentioned that case involved fabrics.

A. Yes.

Q. Is it identified on your CV, the case?

A. Southern Mills on Page 55, the fifth company on the list -- sixth company. I believe it was Southern Mills that Kilpatrick was representing and I was hired by Southern Mills.

Q. Do you recall if -- how long ago was this work?

A. I think it was one or two years.

Q. I'm sorry. Say that --
A. One or two years.
Q. One or two years ago?
A. No, no. It was four or five years ago.
Q. Okay.
A. It lasted one or two years.
Q. Was Southern Mills the owner of the patent?
A. Yes.
Q. And what generally were you asked to give an opinion on?
A. It involved the fabric structure and -- the fabric structure.
Q. Were you asked to give an opinion as to whether the fabric structure was covered by the patent?
A. Yes, I believe so.
Q. Did you conclude that the patent was infringed in that case?
A. Yes.
Q. Were you paid for that work?
A. Yes, I was.
Q. Okay. What other patent work have you done other than for this case with this law firm and

for the client Southern Mills?

A. There was one involving Sulzer Textile.

Q. And that's spelled S-u-l-z-e-r?

A. Yes.

Q. Any others?

A. And also I gave a deposition in another patent infringement case that involved Asten Forming Fabrics and their competitor, and I don't remember right now their competitor's name, but that was many years ago.

Q. Okay. And if you look at Page 18 of Exhibit 1016 --

A. Yes.

Q. -- you see at the bottom of the Page 18 it lists a case involving Asten, A-s-t-e-n --

A. That's right, yes.

Q. -- Forming Fabrics. That's the case you're referring to?

A. That's right.

Q. And then it also lists a case involving Sulzer Textile?

A. Yes.

Q. And then at the top of Page 1016 -- excuse me, at the top of Page 19 it lists a case involving

Southern Mills?

A. That's right.

Q. Those are the three patent cases that you worked on?

A. Yes.

Q. Do you recall if you worked on any other patent cases other than those three cases?

A. I don't recall.

Q. In the Asten case were you representing the -- excuse me. In the Astor case -- excuse me.

In the Asten case, did you work for the company that owned the patent?

A. No.

Q. You worked for a company that was accused of infringing the patent?

A. Yes.

Q. Do you recall what conclusion you reached in that case?

A. They just took my deposition. That was the extent of my involvement.

Q. Did you reach any kind of conclusion as to whether the patent was invalid or infringed in that case?

A. I don't believe so.

Q. Did you prepare an expert report in that case?

A. No.

Q. Do you know why your deposition was taken?

A. I believe the other company was accusing Asten of infringing their patent.

Q. And you were an expert in the case?

A. No. They just called me and they said that they were going to take my deposition about the case and then we met in a hotel room in Opelika and then they took my deposition.

Q. Were you paid in that case?

A. No.

Q. Did you provide any expert testimony in that case?

A. No, not that I remember.

Q. With respect to the Sulzer case that you mentioned, did you prepare an expert report in that case?

A. I believe so.

Q. What was the general nature of your expert report in that case?

A. It was about air-jet weaving.

Q. Can you say that again?

A. Air-jet weaving machine.
Q. A jet --
A. Air, air-jet.
Q. Excuse me. Air-jet weaving machine?
A. Weaving machine, yes.
Q. Excuse me. I may have interrupted you. You were telling me about the general nature of the case.
A. And Sulzer had the patent, I believe, and Picanol was accused of infringing the patent.
Q. And you worked for Sulzer?
A. That's right.
Q. Did you reach a conclusion as to whether the patent was infringed or not?
A. Yes, I did.
Q. And what was your conclusion?
A. It was infringed.
Q. And you had your deposition taken in the case?
A. Yes.
Q. And did you testify in front of the jury?
A. Yes.
Q. Do you recall the jury's verdict?
A. Yes.

Q. What was it?
A. They found Picanol not guilty.
Q. They found the patent was not infringed?
A. Yes. I believe that they decided on nontechnical reasons.
Q. You think the jury was wrong?
A. Technically I believe they were wrong and it was a very sophisticated technical case and I don't -- I don't think that the jury was qualified to make any judgment, technical judgment, on that case. I did my Ph.D. in that area and I know how difficult the subject is.
Q. Have you ever done any prior work for adidas?
A. No.
Q. Have you ever done any prior work in the footwear field?
A. No.
Q. So you've never offered any prior expert testimony involving footwear?
A. No.
Q. Have you ever done any work for Nike?
A. No.
Q. Do you have any patents that are issued in

your name?

A. No. I have several patent disclosures.

Q. But none of those patent disclosures have resulted in issued patents?

A. The university did not apply for them.

Q. Do you recall, have you ever applied for any patents?

A. No.

Q. Just so my -- I'm sorry. My question wasn't clear. As far as you know you have never applied for any patents?

A. That's right.

Q. Have you ever given testimony prior to today -- excuse me. Let me start the question over again.

Have you ever given testimony in any case prior to your work in this case involving claim construction?

A. Yes.

Q. Tell me about your prior experience giving testimony on claim construction.

A. It was the Sulzer case, Sulzer versus Picanol case.

Q. In the Sulzer case you gave testimony on

claim construction?

A. I prepared a report about claim construction.

Q. Any other cases previous to this case other than the Sulzer case where you gave any testimony on claim construction?

A. I don't recall.

Q. In the Sulzer case, did you testify before a judge regarding claim construction?

A. Can you explain more? I mean, the judge was there during the jury trial and there was a jury.

Q. Okay. So in the Sulzer case you testified in front of the jury about --

A. In front of the judge, too, of course.

Q. And in front of the judge. So let me just be clear. So you testified at the actual trial on the Sulzer case?

A. That's right.

Q. Were there ever any occasions where you testified in front of the judge prior to the trial?

A. I don't recall that. I made several trips to Texas to testify. I might have. I don't really remember. It was more than ten years ago.

Q. Have you ever heard the term claim

construction hearing?

A. Yes.

Q. Do you recall if there was a claim construction hearing in the Sulzer case?

A. I believe there was.

Q. Do you know if you were at the claim construction hearing?

A. I don't think so. I don't remember that well, but I don't think so.

Q. Dr. Adanur, what field do you consider yourself an expert in?

A. Textile engineering, fibers and polymer processing.

Q. Do you consider yourself an expert in the design of footwear?

A. As far as the fabrics are concerned, yes.

Q. Have you ever designed any footwear?

A. No.

Q. So you've never designed a shoe upper?

A. Not necessarily for the shoes.

Q. Are you familiar with the term person of ordinary skill in the art?

A. Yes.

Q. Do you consider yourself a person of

ordinary skill in the art of footwear design?

A. Again, from the fabric side, yes.

Q. Well, in terms of the design of the footwear itself, do you consider yourself a person of ordinary skill in the art?

A. With my background I have -- I believe I have the knowledge in that area. I have a mechanical engineering background -- undergraduate degree also.

Q. I'd like to direct your attention to Paragraph 16 of your expert report -- excuse me, of your declaration.

Have you had a chance to review Paragraph 16 of your declaration?

A. Let me finish it. Yes.

Q. Did you create this definition of the level of ordinary skill in the art?

A. Yes.

Q. When did you create this definition?

A. Within the last month.

Q. How did you go about creating this definition of the level of ordinary skill in the art?

A. I looked at some patents that were involved in the case and also I talked with Dr. Frederick on the phone and discussed some issues

involving shoe manufacturing. And, as I said, I have an undergraduate degree in mechanical engineering that can be applied to shoemaking.

Q. Did you write this definition of the level of ordinary skill in the art?

A. Yes.

Q. And it's your testimony that you created this definition about a month -- within the last month or so?

A. Yes, approximately.

Q. Did you review any other written descriptions of the level of ordinary skill in the art before you wrote your definition here?

A. I read those documents that are listed in my declaration including Mr. Tonkel's declaration as well as deposition, I believe.

Q. Okay. Do you have several years of experience from the conceptual stage through the design stage -- let me start the question over again.

Do you have several years of experience with the aspect of shoemaking involving the conceptual stage through the design stage?

A. Not directly in the shoemaking area, but, again, for fabrics that are used in shoes and also in

polymer processing. I know how to process the polymers which are used in the sole of the shoes and other parts of the shoes. I've been teaching that course for several years now. In fact, I developed that course.

And also I'm an active sportsman, I should say, that uses lots of shoes and as an engineer I pay attention to the comfort, the structure of those shoes, so I feel very comfortable to give opinions in that area.

Q. Okay. So you say -- you would say that you have several years of experience in the field of shoemaking from the conceptual stage through the design stage?

A. No, I didn't say that exactly. I have the ingredients that can be used in designing and manufacturing of those shoes.

Q. Okay. Well, I'm just asking -- I'm trying to ask a specific question.

Do you have several years of experience with respect to shoemaking from the conceptual stage through the design stage of shoemaking?

A. I've never worked in the shoe manufacturing industry.

Q. So you've not ever been asked to design a fabric that was incorporated into a shoe, correct?

A. Not directly, yes.

Q. Do you have several years of experience in the development stage of shoemaking?

A. As I said, not directly involved, but again I have ingredients that goes into the shoemaking process.

Q. Do you have several years of experience in the commercialization stage of shoemaking?

A. I just follow the market regarding the companies and different shoes that they put out and watch the commercials, I follow the trends. Again, I use it quite often myself.

Q. But you have no personal experience in the commercialization of a shoe, right?

A. Not directly, no.

Q. Do you have several years of experience in the manufacturing stages of a shoe?

A. Yes. As far as polymer processing is concerned, yes. I've been teaching that course for several years and I developed that course. It did not exist in our department before.

I went and looked at other machines and

decided -- made a decision to purchase the polymer-processing equipment, the machines, and we did purchase those that can be used in shoe manufacturing. And also, of course, I have an industrial sewing machine in our department for our research purposes that also can be used in shoe manufacturing for stitching.

Q. Okay. But you don't have any experience actually manufacturing a shoe, right?

A. Right. I do not work in any shoe manufacturing company.

Q. Okay. Do you have knowledge of the biomechanical and functional requirements of footwear and shoes?

A. I believe so.

Q. Can you explain that?

A. Well, especially the sporting shoes should have the capability for dampening effect, to take the body weight without hurting the body when the foot hits the ground. It should be, of course, comfortable to wear. It should have enough flexibility for the comfort of the foot. It should have abrasion resistance. It should have non-slipping effect.

Q. Okay. Are you finished with your answer?

A. Yes.

Q. So your knowledge of the functional requirements of footwear, is that based on any work that you -- that's not based on any work that -- let me start the question over again.

Your knowledge that you have of the functional requirements of footwear, that's not based on any experience you have actually designing footwear, right?

A. That's right.

Q. You mentioned earlier some machines that are in your department. How many shoes have been made using the machines that are in your department?

A. None.

Q. Okay. I want to direct your attention to the second-to-last sentence of Paragraph 16 that reads, "For example, such a person would have the skills and capabilities to identify knitting machines, knitted fabric structures and their major properties."

Do you see that sentence?

A. Yes.

Q. Can you explain what you mean by that sentence?

A. Well, fabrics are used in shoes a lot

especially for sports. Therefore, a person who's designing a shoe I believe should know about the fabrics and those are mostly knitted fabrics. Therefore, the person should know about the knitting machines, what they produce, the type of fabric structure that each machine produces, and the major properties of the fabrics.

Q. Have you ever talked to a person that meets this definition in Paragraph 16 of a person of ordinary skill in the art?

A. Yes, I believe so. I talked to Dr. Frederick.

Q. Besides Dr. Frederick, have you ever spoken to anyone who meets the definition of a person of ordinary skill of the art in Paragraph 16?

A. I don't think so.

Q. So other than your work in this case you've never communicated with any people who have several years of experience in the design, development, commercialization, manufacturing of footwear, right?

A. Well, I have met so many people throughout my area and I might have, but I don't recall specifically.

Q. Do you know if Dr. Frederick meets the definition of a person of ordinary skill in the art in Paragraph 16?

A. I believe so.

Q. Why do you believe that?

A. When I talked to him it seemed that he has very good knowledge in the shoemaking business and also his CV I believe shows that.

Q. All right. So now that we've gone through Paragraph 16 and the definition of a person of ordinary skill in the art, would you agree with me that you do not meet this definition?

A. No.

Q. You believe that you do meet the definition?

A. Yes.

Q. So you believe that you are a person of ordinary skill in the art in the field of shoemaking?

A. With my background, yes, I believe so.

Q. And just so I'm clear, do you consider yourself an expert in the commercialization of footwear?

A. Again, I follow the trends in the market in terms of the shoe business, but I don't work in

that area, commercialization of the shoe industry.

Q. So do you consider yourself an expert in the commercialization of shoe products?

A. What do you mean by commercialization? I mean, can you be more open?

Q. Well, I'm referring to the definition that you said you created in Paragraph 16 that talks about the stage of commercialization.

My question to you is do you consider yourself an expert in the commercialization of shoemaking?

MS. WILLIAMS: Object to the form.

Q. (By Mr. van Es) You can answer the question.

A. With that word --

Q. Excuse me. Do you understand my question?

A. Can you repeat it?

Q. Sure. Do you consider yourself an expert in the commercialization of shoes?

A. For the success of the shoes in the market from a technical design I believe yes.

Q. Do you consider yourself an expert in the field of the development of shoes?

MS. WILLIAMS: Object to the form.

THE WITNESS: I believe I answered that question.

Q. (By Mr. van Es) What was your answer?

A. Again, I do not work directly in that area, but with my background and with all the degrees I have and all the courses I've been teaching I believe I have the ingredients to offer opinions as an expert in that area.

Q. Okay. But I'm just trying to get about -- can you describe for me the steps that are involved in the stages of conception through design of a shoe?

A. First, of course, the purpose for the shoe, in what kind of -- we are talking about sporting shoes, I assume -- in what kind of sports it is going to be used, whether it is going to have support for the ankle or other parts of the foot; and then the shape of the shoe for ease in movement depending on the sport, and then the sole structure for dampening effects; the materials that should be chosen, such as polyurethane and others, and then the fabric structure for strength, durability, flexibility, abrasion resistance that should be designed. And then joining all those, the fabric piece or pieces with the rubber products for the sole of the shoe.

Q. And do you have personal experience in -- excuse me. Do you have personal experience in those conception through design stages with respect to shoes?

A. What do you mean personal experience?

Q. Have you yourself been involved in the conception through design stage of a shoe?

A. Not specifically for the shoe.

Q. How much experience would a person of ordinary skill in the art as defined in Paragraph 16 have with respect to knowledge of knitting machines?

A. They should be familiar with the types of knitting machines, what kind of fabrics they produce and what are the properties of those fabrics, the major properties of those fabrics.

Q. Would a person of ordinary skill in the art know about the different types of knitting?

A. I think so. They should be able to -- as I said in my declaration, that person should have the skills and capabilities to identify knitting machines, knitted fabric structures and their major properties.

Q. Have you ever designed a piece of knitting equipment that was used to make footwear?

A. You mean the knitting machinery?

Q. Yes. Have you ever designed knitting machinery that was used to make footwear?

A. By design -- from scratch? You mean from scratch?

Q. Have you had any role in designing footwear -- excuse me. Have you had any role in designing manufacturing equipment that was used to make footwear?

A. Like knitting machines, you mean?

Q. Yes. Have you had any role in designing knitting machines used to make footwear?

A. No.

Q. Have you had any role in testing or using or programming knitting machines used to make footwear?

A. We use the -- I use the knitting machines to make fabrics that also could be used in footwear.

Q. Do you yourself have any experience using manufacturing equipment to make footwear?

A. Yes. I think I mentioned that in my declaration. Before I came to the U.S. my family had a knitting business in Istanbul, Turkey, and we had several circular-knitting machines and so I used to work there during the summer breaks.

And also my uncle had a hand in creating the flat-knitting machine that I used to use to make fabrics. And other than that, we had several machines in our department, warp-knitting machines, weft-knitting machines, and we were using those for the labs for our students to make knitted fabric structures.

Q. Okay. So I'm trying to ask a more specific question that relates to footwear.

Do you have any experience in -- do you have any experience using knitting machines to make footwear?

MS. WILLIAMS: Object to the form.

THE WITNESS: Those fabrics are knitted fabrics and they can be used in footwear and fabrics that are used in shoes are made with those machines.

Q. (By Mr. van Es) Do you know if any fabric that you've ever had -- let me strike the question.

Do you know if any piece of fabric that you've been involved in knitting was ever used to make a piece of footwear?

A. Not that I recall.

Q. Dr. Adanur, what opinions were you asked

to reach in this case?

A. I believe I have stated that. I was asked to give some definitions -- it's in Paragraph No. 13 as I wrote it down -- to give some definitions of -- to give definitions of flat-knit textile element and flat-knit edges.

Q. Were you asked to give your opinion on any other issues?

A. Mainly these definitions of the terms.

Q. So you're referring to Paragraph 13 of your declaration?

A. Yes.

Q. And you said that you were mainly asked to give your opinion on the definition of flat-knit textile element and flat-knit edges?

A. Mainly, yes.

Q. What else were you asked to give an opinion on?

A. We talked with the lawyers from the company about -- specifically I was asked to give those definitions. We talked about several cases -- I mean several issues, but those are the things I was asked.

Q. So I'm just trying to be clear. You

weren't asked or were you asked to give opinions on any other issues other than --

A. Not --

Q. -- the construction of flat-knit textile element and flat-knit edges?

A. Not specifically.

Q. When were you first contacted regarding your work in this case?

A. I believe it was mid-October, around that time if I remember correctly.

Q. And I believe you mentioned that you've spoken with some of the lawyers in the case? Just a yes or no question.

A. Yes.

Q. Okay. And you also --

A. Basically just one lawyer.

Q. One lawyer. Was that Ms. Williams?

A. Yes.

Q. And you also mentioned that you spoke to Dr. Frederick?

A. Yes.

Q. Have you spoken to anyone else besides Ms. Williams or Dr. Frederick regarding your work in this case?

A. Yesterday I met with Clay Holloway, too.

MS. WILLIAMS: Counsel, I feel like we're getting a little close to the stipulation.

MR. VAN ES: I'm just asking who he talked to.

MS. WILLIAMS: Okay.

Q. (By Mr. van Es) You mentioned someone else you talked to yesterday and I don't think I caught the name. I'm not trying --

A. Mr. Holloway.

Q. Mr. Holloway. Okay. He's counsel.

MS. WILLIAMS: Yes.

Q. (By Mr. van Es) Other than lawyers at the Kilpatrick firm and Dr. Frederick, have you spoken to anyone else regarding your work in this case?

A. Not that I recall.

Q. Now, in Paragraph 14 of your declaration you identify the materials that you reviewed to form your opinions.

A. Yes.

Q. Did you review any materials other than those identified in Paragraph 14 to form your opinions?

A. No. I did some Web search but --

Q. Anything else besides the Web search?
A. No. I don't recall.
Q. What did you search for on the Web?
A. I searched flat-knit edges, for example.
Q. What else did you search for?
A. I think that was basically it.
Q. What did you learn as a result of your search for flat-knit edges on the Internet?
A. Nothing. It doesn't exist. The term does not exist on the Internet.
Q. How many books have you written?
A. Three.
Q. Do any of your books discuss footwear?
A. Wellington Sears Handbook of Industrial Textiles.
THE COURT REPORTER: I'm sorry?
THE WITNESS: Wellington Sears Handbook of Industrial Textiles.
Q. (By Mr. van Es) Let me help. Let me just help the court reporter here. Okay. So sorry.
My question is do any of your books discuss footwear?
A. There are chapters in that book, Wellington Sears Handbook of Industrial Textiles,

about weaving, knitting, braiding, and those fabrics are used in shoes. There's another book entitled Handbook of Weaving and also woven fabrics are used in shoes, in the upper shoe. And also there's a chapter in that Wellington book about sports and recreation textiles and I believe there is a paragraph about shoe manufacturing with a picture.

Q. What are the names of your three books and if you could just slowly explain the names of your books.

A. The first one is Wellington Sears Handbook of Industrial Textiles; the second one is Paper Machine Clothing; and the third one is Handbook of Weaving.

Q. Does Paper Machine -- does the paper machine book discuss footwear?

A. No. But the fabrics that are made in that industry, I believe similar fabrics are used in shoes.

Q. I'm going to hand you a copy of the Wellington Sears Handbook of Industrial Textiles. Is that one of your books?

A. Yes.

Q. And can you generally explain to me which sections of this book discuss footwear?

A. There's Chapter 2.1. It discusses fibers and polymers.

Q. Does it mention footwear?

A. I don't recall that.

Q. Let me ask you this. You're in the process of updating that book, right?

A. That's right.

Q. Do you recall any specific discussions of footwear in that book?

A. I'd have to look at my notes. Again, I have a chapter here about sports and recreation and there's a paragraph about the shoes. That's Chapter 14. And, for example, there's a picture there that has shoes showing the fabrics that are used, actually a couple or three shoes there in that picture, Figure 14.21, and the methods that are used in those shoes on Page 490 of the book.

And also there is another chapter, "General Industrial Textiles." On Pages 548 and 549 there's a picture of a figure -- picture of, I'm sorry, a shoe. And also on Page 549, 10 -- Paragraph 10, various applications, I think there's mention there that those fabrics are used. It says, if I can read, "Another common application area of

textile is footwear. Structural components such as box toes, counters, midsoles, insoles, doublers, heel tucks, and linings are made of textiles." Figure 16.28.

Q. And that's Page 490?

A. That's Page 494 -- I'm sorry, 594 -- 549. Sorry about that. And there is another picture on Page 547, Figure 16.28, which says, "Footwear Components Made of Textiles."

Q. Okay.

A. This picture and that picture and that paragraph. "Three-dimensional fabrics are used in athletic shoes." Figure 16.29 shows a spring coil fabric for high performance athletic shoes.

Q. So, Dr. Adanur, you've mentioned Pages 490 and 5 --

A. Let me see. 490 -- just to make sure that was the correct page. Yes, 490.

Q. You've mentioned with respect to your book called Wellington Sears Handbook of Industrial Textiles that Pages 490 and 547 through 549 mention footwear.

As you sit here right now, do you recall any other discussions of footwear in this book that

you're updating?

A. Yes. As I said, in the chapter "Polymers and Fibers," Chapter 2, there are polymers there that can be used in shoes and then, of course, there's fiber and yarn manufacturing that go -- fibers and yarns that go in those shoes -- in those fabrics to make the shoes.

There's Chapter 4, "Fabric Manufacturing," that includes weaving, braiding, knitting, and nonwovens which are all used in shoes. And specifically there is a chapter about knitting on Page 127 that includes weft knitting and warp knitting that are used in shoes.

Q. So just to be clear, I'm talking about references to footwear and my question is other than the pages that I just identified, 490 and 547 through 549, do you recall any other pages in that book that reference footwear?

A. Not that I recall directly referencing shoes or shoe manufacturing, but, again, those fabrics in those chapters that I mentioned, they are all materials for shoes.

Q. Now, you mentioned a third book that you've written. Did you provide a copy of that third

book?

A. I don't believe so. I was not asked, I believe.

Q. And tell me again the title of the third book.

A. Handbook of Weaving.

Q. That book's about weaving, not knitting?

A. That's right.

Q. Now, with respect to the various articles and publications that you've written that are identified in your CV, do you recall if any of those discussed footwear?

A. Not specifically. Again, those are mostly about fabrics and those fabrics can be used in shoes and are used in shoes.

Q. How did you go about identifying the materials identified in Paragraph 14 of your declaration? Let me strike the question.

How did you go about deciding what materials to review in forming your opinion?

A. Okay. The first five were given to me by the counsel. The next one, the one on the top of the page, Page 5, I believe several pages were given to me by the counsel, but also I have a copy of that book

myself.

Q. Okay. So just so we're clear, you're talking on the top of Page 5 the bullet point that says, "Excerpts from 'Man-Made Fiber and Textile Dictionary,' Exhibit 2011"?

A. Yes.

Q. That is something that counsel provided you?

A. Yes, several pages of it.

Q. And you also have a copy of that --

A. Yes.

Q. -- in your office?

A. Yes.

Q. Okay. Please continue explaining where --

A. And the next one was provided by the counsel. The third one, I had that book. The fourth one --

Q. So just so we're clear here, the third bullet point which is "Knitted Fabrics, Manufacture and Processing, Ciba-Geigy," C-i-b-a dash G-e-i-g-y, "1976, Exhibit 1017," that was provided by counsel to you?

A. No. That is my book.

Q. Okay. And then the next item which is

Exhibit 1018 --

A. That is also my book. In fact, the author sent me a complimentary copy a few years ago for me to kind of check the book and make comments about it, so I have it also in my office.

Q. Okay. And the next item is the Spencer book about knitting technology?

A. Yes. I have a copy of that book, 1989 edition, and I believe counsel has a later edition.

Q. And the next item listed is the Wellington Sears Handbook. That's your book, correct?

A. That's right.

Q. And the next item listed is "Man-Made Fiber and Textile Dictionary, Celanese," C-e-l-a-n-e-s-e, "Corporation, 1081, 1985." Where did that come from?

A. That's my book.

Q. And continue.

A. And then the next one, Dictionary of Fiber & Textile Technology, that is also my book in my office from Hoechst Celenese. Celenese Corporation combined with Hoechst of Germany and I believe they published that book together. I have a copy of it in my office.

The next one, Technical Fabric Structures, a few pages were sent to me by the counsel, but I know about that book. In fact, I feel that the author was compelled to write that book after my Wellington book, after this green book, and I know the person from the conferences and I might have a copy of it. I'm not sure about that, though.

Weft Knitting Technology was also I believe provided by counsel.

Q. So the item -- just so the record is clear, the item listed in the middle of Page 5 that says "Weft Knitting Technology (1 page)," that was provided by counsel?

A. That's right.

Q. Okay. Please continue.

A. And the patents, they were provided by the counsel. "The Milanese Machine" --

Q. So the next bullet point you're mentioning is "The Milanese Machine, Textiles, December 1921, Exhibit 1019"?

A. Yes. I found that reference on the Internet, I believe, or somewhere and then the counsel provided the original copy of that article, I believe. And then the European patent application, the counsel

provided that.

The next one, "Knitting Fundamentals," that's my class notes that I teach; in fact, I just taught it this semester.

And the next one, various knitting machine manufacturers' brochures, those are the brochures that I picked from the trade shows and companies that I visit to share with my students and to use in my classes, as well as the last item which is fabric samples. Again, I've been collecting those for the last 30 years from different manufacturers, different trade shows, different companies.

Q. I would like to direct your attention to Paragraph 36 of your declaration and in that paragraph you give a construction of flat-knit textile element, right?

A. Yes.

Q. And you say, "Flat-knit textile element means a knitted textile that is knit in flat form."

A. Yes.

Q. Okay. What does that mean?

A. Well, flat-knit textile element means that -- a knitted textile that is knit in flat form, as it is written there.

Q. What does knit in flat form mean?

A. It means that it is a planer fabric. It's made in planer form.

Q. So you say it's a planer fabric made in planer form, right?

A. Right.

Q. I just want to make sure I'm clear about what you said.

A. Yes.

Q. Does that mean it's knit essentially in a flat plane?

A. That's right.

Q. So your construction of -- strike that.

What's your construction of the term flat-knit edge?

A. It is written in Paragraph 38 in my declaration. "When given the broadest reasonable interpretation that is consistent with the '011 patent, flat-knit edges mean edges of a knitted textile that are knit in flat form."

Q. What does that mean, "knit in flat form"?

A. Again, the fabric is planer fabric made in a planer form, flat form.

Q. And when you say planer you mean

p-l-a-n-e-r, right?

A. That's right.

Q. So the definition of flat-knit edges -- strike that.

So your opinion is that the correct construction of flat-knit edges is edges of a knitted textile where the textile is a planer fabric that's made in planer form or flat form?

A. Yes.

Q. Do you have an understanding of the term knit to shape?

A. Yes.

Q. What does that mean?

A. That means that the product is made in the final shape.

MR. VAN ES: Okay. I think this is a good time to take a break.

THE VIDEOGRAPHER: The time is 9:59 a.m. We're now off the record.

(Recess from 9:59 a.m. to 10:14 a.m.)

THE VIDEOGRAPHER: The time is 10:14 a.m. We're back on the record.

Q. (By Mr. van Es) Dr. Adanur, I want to direct your attention to Paragraph 18 of your

declaration. Do you see that paragraph?

A. Yes.

Q. Is Paragraph 18 the framework that you followed to provide your opinion regarding claim construction?

A. I read that document and then, yes, I used information there.

Q. When you say you read that document what are you referring to?

A. There was a document that was given to me by the counsel. I guess it has a title "Inter Partes Review of '011 Patent." I think I misunderstood part of your question. Sorry about that. Yes. So I misunderstood your question.

Q. Okay. Do you want to try to answer it again?

A. Could you repeat the question again? Sorry.

Q. Does Paragraph 18 reflect the framework that you used to determine your proposed claim constructions?

A. Yes, partly.

Q. What do you mean by partly?

A. I mean I used other resources, too,

including this one given in Paragraph 18.

Q. Is Paragraph 18 the standard that you followed to arrive at your claim constructions?

A. Again, that was part of it.

Q. When you say "that was part of it" what do you mean?

A. Because I was trained also before in that area in the Sulzer case.

Q. You're referring to one of your earlier cases that you worked on --

A. Yes.

Q. -- the Sulzer case, S-u-l-z-e-r?

A. Yes. And also I took more training in patents and these issues. There was one that was offered by the National Science Foundation Conference, part of the conference, and also I believe I did some webinars a few years ago about patents.

Q. Okay. But does Paragraph -- strike that.

Did you follow a standard to arrive at your claim construction other than what is described in Paragraph 18?

A. That is difficult to answer because, again, I have a background in that area. This is something that I used, but there might be other things

that I have as a background.

Q. Can you tell me what standard you did follow to arrive at your claim construction opinions?

A. This one that is listed in 18 and also in Paragraph 19, 35 USC 102, Paragraph 20, I read those, and 35 USC 103.

Q. Anything else?

A. Paragraph 22 which is really from 35 USC 103, a summary of that, those A, B, C, D, E, F, G listed there. And I guess there was a case that involved KSR International versus Teleflex that was also mentioned in that document.

Q. So just so I'm clear, the standard that you followed to arrive at your proposed claim construction is reflected in Paragraphs 18 through 22 of your report?

A. Well, I used those, I read those, and, again, I was informed by the counsel about inter partes review. So it is difficult to pinpoint what I used now, but these are things that I reviewed when I was forming my opinion.

Q. So, Dr. Adanur, I'm not asking you what materials you reviewed. I'm trying to understand the standard or the framework or the model that you used

to arrive at your proposed claim constructions. Do you understand?

A. Yes. This is the model that I followed.

Q. Do you understand my question?

A. Yes.

Q. So did you follow a standard other than what is specified in Paragraph 18 to arrive at your proposed claim constructions?

A. Again, it is difficult to pinpoint, but I don't recall specifically if I used others but what I used is listed here in my declaration.

Q. And when you say "listed here" you mean which paragraphs?

A. All these, 18, 19, 20, 21, 22, 23.

Q. Do Paragraphs 19 through 23 bear on the standard that you used to arrive at your proposed claim constructions?

A. Mostly Paragraph 18, I believe, had the facts that I used.

Q. Okay. Who told you about the standard in Paragraph 18?

A. I knew it before from the previous cases, especially that case that involved Sulzer, but also my counsel; discussed with my counsel.

Q. So tell me about just generally the process that you went through to construe the claim terms.

A. Can you be more specific about process? I mean --

Q. Well, what process did you follow to arrive at your proposed claim constructions?

A. Well, I read the patents that are involved and, again, I discussed with counsel that inter partes review and I reviewed that document that is listed as No. -- Bullet 3 on Page 4.

Q. You're referring to Exhibit 2005?

A. Yes.

Q. Okay. So please continue in describing the process that you went through to arrive at your claim constructions.

A. So I read those and then --

Q. So to be clear, you've looked at the '011 patent?

A. Yes.

Q. You've looked at Exhibit 2005 which is the PTAB decision?

A. Yes.

Q. And what else did you look at?

A. Well, I reviewed the file history, Nike's Motion to Amend Patent '011. I read the declaration of Mr. Tonkel and I read -- I reviewed those patents also listed on Page 5 and all those documents listed on Page 5, and, again, 35 USC 102 and 103.

Q. Okay. And referring to the first sentence of Paragraph 18, did you determine first what the broadest reasonable interpretation of the claim terms was?

A. Yes.

Q. And then did you next check if that was consistent with the patent specification?

A. Yes.

Q. And that's the standard you used to offer your claim construction opinion?

A. Yes, I would say so.

Q. I want to ask you some questions about warp and weft knit. First of all, warp and weft knitting are different types of knitting; is that right?

A. That's right.

Q. Can a single article be both warp knit and weft knit?

A. In the same structure?

Q. Yes.

A. There is a structure in one of the brochures that has warp knitting and weft knitting combined and that is from Karl Mayer.

Q. Would you say that a structure that is both warp and weft knit in a single structure is unusual?

A. Well, the original article is in German and there's a combination at the back of the brochure. I remember the figure but I don't remember what they called the structure.

Q. I'm going to hand you a pile -- excuse me. I'm going to hand you a stack of materials that appear to consist of a piece of paper with some sort of material stapled to them. Do you recognize this pile of materials?

A. Yes.

Q. Are those materials from your office?

A. Yes.

Q. Is one of the samples that you described in that stack of materials?

A. No.

Q. Okay. Did you bring to the offices today the sample material that you describe that's both warp

and weft knit?

A. No.

Q. Aside from that specific Mayer sample that you saw, have you ever seen a --

A. It wasn't a sample, it was a document.

Q. Okay.

A. It was not a fabric sample.

Q. I see. I understand. Aside from that article -- the article that you mentioned, it's in German?

A. Yes, it's in German but with English translation. However, they don't translate, I believe, if I remember correctly, the titles of the figures, what pictures. They just translate the text.

Q. I see. And aside from this German article, are you aware of any other materials that describe a single article that's both warp and weft knit?

A. Well, there is another structure that is called milanese knit fabrics and it can be considered also between warp knitting and weft knitting. The structure is kind of in between.

Q. So milanese knitting is both warp, w-a-r-p, and weft, w-e-f-t, knitting?

A. It is considered to be by different resources. I believe some resources consider it to be warp and others weft, but the structure is kind of in between.

Q. So some people consider milanese -- strike that.

Some people consider a milanese knit material to be warp knitting and some might consider it to be weft knitting?

A. Yes, that's possible, and actually it is in my declaration, Paragraph 25. It says, "In addition to warp knit and weft knit, milanese is another type of knitted textile in which the yarn is oriented diagonally knit across the textile."

Q. Dr. Adanur, can I just ask for the sake of the court reporter that when you read from any materials if you could read slowly so she can transcribe more easily.

A. I'm sorry. Okay. Shall I repeat? "In addition to warp knit and weft knit, milanese is another type of knitted textile in which the yarn is oriented diagonally across the textile." It is Exhibit 1018, Page 10. "Milanese has been a well-known form of knitting since at least 1921."

That's Exhibit 1019, Page 3.

Q. That's fine, Dr. Adanur.

A. Okay.

Q. But milanese is not considered to be a combination of both warp and weft knitting, correct?

A. No.

Q. That's correct, right?

A. That's right.

Q. Are there different types of weft knitting?

A. There are subcategories of weft knitting.

Q. What are the subcategories of weft knitting?

A. Circular knitting, which is the dominant form of weft knitting, and flat knitting.

Q. Are there different types of warp knitting?

A. Yes. Warp knitting also has flat knitting, which is a dominant way of making warp-knit fabrics, and also circular knitting.

Q. So is flat knitting a subset of warp knitting?

A. Yes. Actually, the major subset of warp knitting.

Q. What do you mean by major?

A. Most of the warp-knitting machines are flat and they produce flat fabrics.

Q. Can a flat-knit textile element be made in any way other than by flat knitting?

MS. WILLIAMS: Object to the form.

Q. (By Mr. van Es) Do you understand the question?

A. Can you repeat it?

Q. Sure.

MR. VAN ES: Can you read back the question, please.

(The record was read by the reporter.)

THE WITNESS: If you make a circular knitted fabric and then slit it, cut it open and make it -- cut a piece out of it, that would be a flat element from a circular knitted fabric.

Q. (By Mr. van Es) So a flat-knit textile element can be made by circular knitting?

A. Well, it depends on your definition. Again, you know, in circular-knitting machines, warp knit and weft knit, the fabric is in a circular form, a tubular form, but in industry they open it and then cut pieces from that and that could be considered a

flat structure, not flat knitted but a flat structure.

Q. So my question is can a flat-knit textile element be made by circular knitting?

A. I think I answered that question. When the fabric comes out of the machine it comes either in flat form made on a flat machine or in a circular form made on a circular machine, but people use the circular flat-knit fabric, they slit it, they open it, they cut a piece, and if you show that piece to another person that did not see that process, that's a flat element to that person.

Q. So circular knitting can be used to make a flat-knit textile element?

A. In industry, for example, they call a circular-knit underwear fabric a flat-knit fabric.

Q. Okay. As you --

A. Again, it depends on the definition and the person that sees that -- the time that the person sees that fabric. The circular fabric that comes from the circular weft-knitting machine for underwear, it's a circular -- made circular fabric, but in industry it is kind of referred to as flat fabric or flat element because -- basically because of the smooth surface, the flat, smooth surface. The flat comes from the

smoothness of the surface on that element.

Q. So you're an expert in knitting, right?

A. Yes.

Q. Would you say that circular knitting can be used to make a flat-knit textile element?

A. Circular-knitting machine?

Q. Yes. Can a circular-knitting machine be used to make a flat-knit textile element?

A. It is not a common practice.

Q. So does that mean circular knitting could be used to make a flat-knit textile element in your opinion?

A. Well, there are tricks in the trade that make it possible with manipulation of the machine, but that would be well beyond the common practice.

Q. Does it depend on whether the material is planer during the knitting process?

A. Does it what?

Q. Does whether or not the resulting material is a flat-knit textile element or not depend on whether the material is planer during the knitting process?

A. Yes. The definition of flat-knit fabric is that it is made flat on the machine, the common

definition.

Q. And the definition of flat-knit textile element means it's made flat on a machine?

A. That's right.

Q. Have you ever seen a flat-knit textile element made on a circular-knitting machine?

MS. WILLIAMS: Object to the form.

THE WITNESS: Not that I recall.

Q. (By Mr. van Es) So, Dr. Adanur, what does the term flat knitting mean?

A. Flat knitting means the fabric comes from the machine in flat form, in planer form.

Q. The fabric comes from the machine in flat or planer form?

A. Yes.

Q. What is your definition of weft-knit textile element?

A. It is a fabric in which the yarn moves in the horizontal direction. Actually, it is written in my declaration, Paragraph 24, if I can read.

Q. Certainly.

A. "Knitted textiles are generally" -- sorry. "Knitted textiles are generally divided into warp knitted and weft knitted on the basis of fundamental

differences in the construction of two groups. Generally speaking, in weft-knitted textiles the yarn being kinked into loops runs horizontally across the textile, whereas in warp-knitted textiles the yarn being kinked into loops runs vertically along the textile."

That's from Exhibit 1017, Page 55.

Q. Okay. Dr. Adanur, what's your definition of warp-knit textile element?

A. Warp-knit textile element, as I said here, it is the fabric that is -- in which the yarn runs in the vertical direction.

Q. And what would be the proper construction of flat-knitted textile element?

A. Flat-knitted textile element can be both warp knit and weft knit and, again, it is -- the fabric is in the planer or flat form, produced in that form.

Q. Is the definition of -- excuse me.

Is the construction of flat-knitted textile element the same as the construction of flat-knit textile element?

A. Yes. Knit and knitted are used interchangeably.

Q. Does the term flat-knit textile element mean the same thing as knit flat textile element?

A. It is distorted I guess in grammar, but I would agree, yes.

Q. So the word "flat" in flat-knit textile element in your opinion modifies the word "textile element," correct?

MS. WILLIAMS: Object to the form.

THE WITNESS: Let me find that. Okay. Can you repeat that question, please?

Q. (By Mr. van Es) So we're talking about the term flat-knit textile element --

A. Yes.

Q. -- and you just said that flat-knit textile element and knit flat textile element mean the same thing. So my question to you is, does the word "flat" in flat-knit textile element just modify the term "textile element"?

MS. WILLIAMS: Object to the form.

Q. (By Mr. van Es) Do you understand the question?

A. Not necessarily, because here I think there is a reference to the manufacturing process, too.

Q. Okay. Just to be clear so the record's clear, you understood my question?

A. I think so.

Q. Okay. Now, explain again what the term flat in flat-knit textile element -- is that an adjective, the term flat?

A. Flat knit here refers to manufacturing in the flat form and it is the same thing as flat-knitted textile element. Again, knit and knitted are used interchangeably in the profession. But if you say just flat textile element, that would not refer to the manufacturing process.

Q. So the word "flat" in flat-knit textile element is directed to the manufacturing process?

A. Yes.

Q. Okay. Now, I understand that all of those constructions that you just provided are your opinion of what those terms mean, right?

A. Yes.

Q. And you're an expert in knitting?

A. Yes.

Q. Are those constructions that you have offered what those terms would mean to a person of ordinary skill in the art of footwear?

A. It should be.

Q. And what's your basis for saying that?

A. Because they should know what they are using in their product.

Q. Explain to me what you mean by that.

A. I mean the fabric especially in sporting shoes is the product's most important element for sales, for commercialization, for example, the texture, the color, the shape, and of course the comfort, the properties, the flexibility, the abrasion resistance, maybe even stain resistance. So all those things are an important part of shoe manufacturing and a person working in that industry or in that field should know those definitions.

Q. Have you ever heard anyone refer to an item that was warp knit as a flat-knit textile element?

A. Well, yes. In fact, the majority of warp knitting is knit in flat form.

Q. And you've heard -- so when is the last time you heard someone refer to a product that was made by warp knitting as a flat-knit textile element?

A. Well, again, the default today in the industry, in the market, the default manufacturing

method in warp knitting is flat knitting. The fabrics produced in warp machines, the majority are flat fabrics, come out of the machine as flat fabrics, knitted flat, and circular is the exception in warp knitting.

Q. Okay. Are you saying that the industry refers to an item coming off a warp machine as a flat-knit textile element?

A. That's right.

Q. And when is the last time you heard someone describe an article that came off a warp-knitting machine as a flat-knit textile element?

A. Well, it is in every reference everywhere. I mean, if you look at any brochure of any warp-knitting machine manufacturer, the samples -- if you look at the samples of warp-knit fabrics, they're all flat. So it is -- again, the default is warp-knitting machines produce flat fabrics.

Q. Have you heard anyone actually use the words flat-knit textile element to describe an article that came off of a warp-knitting machine?

A. I don't remember that I paid attention specifically. I talk to people in conferences and trade shows and everything, but that's again by

default. Even if they said it I wouldn't pay attention because by default it is a flat fabric that comes from warp-knitting machines and all these fabrics is all of warp-knitted structures and they are all made in flat form on the machine.

Q. And my question to you is do you have any dictionaries that describe a flat-knit textile element as something that came off a warp-knitting machine?

A. Well, if --

MS. WILLIAMS: Object to the form.

THE WITNESS: I'm sorry?

MS. WILLIAMS: I said object to the form.

THE WITNESS: If you look at again the references I listed it tells you that warp knitting produces flat fabrics. For example, in my declaration, for example, in Paragraph 33, "Warp Knit Fabrics Technologies, a reference book in 2007 and which is contemporaneous with the '011 patent, states that 'In the industry, some people refer to weft-knitting machines as flat machines and warp-knit machines as circular machines, but in reality there are flat and circular warp as well as weft-knit machines." This is Exhibit 1018, Page 9.

And also in Exhibit 1017, again, in Paragraph 32 on Page 12 of my declaration, "However, there are circular warp-knitting machines as well in which needles move individually." Exhibit 1017, Page 11. "The Man-Made Fiber and Textile Dictionary (a reference book that I have in my office and also submitted as an exhibit by patent owner) defines flat-knit fabric as 'a fabric made on a flat-knitting machine, as distinguished from tubular fabrics made on a circular-knitting machine,'" Exhibit 2011, Page 6.

And as I wrote there, "While the reference states that the term flat-knit fabric may be used in the trade to refer to weft-knit fabrics, this reference also supports the industry understanding that tricot and milanese" --

Q. (By Mr. van Es) Hold on. Hold on. Dr. Adanur, can I ask you to repeat that sentence?

A. "While the reference states that the term flat-knit fabric may be used in the trade to refer to weft-knit fabrics, this reference also supports the industry understanding that tricot and milanese warp-knit fabrics are knit in flat form." And, again,

as I said, really the majority of the warp-knit fabrics are made in flat form and the majority of the weft-knit fabrics are made in circular form.

Q. Are you finished?

A. I'm sorry?

Q. Continue.

A. Paragraph 31, in the middle it says, "It is well known that warp-knit fabrics produced by tricot machines are knit in flat form."

Q. So you've referred -- and my question is documents that refer to a fabric made on a warp-knitting machine as a flat-knit textile element and you've referred to Exhibits 1018, 1017 and 2011, correct?

A. Yes.

Q. Any others?

A. Again, in every knitting book, for example, the chapter that I have in my book shows a picture, 453 --

Q. Dr. Adanur, I'm asking you about your declaration. Your declaration doesn't cite any pages of your book, does it?

A. Well, it lists the chapters as part of my documents that I reviewed.

Q. But it doesn't cite any pages in your dec --

A. I do not --

Q. Doctor, let me finish the question. Your declaration doesn't cite any pages of your book, does it?

A. I don't think so.

Q. Okay. So my question is in your declaration, other than Exhibits 1018, 1017 and 2011, can you direct me to any documents that you say refer to a fabric made on a warp-knitting machine as a flat-knit textile element?

MS. WILLIAMS: Objection to form.

THE WITNESS: Can I read it? Again, in Paragraph 27 on Page 11 it says, "There are flat and circular warp and weft-knitting machines." That's again in Exhibit 1017. "Both flat-knitting machines and circular-knitting machines may be used to produce warp-knitted and weft-knitted textiles as shown in Table 1."

Q. (By Mr. van Es) And that's referring to 1018, right?

A. 1018, yes.

Q. So just again my question, Dr. Adanur, in

your declaration can you direct me to any documents other than Exhibits 1018, 1017 and 2011 that you say refer to a fabric made on a warp-knitting machine as a flat-knit textile element?

A. Okay. Let me again review some more. Exhibit 1019, it is mentioned in Paragraph 25, "Milanese has been a well-known form of knitting since at least 1921."

Yes. Exhibit 1022, as I said in Paragraph 34, "U.S. Patent '596, which is also contemporaneous with the '011 patent, includes a similar definition of flat knit (i.e., a knitted fabric made on a flatbed" -- "a knitted fabric made on a flatbed knitting frame, as distinguished from tubular fabric made on a circular frame) to describe a warp-knit construction produced on a conventional flat-knitting machine."

Q. And that's it, right?

A. I believe so.

Q. All right. I want to first be clear, Exhibits 1018, 1017, 1019, 1022, they're not dictionaries, are they?

A. Exhibit 1022 is not. 1018 is a book. 1017 is a book also. They're not.

Q. And none of these exhibits, 1018, 1017, 1019 or 1022, say that a fabric made on a warp-knitting machine is a "flat-knit textile element," correct?

A. It is not maybe that quotation but it is by default. Most of the fabrics woven on warp-knitting machines are made flat.

Q. But none of those exhibits, 1017, 1018, 1019 or 1022, say that something that is warp knit is a flat-knit element --

MS. WILLIAMS: Object to the form.

Q. (By Mr. van Es) -- correct?

A. Well, I cannot say that. I have to read those books again or do a search in those books again. I cannot remember -- I didn't memorize those books. I cannot remember whether they say it or not. But even if they don't say it, I wouldn't be surprised because by default warp-knitting machines produce flat fabrics. And, again, if you'll allow me, I can refer to my book.

On Page 131 there's a picture or a schematic of a warp-knitting machine and, as you can see from there, in that figure the fabric is flat and that is representative of warp-knitting machines today

in the industry.

Q. So I'm asking very specifically about the term flat-knit textile element. Do you understand that?

A. Yes.

Q. And your book or none of these exhibits that we've been talking about refer to a flat-knit textile element as something that came off a warp-knitting machine, correct?

A. I don't know that I said that.

Q. Do you disagree with that?

A. I would disagree with that.

Q. Does your book say that a flat-knit textile element is something made on a -- can be something made on a warp-knitting machine?

A. Does it say that? You mean -- what is your question again?

Q. My question is, does your book say that a flat-knit textile element is something that can be made on a warp-knitting machine?

A. I don't remember, you know, the exact wording in that chapter, but, again, that is by default. It is the understood manufacturing method in the profession, in the industry that the majority of

warp-knitting machines produce flat warp-knit fabrics and, again, that is the common form of fabric that comes from those machines.

Circular warp knitting is the exception right now. In the past maybe it was not, but now circular warp knitting is the exception. The majority of the warp-knitting machines produce flat-knitted fabrics, almost all.

Q. And when you say a warp-knitting machine makes flat-knitted fabrics, that's because during the knitting process the material is planer?

A. That's right.

MR. VAN ES: I've gotten a note from the videographer that we just have a couple of minutes to go on the tape, so maybe we can just take a short break and go off the record and change the tape.

THE VIDEOGRAPHER: The time is 11:03 a.m. This concludes Tape No. 1 and we are now off the record.

(Recess from 11:03 a.m. to 11:12 a.m.)

THE VIDEOGRAPHER: The time is 11:12 a.m. This is the beginning of Tape No. 2. We're back on the record.

Q. (By Mr. van Es) So, Dr. Adanur, I've handed you Exhibit 1017. Do you see that?

A. Yes.

Q. Does Exhibit 1017 anywhere say that an article made by a warp-knitting machine would be considered a flat-knit textile element?

A. Looking through, I believe it does. If you look at Page 11, there's a table there. If you look at the table, very last column, "Bearded and 2-Piece-Needle Knitting Machines," and under that last column, "Loops formed from sets of threads, warp-knitting machines." And then under that, "Yarn looped vertically," and under that, "Needles in one line, flat warp-knitting machine."

Q. And does that tell you, Dr. Adanur, that an article made on a warp-knitting machine is a flat-knit textile element?

A. Yes. Again, on the same table, second large column, "Latch-Needle Knitting Machines," if you follow the right side of that column, "Loops formed from sets of threads, warp-knitting machines," and under that, "Needles move collectively. Under that, "Yarn looped vertically," and under that, "Needles in one line, raschel machine," r-a-s-c-h-e-l. A raschel

machine is a flat --

Q. Can you point to where you are right now?

A. A raschel machine, as it is known in the industry, is a flat fabric producing machine.

Q. And the reason that these two types of machines you would say create a flat-knit textile element is because the textile is planer during the knitting process?

A. That's right.

Q. So after using a warp -- warp knitting can be -- take a step back.

In warp knitting the textile can be planer or it can be nonplaner, correct?

A. It can be circular, too, but, again, this table shows circular warp-knitting machines, too, but this book was I guess written in the 1970s. Right now the rule in warp knitting is to produce flat fabrics on warp-knitting machines and the exception is to produce circular warp-knitted fabrics.

Q. So if you have a textile element that's knitted by a circular warp-knitting machine, can you tell after the textile element is knitted and the knitting process is complete whether it was knit on a circular warp-knitting machine or not?

A. Let me refer to -- let me refer you to my declaration first on Paragraph 27. It says, "The manner in which loops are formed differentiates the knitting machines. Regarding the knit fabric structure, it is hardly possible to state with certainty the type of knitting machine on which the fabric was knitted. There are flat and circular warp and weft-knitting machines," and that is Exhibit 1017, Pages 9, 11, 12.

So having said that, if the fabric comes in a circular -- comes from a circular warp-knitting machine, as you said, yes, one should be able to identify that fabric structure by looking at the flow of the yarns in the fabric. Since it's a circular, tubular structure it is obviously a tubular fabric or a circular fabric and by looking at the yarn flow in the fabric design, then he or she should be able to tell that it is from a warp-knitting machine.

Q. Okay. So to know whether a knitted textile is knit in flat form you need to know the configuration of the textile during the knitting process, right?

A. That's right.

Q. So you need to know whether the knitting

process -- the particular method of the knitting process, whether it's circular or flat?

A. Yes, you should know the machine.

Q. So in construing flat-knit textile element you do need to know a particular method of producing the fabric, right?

A. Yes, I would say so.

Q. So did anywhere in Exhibit 1017 -- let me take a step back.

Did you review the entire book that the pages of Exhibit 1017 were copied from?

A. I skimmed through the entire book and then picked the relevant sections for this case and reviewed those.

Q. And anywhere in the book did the book say that a particular textile was flat knit when it was made on a warp-knitting machine?

A. Again --

MS. WILLIAMS: Object to the form.

THE WITNESS: By default -- I don't remember -- I don't recall specifically if the book said that, but if you look at the pictures, for example, Exhibit 1017, Page 31, there's an automatic warp-knitting machine and you can see

the fabric in the front. That is a flat warp-knit fabric. So I think the books are beyond that point to indicate that a warp-knitting machine produces a flat warp knit. I mean, it is pretty much the standard in the industry now.

Q. (By Mr. van Es) So just to be clear, the book doesn't use the terminology flat-knit textile element to describe an element that was knit on a warp-knitting machine?

A. I believe it does. Again, I don't --

Q. But can you point me to any specific instance where the book describes -- let's focus on terminology here and I want to focus on the textile element.

A. Okay.

Q. Can you describe any -- can you show me anyplace in the book, Exhibit 1017, where a textile element is described as flat knit where it was made on a warp-knitting machine?

A. Yeah. I didn't memorize the book but I can find it for you, I think. Okay. On Page 9, very last bullet item, this is a survey of the knitting machines, "A further subdivision of the machines is

based on a number of distinctive" --

Q. Slow down, Dr. Adanur.

A. I'm sorry. The second paragraph on that page, it says, "A further subdivision of the machines is based on distinctive machine features and allows designations to be derived from them," and there are a couple of bullets and the third bullet item is, "Arrangement of the needles in the machine, i.e., flat or straight-bar machines or circular machines." And it says, "On flat or straight-bar knitting machines, the needles are arranged in a straight line and the fabrics knitted on these machines are produced in an open width or as flat fabrics. Circular-knitting machines have their needles arranged in a circle and the fabric leaves such machines in tubular form."

Okay. So I gave the definition of flat fabric, right, on this page. So if you go to Page 13, "Raschel Machines," the second paragraph, "Needles and thread are roughly in the same vertical plane," that is a warp-knitting machine.

Okay. On Page 12, straight-bar -- the very last bullet item, "Straight-Bar Warp-Knitting Machines: These are subdivided into circular machines (automatic warp-knitting machines), raschel machines

and crochet machines in accordance with the type and arrangement of the needles and threads and the way in which the knitted fabric is drawn off from the knitting position."

That is a straight-bar warp-knitting machine and, as I said, on Page 9 the definition of flat fabric is a fabric that comes from a straight-bar knitting machine.

Q. Okay. And my question is, Exhibit 1017 doesn't say anywhere that flat knit means an article that came off a warp-knitting machine, right?

A. No. I think it is --

Q. Let me ask the question again.

A. I'm sorry.

Q. Exhibit 1017 doesn't say that a flat-knit element is something that could come off of a warp-knitting machine, correct?

MS. WILLIAMS: Object to form.

THE WITNESS: I just said it. I just explained it. If you look at Page 12, the last bullet item --

Q. (By Mr. van Es) Page 12 does not use the word flat knit, does it?

A. But if you combine it with the last bullet

item on Page 9, it's a flat fabric. The definition of flat fabric on Page 9, the last paragraph, again, let me read it again, "On flat or straight-bar knitting machines, the needles are arranged" --

Q. You don't need to read it again.

A. Okay. The definitions are there and there may be more. Again, I don't know the whole book -- I didn't memorize the whole book, but I'm sure there are other places that talk about flat-knitting machines saying that they produce warp-knit fabrics.

Q. And just to be clear on the terminology, I'm asking you about the terminology flat-knit textile, flat-knit textile.

A. Yes.

Q. Exhibit 1017 doesn't say that a flat-knit textile can be made on a warp-knitting machine?

A. It does say that.

Q. But it doesn't use the word flat knitting to describe that process, does it?

A. Well, it does. I mean, here -- it describes, yes, the machine operation. On Page 14, "Construction, Operation and Special Features of Various Types of Knitting Machines," 2.1, "Flat-Knitting Machines," it describes the

construction and then on Page 15 it describes operation and special features. Okay?

And then again on Page 23, Paragraph 2.5, "Straight-Bar Warp-Knitting Machine," and straight-bar is the bar that has needles on them straight and then it produces a flat fabric. Again, the construction is explained there.

"Operation and Special Features" on the next page, Page 24.

Q. The flat-knitting machine described in Section 2.1 on Page 14, is that a warp-knitting machine or a weft-knitting machine?

A. On Page 14? I have to read it, but, again, both, because there are flat machines both in warp knitting and weft knitting. The approach of this book is a little bit different than classic textbooks because these are the manufacturers of the machines, so they really classify the machines a little bit different than just warp and weft-knitting machines.

Q. This book is directed more towards manufacturers?

A. Yes, machine manufacturers. Yeah, I think this is from the machine manufacturers, manufacturers of the knitting machines.

Again, on Page 24, the last paragraph, "Automatic Warp-Knitting Machines (Tricot Machines)." On Page 25, "Raschel Warp-Knitting Machines."

Q. Dr. Adanur, does the term flat knit appear in Exhibit 1017?

A. Well, I told you on Page 9, flat fabric.

Q. I'm asking about the term flat knit. Does the term flat knit appear in Exhibit 1017?

A. Again, I'd have to read the whole book to answer --

Q. As you sit here right now, do you know whether the term flat knit appears in Exhibit 1017?

MS. WILLIAMS: Object to the form.

THE WITNESS: I don't know. Again, I'd have to do either a search on the book or read the whole book. But flat-knitting machines in the index, for example, Page 7 -- no, Page 14 that I just mentioned, "Flat-Knitting Machines," so flat knitting is there.

Q. (By Mr. van Es) Okay. But none of the paragraphs in your declaration talk about the term flat knit appearing in Exhibit 1017, correct?

A. Just flat knit, not flat knitting?

Q. Your declaration doesn't refer to flat

knit or flat knitting, does it?

A. Which paragraph are you talking in my declaration?

Q. I'm talking about your discussion of Exhibit 1017. There's no discussion in your declaration of flat knit or flat knitting appearing in your declaration?

MS. WILLIAMS: Object to the form.

THE WITNESS: Well, I defined the flat-knit textile element in Paragraph 36 as a knitted textile that is knit in flat form.

Q. (By Mr. van Es) Dr. Adanur, I'm asking you about Exhibit 1017 and my question is in your declaration you don't say that Exhibit 1017 talks about the term flat knit, correct?

A. I wouldn't say so because in Paragraph 31 in my declaration I gave Exhibit 1017 and it says, "Flat warp-knitting machines are also referred to as straight-bar warp-knitting machines which are often subcategorized as tricot machines, raschel machines, and crochet machines."

Q. Okay. I want to focus on the term flat knit. Can you focus on the term flat knit with me?

A. Okay.

Q. In your declaration you don't say that Exhibit 1017 says anything about the term flat knit, correct?

A. Well, I wouldn't say that. Again, in the same paragraph, just the next sentence, "These machines produce warp-knitted fabrics in flat form."

Q. Okay. And I'm asking you about the term flat knit. The term flat knit does not appear in Exhibit 1017, does it?

A. I don't know that because I'd have to review the whole book.

Q. Okay. But your declaration doesn't say that the term flat knit appears in Exhibit 1017, correct?

MS. WILLIAMS: Object to the form.

THE WITNESS: Let me look again. Again, in that same paragraph it says, "It is well known that warp-knit fabrics produced by tricot machines are knit the flat form."

Q. (By Mr. van Es) Dr. Adanur, I'm asking you about the term flat knit. Your declaration doesn't say that the term flat knit appears in Exhibit 1017, correct?

MS. WILLIAMS: Object to the form.

THE WITNESS: I couldn't find it in my declaration.

Q. (By Mr. van Es) Okay. I'm going to hand you Exhibit 1018. Do you recognize this exhibit?

A. Yes.

Q. Does Exhibit 1018 use the term flat knit?

A. Again, I'd have to either read the whole book or do a search on the book to answer your question, you know, precisely, but I would be surprised if it was not used in this book because it's all about warp knitting.

Q. In any event, in your declaration you don't cite to any section of Exhibit 1018 where the term "flat knit" is used, right?

A. Let me see. Well, again, on Page 9 -- in Paragraph 27 in my declaration, "Both flat-knitting machines and circular-knitting machines may be used to produce warp-knitted and weft-knitted textiles, as shown in Table 1." And the reference is Page 9 in Exhibit 1018, one of the references.

Q. Right. And so in your declaration you don't cite to any examples of where the term "flat knit" is used in Exhibit 1018, right?

A. I believe by default it is referring to

flat knit, some of my sentences. But, again, in Paragraph 33 in my declaration, "Warp-Knit Fabrics Technologies, a reference book written in 2007 and which is contemporaneous with the '011 patent, states that 'In the industry some people refer to weft-knitting machines as flat machines and warp-knitting machines as circular machines, but in reality there are flat and circular warp as well as weft-knitting machines.'"

Again, for a person who's skilled in the art that means that a warp-knitting machine produces flat-knit fabric.

Q. Okay. But the language flat knit or flat-knit textile element or flat-knit fabric do not appear in Exhibit 1018 or in your declaration describing Exhibit 1018, right?

A. Well, I cannot say about Exhibit 1018 because, again, I'd have to review the whole book word by word to answer that question, but in my declaration it seems that maybe I don't have it -- my own terms. I mean, in Paragraph 36 I'm explaining it, but I guess it comes from the patent.

Q. I'm going to hand you what's been marked as Exhibit 1019. Do you recognize that exhibit?

A. Yes.

Q. Exhibit 1019 doesn't define the term flat knit, does it?

A. I'd have to read the text here to answer that question again. I didn't memorize the article.

Q. Well, certainly in your declaration you didn't say that Exhibit 1019 defines the term flat-knit textile in it, right?

A. Let me check on that. In Paragraph 26 I say, "As the figure indicates, the loops in the milanese-knitted fabric are similar to the loops in the weft-knitted structure except the directionality; on the other hand, in some literature, milanese knitting is considered to be part of warp knitting."

Milanese machines can be flat and circular, too, so producing a --

Q. Dr. Adanur, I'm asking you about Exhibit 1019.

A. Yes.

Q. Paragraph 26 of your declaration is not directed to Exhibit 1019, is it?

A. Oh, okay. I'm sorry. It's 1018.

Q. I want to remind you what the question is and the question is -- or I'm going to ask you this

question.

Exhibit 1019 doesn't use the term flat knit, does it?

A. I'd have to read the text to answer that question.

Q. As you sit here right now you don't know if Exhibit 1019 uses the term flat knit, right?

A. Again, I'd have to read the whole text to answer that question.

Q. And in your declaration you didn't say that Exhibit 1019 uses the term flat knit to describe a flat-knit textile, correct?

A. Not specifically, yes.

Q. Okay. I want to direct your attention to some pages -- let's go back in your declaration to Paragraph 14 and in Paragraph 14 you list various materials that you reviewed in forming your opinions --

A. Yes.

Q. -- and on Page 5 around the middle you list two items. The first is "Man-Made Fiber and Textile Dictionary, Celanese Corporation, 1981, 1985"; and second is "Dictionary of Fiber & Textile Technology, Hoechst," H-o-e-c-h-s-t, "Celanese, 1990."

A. Yes.

Q. And before this deposition I asked counsel to provide to me copies of the pages that you reviewed in forming your opinions and presumably you provided those to counsel and I'm going to mark two exhibits.

(Nike Exhibit 2015 was marked.)

Q. (By Mr. van Es) The first is Exhibit 2015 and that is various pages from the document entitled "Man-Made Fiber and Textile Dictionary, Celanese Corporation," and I'll represent to you that this is the collection of papers that counsel provided to me.

My question to you on Exhibit 2015, are these the pages of this document, Man-Made Fiber and Textile Dictionary, that you reviewed in forming your opinions?

A. Yes, that's one of the documents.

Q. And the specific pages in Exhibit 2015 of the book are Pages 78, 79, 80, 81, and 154 through 157?

A. Yes, as far as I remember.

Q. Those are the pages you reviewed from the Man-Made Fiber and Textile Dictionary to form your opinion, right?

A. Yes. Those are the pages that I included,

yeah.

Q. And you didn't review any other pages --

A. I don't --

Q. Hold on. Let me finish my question. You didn't review any other pages to form your opinion?

A. In this book?

Q. From Exhibit -- separate and apart from Pages 78, 79, 80, 81, and 154 to 157, you didn't review any other pages of the Man-Made Fiber and Textile Dictionary to form your opinion in this case, correct?

A. I believe I skimmed through, again, the fabric -- I mean the book and then found the relevant sections and then reviewed those in detail.

Q. Okay. And I'm going to -- so the pages of Exhibit -- excuse me. The pages of this Man-Made Fiber and Textile Dictionary that you reviewed and relied upon are reflected in Exhibit 2015, correct?

A. Can you repeat the question?

Q. The pages of this Man-Made Fiber and Textile Dictionary that you reviewed and relied upon to form your opinion are reflected in Exhibit 2015, correct?

A. Yes.

(Nike Exhibit 2016 was marked.)

Q. (By Mr. van Es) I'm going to hand you what's marked as Exhibit 2016 and that is a document that consists of various pages from a book called Dictionary of Fiber & Textile Technology --

A. Yes.

Q. -- from Hoechst Celanese and attached to -- counsel has represented that the pages you reviewed in forming your opinion are those attached in Exhibit 2016 and those are Pages 84 through 87.

A. Not 84. Well --

Q. Okay. I see the copy was cut off.

A. Yeah, cut off.

Q. So which are the pages of this dictionary that you relied upon?

A. Page 85 and Page 84 also has technical phrase of knitted fabrics so probably 84, too, but mostly 85, 86 -- which continues on 86 and 87.

Q. So the pages of the Dictionary of Fiber & Textile Technology that you relied upon in forming your opinion are Pages 84 through 87 as reflected in Exhibit 2016, right?

A. Yes.

Q. And you didn't rely on any other pages?

A. Again, I looked through the book and I thought those were the relevant sections for this case.

Q. Do you consider these two dictionaries to be reliable?

A. To some extent.

Q. Do you have them in your office?

A. Yes.

Q. Do you refer to them?

A. When I need to sometimes, yes.

Q. Now, there are -- have you ever found these dictionaries that the pages from Exhibits 2015 and 2016 are copied from to be unreliable?

A. To be what?

Q. Have you ever found the two dictionaries to be unreliable?

MS. WILLIAMS: Objection to the form.

THE WITNESS: I believe there is one place that I didn't feel comfortable with and I feel that as a professor in this profession for a long time I have the right to not to agree with the book, having written books myself. I think there is a definition of flat knitting. Let me see. I may have it in my declaration. Probably I

pointed it out.

Okay. In Paragraph 32, "The Man-Made Fiber and Textile Dictionary (a reference book that I have in my office and also submitted as an exhibit by patent owner) defines flat-knit fabric as a fabric made on a flat-knitting machine, as distinguished from tubular fabrics made on a circular-knitting machine. While the reference states that the term flat-knit fabric may be used in the trade to refer to weft-knit fabrics, this reference also supports the industry understanding that tricot and milanese warp-knit fabrics are knit in flat form."

So if I can find that thing, Exhibit --

Q. (By Mr. van Es) Dr. Adanur, you found something about the dictionary to be unreliable here?

A. Yes. That one term I think I have some -- I don't feel comfortable with the definition of the term. Let me find it in the -- if I remember. Let me find it here.

MS. WILLIAMS: Counsel, I believe he's looking for the exhibit that he was referred to. I don't think it's in the ones that you've given him.

Q. (By Mr. van Es) Are you looking for something, Dr. Adanur?

MS. WILLIAMS: He is.

THE WITNESS: Yes.

Q. (By Mr. van Es) What are you looking for?

A. The definition of flat-knit fabric. It says -- in the reference it says that it is used -- it may be used in the trade to refer to weft-knit fabrics, but that is not the case because, again, the warp-knitting machines produce flat-knit fabrics more than the weft-knitting machines in the industry. So in that sense, if I can find that definition in the reference --

Q. We'll get to that in a minute.

Other than that definition, is there anything in these dictionaries that you've ever disagreed with?

A. Not that I remember.

(Nike Exhibits 2017 and 2018 were marked.)

Q. (By Mr. van Es) Okay. I'm going to hand you what I'm marking as Exhibit 2017 and Exhibit 2018. Exhibit 2017 is pages from the Man-Made Fiber and Textile Dictionary including Pages 28 through 29, 60 through 63, 78 through 81, and 154 through 157. And

I'm going to hand you what's marked as Exhibit 2018 and those are pages from the Dictionary of Fiber & Textile Technology --

A. Yes.

Q. -- pages including 28, 29, 64 through 67, 84 through 87, and 172 through 175.

MS. WILLIAMS: Do you have another copy of Exhibit 2017?

MR. VAN ES: Yes.

MS. WILLIAMS: Thank you.

Q. (By Mr. van Es) And Exhibit 2017 as compared to Exhibit 2015 includes a number of pages that you said you did not review --

A. No.

Q. -- to form your opinion; is that correct?

A. I'm sorry. No. Now I remember what happened. Exhibit 2015 I believe, if I remember correctly, was given to me by the counsel. No?

MS. WILLIAMS: Exhibit 2015?

Q. (By Mr. van Es) Dr. Adanur, let me --

MS. WILLIAMS: Those were the pages you identified to us in the book that were in addition to Exhibit 2011.

Q. (By Mr. van Es) Dr. Adanur, let me also

hand you Exhibit 2011.

A. But anyway, I found that place.

Q. Let's be clear now. I'm not sure what the question is. Let me make sure. I'm comparing Exhibit 2015 to Exhibit 2017, right? Do you have Exhibits 2015 and 2017?

A. Yes. 2017 and 2015, you said? Yes.

Q. Both Exhibits 2015 and 2017 are pages from the Man-Made Fiber and Textile Dictionary from Celanese, right, copyright 1965, '67, '74, '75, '81 -- sorry. Let me try that over -- copyright 1965, '67, '74, '75, '78 and '81?

A. Yes.

Q. So Exhibits 2015 and 2017, those are pages from the 1981 Celanese Man-Made Fiber and Textile Dictionary?

A. That's Exhibit 2017, but I don't think that Exhibit 2015 has the copyright page.

Q. Exhibit 2015 are the pages that your counsel told me you reviewed. Do you agree with that?

A. Yes.

Q. And you didn't review the other pages other than --

A. No, I reviewed -- I believe I reviewed the

other pages, too. As I said, I skimmed through the whole book and I believe I reviewed these pages, if I remember correctly, because I remember this -- it is in my declaration that -- you know, on Page 62 in Exhibit 2017 there is a definition of flat-knitting machine that is not complete and, as I said, as a professor I think that is not right.

On Page 62 it says, "Flat-Knitting Machine: A weft-knitting machine with needles arranged in a straight line in a flat plate called the bed." That is also applicable to a warp-knitting machine, so in that sense this dictionary is not right with that definition.

Q. What are you referring to?

A. It's Page 62 in Exhibit 2017.

Q. So Exhibit 2017 are pages that I copied from the Celanese Corporation Man-Made Fiber and Textile Dictionary and 2015 are the pages you said you reviewed, correct? That's what your counsel told me, that Exhibit 2015 are the pages you said you reviewed.

MS. WILLIAMS: Counsel, I believe he's also referring to Exhibit 2011 as being all part of the same dictionary.

Q. (By Mr. van Es) Exhibit 2011 --

A. Yes. In my declaration, Exhibit 2011 in Paragraph 32.

Q. Okay. Exhibit 2011 is different from Exhibits 2015 and 2017, isn't it, because Exhibit 2011 is copyright 1975 and Exhibits 2015 and 2017 are copyright 1981. Do you agree?

A. Yes.

Q. Okay. So I want to be clear and I want you to refer to Exhibit 2015.

A. Okay.

Q. All right. We've already established that the pages you reviewed from this book, Man-Made Fiber and Textile Dictionary from 1981, are those in Exhibit 2015 and you didn't review other pages.

A. I believe I did because it is in my declaration that I referred to those pages.

Q. No. Your declaration doesn't refer to the 1981 version. Your declaration is referring to Exhibit 2011 which is the 1985 version.

A. Okay. Let me make this clear. These are all the same book.

Q. When you say "these" what are you referring to?

A. These exhibits, 2015, 2016, 2017, 2011,

2017 and 2018. These are all the same thing basically, just copying different pages or so. These are really basically one book, first written by the Celanese Corporation when they were alone as Celanese Corporation, then later they merged with Hoechst from Germany. They became Hoechst Celanese and then they upgraded that dictionary, but it is really one book.

Q. These are different editions of the book?

A. Not different editions, but the definition of flat-knitting machine is the same which is a wrong definition.

Q. Okay. Well, you did not indicate that you reviewed -- let's focus on Exhibit --

MS. WILLIAMS: Counsel, would it help if we compared the definition in Exhibit 2015 and 2011 and if there's any differences? Otherwise, if it's the same does it really matter?

MR. VAN ES: Well, I do have some questions I want to ask the witness about because I want to be clear.

MS. WILLIAMS: Okay. I'm just trying to move things here.

Q. (By Mr. van Es) Referring to Exhibit --

A. I believe the definitions are the same.

They didn't change the definitions of those in different editions.

Q. Okay. Let's look at Exhibit 2018. That's a 1990 book, right?

A. Yes, the latest.

Q. And I'll direct your attention to Page 65.

A. Yes.

Q. And this is not a page that you said you reviewed, correct?

A. No, I reviewed that page, too. I mean --

Q. You reviewed Page 65 of Exhibit 2018?

A. That page is on 2011, too.

Q. It's a different book, though, right?

A. No.

Q. It's not a different book?

A. No.

Q. Okay.

A. Different editions/updates but the same book.

Q. I'd like you to read the definition that's on Page 65 --

A. Yes.

Q. -- of Exhibit 2018 --

A. Yes.

Q. -- the definition of flat-knit fabric. Read the definition No. 1?

A. "Flat-Knit Fabric: 1) A fabric made on a flat-knitting machine, as distinguished from tubular fabrics made on a circular-knitting machine. While tricot and milanese warp-knit fabrics (non-run) are knit in flat form, the trade uses the term flat-knit fabric to refer to weft-knit fabrics made on a flat machine rather than warp-knit fabrics."

Q. And you disagree with that definition?

A. I disagree with that and the reason is that, again, the majority of the warp-knit machines produce flat fabrics. That's the rule. The exception is circular fabrics. In weft knitting the majority -- I would say the majority in the trade shows I see, the majority of the companies exhibit/display circular-knitting machines and less companies flat weft-knitting machines.

Q. So just to be clear, there are at least three editions of this dictionary that have different titles, right?

A. I thought it was two different titles.

Q. There are at least three editions of this book that has at least two different titles. Do you

agree with me?

A. Man-Made Fiber and Textile Dictionary and the other one is Dictionary of Fiber & Textile Technology, yes.

Q. And all of these dictionaries define the term flat-knit fabric in this manner but you disagree with it?

MS. WILLIAMS: Object to the form.

THE WITNESS: Yes. I have an issue with that definition of flat-knit fabric and also I have an issue with the definition of flat-knitting machine which makes it more limited to weft-knitting machines as the only flat-knitting machines. That is wrong.

Q. (By Mr. van Es) In your mind, Dr. Adanur, putting aside these dictionaries for a minute, does the term fabric mean something different than textile element?

A. A textile element, it can include fabric. But let me give you a little bit of background about these companies. None of them are textile companies. Hoechst was a producer of fibers, not textiles, in general and -- I'm sorry. I take it back.

Celanese as an American company was a

producer of mostly fibers from the polymers, so not a textile company; not necessarily. They were not in the business of producing textiles.

Hoechst, a German company, is a chemical company or was a chemical company. I don't believe that they exist anymore. They got married in the '80s, I believe, if I remember correctly, and then got divorced a few years ago and I think Hoechst dissolved, if I remember correctly, and Celanese is still continuing as American Celanese, I believe.

You know, I may be not a hundred percent up to date on that, but none of them are textile companies. Hoechst was definitely a chemical company, a giant in the world, and so that's why I have reservations with these definitions in their book.

Q. Dr. Adanur, Exhibit 2018 is entitled Dictionary of Fiber & Textile Technology, right?

A. Yes.

Q. Before today have you ever told anyone that any of the definitions in this dictionary were unreliable?

A. I don't recall if I told my counsel about that.

Q. Okay. Besides that, before today have you

ever told anyone that any definitions in Exhibit 2018 or any of these other dictionaries are unreliable?

A. I don't recall that, but in my book, you know, I didn't define a flat-knitting machine or a flat-knit fabric the way they defined it in their dictionaries.

Q. Okay. I believe you've already been provided with a copy of the -- I think it's Exhibit 2005. It should be in front of you there.

A. Okay. Let's see.

Q. Have you reviewed this document before?

A. Yes, I've read it.

Q. Okay. Directing your attention to Page 13 --

A. Okay.

Q. First of all, what is your understanding of what this document is?

A. This document is about inter partes review which is a process to object to the claims of a patent after a certain period of time elapsed, I think, so this is about that '011 patent in that process.

Q. And do you -- directing your attention to Page 13 at the bottom, do you agree that the terms weft knitted and flat knitted are well known in the

art?

A. Yes.

Q. Do you agree that the term flat-knitted textile element is well known in the art?

A. Yes. Not necessarily in, you know, those words, but yes.

Q. I'm talking about those words. Is the term flat-knitted textile element well known in the art?

A. For a person who is skilled in the art, yes, that would be well known.

Q. What about weft-knitted textile element, is that term well known --

A. Yes.

Q. -- to one skilled in the art?

A. Yes.

Q. And at the top of Page 14 you see that the decision says that "The '011 patent describes various textile types" -- do you see that?

A. Yes.

Q. -- "and subtypes"?

A. Yes.

Q. And you agree flat knitted is one of the subtypes identified?

A. In the '011 patent?
Q. Yes.
A. Can I see the '011 patent?
Q. I'm handing you Exhibit 1002 which is the '011 patent.
A. Yes.
Q. Okay. What section of the '011 patent do you need to refer to to answer that question?
A. In the abstract it talks about warp knitting and weft knitting and then again talks about textile element. And then circular and flat knitted, I also remember that it was mentioned in the patent.
Q. Okay. Can a weft-knitted textile -- let me start over again.
A. It has been a long morning.
Q. Can a weft-knitted textile element be made by warp knitting?
MS. WILLIAMS: Object to the form.
THE WITNESS: No.
Q. (By Mr. van Es) Referring back to Exhibit 2005, do you agree that the Board that issued this decision determined that flat knitting is a subtype of weft knitting?
A. Which page are you referring to?

Q. I'm at Page 14.
A. Which line?
Q. So I'm on Page 14 near the top, the first full paragraph.
A. Okay.
Q. Do you agree that the decision indicates that flat knitting is a subtype is weft knitting?
A. I believe so.
Q. And do you think that the decision is saying that flat knitting is a subtype of warp knitting?
A. According to this, yes. I mean, it says here, "Warp and weft knitting are subtypes of circular and flat knitted." That means that both warp knitting and weft knitting has circular and flat.
Q. So just to be clear, it's your opinion that the Board concluded that one of the subtypes of warp knitting is flat knitting?
A. Yes.
Q. Did adidas ever argue to the Board that -- prior to this decision that warp knitting included a subtype of flat knitting?
MS. WILLIAMS: Objection.
THE WITNESS: Prior to this document,

2005?

Q. (By Mr. van Es) Yes.

A. I wouldn't know that, I guess.

Q. Let me direct your attention to -- let me ask you a question.

If a sweater -- this is a hypothetical. If a sweater is made by knitting is it proper to refer to it as a knitted sweater?

A. Yes.

Q. Is it proper to refer to it as a knit sweater?

A. Yes.

Q. Because knit and knitted mean the same thing?

A. Yes.

Q. If a sweater is made by warp knitting, in your opinion is it appropriate to refer to it as a flat-knit sweater?

A. Yes, flat-knitted sweater, but it could be circular, too, depending on the warp machine that is used.

Q. So if the sweater is made by warp knitting it may or may not be a flat-knit sweater according to your --

A. That's what I'm saying because warp knitting has flat knitting as well as circular knitting. Although flat knitting is the rule in today's market, it is possible if you have a machine -- circular warp-knitting machine to produce a circular sweater on that machine.

Q. So if I gave you a sweater and said this was made by warp knitting you wouldn't be able to tell if it was flat knit or circular knit, right?

A. If you just give me the sweater probably -- it would be difficult to tell.

Q. And the difference would depend on the particular method of producing the sweater, right?

MS. WILLIAMS: Object to the form.

THE WITNESS: You mean producing the fabric or making the sweater?

Q. (By Mr. van Es) Well, let me ask you this. If I hand you a sweater and I told you it was warp knit and you wanted to know whether it was made by what you call a flat-knitting process or a circular-knitting process, you would need to know the particular method by which that sweater was manufactured, right?

A. Yes, but now you're introducing something

different. You are saying warp-knitted sweater. That means that the yarns are running in the vertical direction, so that is making it more specific. But, yes, you have to know the process, whether it was flat or circular.

Q. Would the same be true of a weft-knitted sweater? If I handed you a weft-knitted sweater and didn't tell you whether it was knit by flat knitting or circular knitting, would you be able to tell that just by looking at the sweater?

A. It would be very difficult.

Q. You would need to know the specific method of manufacturing that sweater, whether it was circular or flat knit, right?

A. That's right.

Q. Okay. Let me direct your attention to the '011 patent which is Exhibit 1002 and specifically Column 7, Line 2.

A. Yes.

Q. Do you see that it says, "With regard to warp knitting, various specific subtypes that may be utilized to manufacture a textile, including tricot, raschel and double needle-bar raschel (which further includes jacquard double needle-bar raschel)?" Do you

see that?

A. Yes.

Q. So the patent identifies certain specific subtypes of warp knitting. Do you agree?

A. Yes.

Q. And the patent goes on to say, "With regard to weft knitting, various specific subtypes that may be utilized to manufacture a textile include circular knitting and flat knitting."

Do you see that?

A. Yes.

Q. So the '011 patent identifies certain subtypes of weft knitting and certain subtypes of warp knitting, right?

A. Yes.

Q. And the only subtypes of weft knitting that are identified are circular and flat, right?

A. Yes.

Q. And circular and flat knitting are not identified as subtypes of warp knitting, correct?

A. Correct.

Q. You agree that subtypes of warp knitting include those identified here in the '011 patent, namely, tricot, raschel, double needle-bar raschel?

MS. WILLIAMS: Object to the form.

THE WITNESS: Could you repeat the last part of the question again?

Q. (By Mr. van Es) Sure. Do you agree that specific subtypes of warp knitting include tricot, raschel, and double needle-bar raschel?

A. There is something missing there and that is there should be another classification before that classification if they want to be thorough in this patent and that should be flat knitting and warp knitting -- circular knitting or warp knitting. The reason they didn't do it, and I don't blame them, is because, as I said, almost all the fabrics made at the time of the patent application, almost all the warp fabrics are flat-made fabrics.

So I think that they did not need -- they did not see the need to classify it as flat warp knitting and circular warp knitting because circular warp knitting is an exception. So that's why they went directly to the further classification of tricot, raschel and jacquard as subtypes. But by default, again, for a person skilled in the art, when you say warp knitting today it is almost exclusively flat-knit fabrics and that's why they are missing that point

here, I believe.

Q. Okay. Let me direct your attention to Column 11 of the patent. Do you see in Column 11 starting at Line 19 it says that "A variety of knitting processes may be utilized to form textile element 40, as discussed above"?

A. Yes.

Q. And then it goes on to describe what's called a specific example and that's a jacquard double needle type raschel-knitting machine?

A. Uh-huh.

Q. What kind of knitting machine is that?

A. That's a warp-knitting machine.

Q. And is that described in the specification here as a flat-knit textile structure?

A. In the whole specification or in this paragraph?

Q. In this paragraph.

A. Yes. It is saying it is a machine that is producing a flat textile structure and in Column 7 that we just reviewed it is saying the double needle-bar raschel is a warp-knitting machine.

Q. Okay. And my question is, is that described in the specification as a flat-knit textile

structure?

A. Yes, because when it says jacquard double needle-bar raschel-knitting machine, that is a knitting machine and it produces a structure -- a textile structure that would be a knitted structure.

Q. Okay. But the specification here of the patent doesn't say that this particular knitting machine which is a jacquard double needle-bar raschel is creating a flat-knit textile structure, correct?

A. Well, not in those words, but it is obvious, I mean more than obvious that it is a flat-knit fabric.

Q. Let's direct your attention, then, to Line 38 and there it says, "Similarly, other types of knitting, such as a flat knitting, may be utilized within the scope of the present invention to impart various textures," et cetera. Do you see that?

A. Yes.

Q. So that language there is contrasting other types of knitting such as flat knitting with the knitting that was described earlier in the paragraph, right?

A. Right.

Q. And that tells you that flat knitting is

another type of knitting than the warp knitting described above?

A. No, I wouldn't say that. I wouldn't take it that way.

Q. In Column 11, the language that's discussed in Lines -- excuse me. In Column 11, the knitting machine that's described at around Line 22, is it your opinion that that knitting machine would be creating a flat-knit textile element?

A. Yes.

Q. And at Line 38 other types of knitting such as flat knitting are described, right?

A. Right.

Q. So there's a contrast here between flat knitting and the warp knitting described above. Do you agree with that?

A. Kind of.

Q. Okay. Let's turn to Figure 9 of the patent. Is Figure 9 -- do you have that in front of you?

A. Yes.

Q. Is Figure 9 of the '011 patent a flat-knit textile element?

A. No, it is a circular-knit textile element,

a circular knit fabric and there is a textile element obviously cut from that circular knit and flat -- and it looks flat after it is cut.

Q. So is Figure 9, is the -- start over again.

Is the textile structure shown in Figure 9 knit in a flat form?

A. No. It is knit in a circular form, the whole fabric.

Q. So the textile structure shown in Figure 9, is it generally planer?

A. No. It was -- I believe it was knitted in a circular form, but the textile element in that shape is cut obviously from that and it is in a planer form after it is cut.

Q. So you agree that the textile structure shown in Figure 9, as actually illustrated in Figure 9 is planer, right?

MS. WILLIAMS: Object to the form.

THE WITNESS: No, I didn't say that.

Q. (By Mr. van Es) It's not? The textile structure shown in Figure 9 is not planer?

A. The textile structure in No. I believe 60 in this case, the original structure is a

circular-knitted fabric.

Q. Okay. Let me ask you about the textile element, the textile element 40 shown in Figure 9.

A. What do you mean by textile element because -- what do you mean by it?

Q. Is textile element a term that you're not comfortable talking --

A. I'm comfortable, but it may refer to this circular fabric here as well as the piece that is cut from the circular fabric. Both are textile elements.

Q. Okay. Well, based on your understanding of the '011 patent and textile element 40, is the textile element 40 shown in Figure 9 planer?

A. Yes. 40, as it is shown here, element part 40 is planer; seems like planer, yes.

Q. So is the textile element 40 in Figure 9 flat knit? Is it a flat-knit textile element?

A. Well, looking at the whole figure here, since it is cut from a circular-knitted fabric it is a circular-knitted structure element.

Q. So I want to ask you what's based -- I want to ask you questions based on what's shown in Figure 9. Okay?

A. Okay.

Q. In Figure 9, does that show a flat-knit textile element as you construe that term?

A. Again, Figure 9 shows two elements. One is a circular-knitted fabric from which another element is cut. If you give me that element 40 alone without me knowing that it was cut from that circular fabric it would be very difficult to tell whether it was circular knit or flat knit.

Q. Okay. So you're saying once textile element 40 is cut from the structure shown in Figure 9 you wouldn't be able to tell whether it meets your definition of flat-knit textile element?

A. Yeah. If you don't know the previous process, the cutting process, if you just have that piece in front of you in that shape and you don't know if it was made with circular or flat knitting, it would be very difficult to tell whether it was from a circular-knitted fabric or from a flat-knitted fabric.

Q. Now I want you to look at Figure 9 and look at the textile element 40 of Figure 9 before it's cut out of the textile structure 60. Okay?

A. Yes.

Q. As shown in Figure 9, would that textile element meet your definition of flat-knit textile

element?

A. No.

Q. Is it planer? Is the flat -- excuse me. Is the textile element 40 planer in Figure 9?

A. Before it was cut it was not planer. It was circular.

Q. I'm asking you what's shown in Figure 9.

A. Well, Figure 9 shows both. It shows a circular structure as well as a piece cut in a circular structure and the circular structure is laid down as a flat piece because of the flexibility of the fabric. So it looks like planer -- No. 40 -- element 40 looks like planer in the picture, but it is part of a circular structure.

Q. Okay. So just to be clear, if we look at Figure 9, what's actually shown in Figure 9 --

A. Yes.

Q. -- if there's a textile element 40 before it's cut out of the textile structure 60 that could meet your definition of flat-knit textile element?

MS. WILLIAMS: Object to the form.

THE WITNESS: Not necessarily.

Q. (By Mr. van Es) But it could?

A. No. Knowing that it is part of a

circular-knit fabric it wouldn't be a flat-knit textile.

Q. Referring to Figure 9 -- okay.

MR. VAN ES: Actually, I got a note from the videographer that we have just a couple of minutes left on the tape here, so why don't we take a quick break and figure out where we are.

THE VIDEOGRAPHER: The time is 12:40 p.m. We're now off the record.

(Lunch recess from 12:40 p.m. to 1:21 p.m.)

THE VIDEOGRAPHER: The time is 1:22 p.m. This is the beginning of Tape No. 3. We're back on the record.

Q. (By Mr. van Es) Dr. Adanur, I want to ask you some questions about the term flat-knit edge.

A. Okay.

Q. And my first question to you is how would you go about determining whether an edge of a textile has a flat-knit edge?

A. If it is a flat-knit fabric then the edge would be a flat-knit edge.

Q. So whether or not a fabric has a flat-knit edge depends upon whether the fabric during the

knitting process was planer?

A. Yes.

MS. WILLIAMS: Object to the form.

Q. (By Mr. van Es) And we talked earlier about the term knit to shape. Do you remember that?

A. I believe so. It's been a long, long meeting.

Q. How would you tell whether the edge of a textile has been knit to shape?

A. Can you repeat the question again?

Q. Sure. Would you be able to tell whether the edge of a textile element was knit to shape?

A. Well, knit to shape refers to the product itself, if it is a fully-fashioned product or knit to shape or knit shape. Those are different terms that we use in the textile industry. There is -- for example, in one of the references it is referred to as fully-fashioned textile.

Q. Okay. And my question is how would you be able to tell whether the edge of a textile element was knit to shape?

A. Well, the edge of the textile fabric -- I'm not sure about your -- if I understand your reference.

Q. Sure. So, Dr. Adanur, if I handed you a piece of knitted textile and I said can you tell me whether the edges of this textile are knit to shape, would you be able to answer that question?

A. The edges are not knit to shape. Really the product itself is knit to shape.

Q. So if I handed you a textile element and asked you whether the edges were knit to shape you would say it depends on the configuration of the textile material during the process?

A. Again, the edges are not knit to shape, it's the product, if it is knit to shape or not.

Q. Can edges be knit to shape?

A. That is -- no. Again, the product is knit to shape, not the edges.

Q. So edges cannot be knit to shape?

MS. WILLIAMS: Object to the form.

THE WITNESS: Fabrics have edges and there are fabrics that are either made in fully-fashioned form or not, so those are kind of different things that you're asking.

Q. (By Mr. van Es) Can you tell by looking at a textile element whether it has flat-knit edges?

A. Yes. If it's a flat piece of fabric then

the edges are flat-knit edges.

Q. But if I hand you a finished product, could you tell whether the edges are flat knit under your definition of flat knit?

A. And let me refer to my declaration and I explain that in Paragraph 38. "Flat knit means" -- okay. "Flat knit edges when given it's broadest reasonable interpretation that is consistent with the '011 patent specification means edges of a knitted textile that are knit in flat form."

Q. So the edges are knitted or the material is knitted?

A. The material is knitted and the edges are part of the material. In a flat-knitted fabric you have to have edges because that's your end point. Therefore, flat-knit edges means edges of a knitted textile that are knit in flat form.

Q. Okay. Would the edges of a textile that's been knit in flat form be the same as the edges of a textile knit in circular form?

A. Circular form being circular would not have edges except at beginning and end points of the tubular structure.

Q. Well, when something is circular knit,

does it at any point in time have edges?

A. Again, at the beginning and at the end of the tubular structure it has edges, but not on the sides because it's a continuous circular structure.

Q. So is it your testimony that an edge cannot be knit to shape?

A. The product or the pieces are knit to shape but not the edge.

Q. So a flat knit -- so can -- okay. So what your testimony is is that a textile element could be knit to shape, right?

A. Yes.

Q. And if that textile element is knit to shape with edges, aren't the edges of the textile element also knit to shape?

A. Again, not necessarily, because you don't knit the edges. You knit the textile product with edges but you don't knit the edges.

Q. Why is that?

A. That's not the purpose of making the product.

Q. So if the edges are not knit how do the edges get created?

A. Well, it depends on the machine. If it is



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a warp -- flat warp-knitting machine the yarn has to return from both sides, each of the both sides, and that generates a knitted edge and it's an edge.

Q. So a machine creates a knitted edge?

A. The machine as part of the product also creates an edge.

Q. Would an edge created by a machine differ from an edge that's created when a textile element is cut out of a web?

A. They would be both edges because still if you cut a textile element from a larger piece it has -- it would have edges and those are also knit edges. I mean, you are not doing anything extra, so the edges are part of the product structure and they're knit edges.

Q. So my question is structurally, structurally are there differences between the edges of a product where the product was knit to shape by a machine as opposed to the edges of a product that was cut out of a web?

A. You need to narrow or widen a knit-to-shape product, but, again, the edges are not necessarily much different than each other, a cut versus shape.

Q. So an edge that is cut out of a web -- excuse me. An edge that's formed by cutting a textile element out of a web in your opinion would be how structurally different from an edge created by a machine that knitted the edge?

A. Well, the machines by making the fabric is producing the edges anyway. It's part of the process.

Q. Do edges of the textile element that's cut out of a web need to be finished or stabilized in the context of footwear manufacturing?

MS. WILLIAMS: Object to form.

THE WITNESS: It depends on the structure of the shoe. If there's going to be molded, for example, polymer parts you don't need to do that. It depends on the structure.

Q. (By Mr. van Es) But it could?

A. It could, yeah.

Q. Okay. I want to direct your attention to Exhibit 1005.

A. Okay.

Q. Is this one of the patents that you reviewed in forming your opinions in this case?

A. Yes.

Q. Okay. I want to direct your attention to

Figure 1.

A. Yes.

Q. Can you tell whether the structure that's shown there in Figure 1 is flat knit under your definition of flat knit?

A. Just based on this figure it would be difficult to tell.

Q. Well, have you reviewed the text of the Nishida patent?

A. Yes.

Q. And based on your review of the text and looking at Figure 1 or let's look at Figures 2 or 4 or 5, can you tell whether the structures that are shown there are flat knit under your definition?

A. Well, I don't remember the text now. Let me look at it briefly. It says cutting that shape from a web of material. It doesn't really -- if I remember, it doesn't specify whether it's flat-knitted fabric or circular. Again, I would have to read the whole patent to remember.

For example, in Column 1, Lines 13, 14, "Cutting out these layouts from the web of material," and it doesn't say whether it is flat-knitted web of material or circular. It refers to woven-knitted

fabrics and woven fabrics are pretty much flat all the time, and knitted fabrics can be both flat and circular.

Q. Okay. You mentioned earlier that you spoke with Dr. Frederick before you prepared your declaration.

A. Yes.

Q. When did you speak to him?

A. I don't remember the exact date but maybe two weeks ago or so; two or three weeks ago maybe.

Q. And how many times did you speak with Dr. Frederick?

A. Once, I believe.

Q. Was that by telephone?

A. Yes.

Q. Did you ever meet with him in person?

A. Yes, yesterday and today at lunch.

Q. Other than meeting him in person today and yesterday, did you ever meet with Dr. Frederick in person?

A. No.

Q. Did you send him any e-mails?

A. No, I don't think so.

Q. Did he send you any e-mails?

A. Not that I remember.

Q. Who else was on the phone when you spoke to him?

A. Ms. Williams and then Wab.

Q. Anyone else?

A. I don't believe so.

Q. So before yesterday, did you have any communications at all with Dr. Frederick other than this one phone call?

A. No.

Q. How long did the phone call last?

A. Around 45 minutes or so. Again, I don't remember exactly but something like that. It was like a teleconference type of thing.

Q. What did you discuss?

A. I asked his background a little bit, he explained it, and then his experience in the shoe industry. And I think I mentioned in my declaration I asked about the capabilities of the skilled person in this field, so he told me about those things. This is in Paragraph 17 of my declaration.

Q. So Dr. Frederick discussed his background, he discussed the capabilities of a skilled person, and what else did he discuss?

A. About the shoemaking, about what is involved in general terms.

Q. What else did you discuss?

A. I don't remember the details, but I think that was basically the headlines of the talk.

Q. Did you explain anything to Dr. Frederick?

A. I guess I -- I believe I mentioned my background and explanationwise, not much. I don't recall. I discussed, again, the person of ordinary skill in the art in this business.

Q. Do you recall anything else?

A. I don't recall anything else.

Q. Did Dr. Frederick ask you any questions?

A. Not that I remember.

Q. Did you ask him any questions?

A. Again, his background and, you know, how long he has been in the business and that kind of stuff.

Q. Why did you speak to Dr. Frederick?

A. Well, he was I guess another expert in the field that was involved with the case.

Q. Did you think you needed to speak to him about anything in particular?

A. No, not necessarily.

Q. Before you spoke to Dr. Frederick -- hold on a second.

So in your declaration you've defined at Paragraph 16 a person of ordinary skill in the art. Do you see that?

A. Yes. Before that answer, Paragraph 15, now I remember, we talked about proposed constructions of certain claim terms discussed in my declaration, and it is written here, the motivation that such a person would have to modify certain textiles.

Q. What did you tell -- well, first let me ask you, is it your understanding that Dr. Frederick is a person of ordinary skill in the art as defined in Paragraph 16?

A. Yes.

Q. And before you spoke to Dr. Frederick a few weeks ago, had you ever spoken to a person of ordinary skill in the art as defined in Paragraph 16?

A. No, not that I recall.

Q. Okay. With respect to Paragraph 15, you said that you discussed with Dr. Frederick "the proposed constructions of certain claim terms discussed in my declaration."

A. Yes.

Q. Tell me about that discussion.

A. Well, basically I believe we talked about those terms such as flat-knit textile element and flat-knit edges.

Q. And you told Dr. Frederick what your construction of those terms would be?

A. No. I asked him what he thinks about those terms.

Q. I'm sorry. Let me clarify? You asked him what he thought the construction --

A. What he would understand from those terms.

Q. So just so I'm clear, you asked Dr. Frederick for Dr. Frederick's construction of the term flat-knit textile element and of the term flat-knit edge?

A. I asked him what is his understanding of those terms.

Q. And what did Dr. Frederick tell you?

A. Well, I don't recall that he said anything that I remember or that I -- I mean, basically, if I remember correctly, he said a flat-knit textile element is a flat-knit textile piece of fabric. And flat-knit edges, he was not sure what it really means other than, you know, the edges of a flat knit. In

fact, flat-knit edges is a new term that I ran into in these discussions.

As I said earlier this morning, I did a Google search on the Internet and that term doesn't exist, flat-knit edges. I checked the entire book, Spencer book. The term does not exist in that book which is one of the major books in the industry. I did a word-by-word search. It doesn't exist in the Gajjar book, in the indices of the Gajjar book, and I didn't see it in the book itself. It doesn't -- I didn't see it in the Ciba-Geigy book. So really that is a brand new term to me.

Q. Dr. Adanur, I move to strike that answer. That answer was nonresponsive to my question and none of what you said is contained in your declaration in any event.

All right. So my question to you is with respect to Dr. Frederick, did he tell you what he thought the proposed construction of flat-knit textile element should be?

A. Not specifically. We just talked about the term.

Q. Did he have before that phone call and conversation what the term flat-knit textile element



Patent Owner NIKE, Inc. Exhibit No. 2021 - page 133
Skechers EX1013-p. 6731
Skechers v Nike

would be?

A. I'm sorry?

Q. Before that phone call, did Dr. Frederick have a understanding of what the term flat-knit textile element was?

A. I don't recall.

Q. Before that phone call, did Dr. Frederick have an understanding of the term flat-knit edge?

A. I don't know.

Q. Can you put in front of you, please, Exhibits 2017, 2018, 2011.

MS. WILLIAMS: Counsel, I don't think I received a copy of 2011 when you gave it to --

Q. (By Mr. van Es) So do you have in front of you Exhibits 2017, 2018 and 2011?

A. Yes.

Q. Other than these dictionaries, are you aware of any dictionaries that define the term flat-knit fabric?

A. I don't recall, but there might be.

Q. Other than these dictionaries, do you recall any dictionaries that define the term flat-knit textile element?

A. Again, I don't recall but -- I don't know.

There might be. There are other dictionaries out there.

Q. Okay.

MR. VAN ES: I would like to take a break and go off the record.

THE VIDEOGRAPHER: The time is 1:51 p.m. We're now off the record.

(Recess from 1:51 p.m. to 1:57 p.m.)

THE VIDEOGRAPHER: The time is 1:57 p.m. We're back on the record.

MR. VAN ES: I don't have any further questions of the witness at this time.

MS. WILLIAMS: No questions.

THE VIDEOGRAPHER: This concludes the videotape deposition of Sabit Adanur. We're off the record at approximately 1:57 p.m.

(Deposition concluded at 1:57 p.m.)

CERTIFICATE OF COURT REPORTER

STATE OF GEORGIA:

COUNTY OF FULTON:

I hereby certify that the foregoing transcript was reported as stated in the caption and the questions and answers thereto were reduced to writing by me; that the foregoing 135 pages represent a true, correct, and complete transcript of the evidence given on Tuesday, December 3, 2013, by the witness, Sabit Adanur, who was first duly sworn by me.

I certify that I am not disqualified for a relationship of interest under O.C.G.A. 9-11-28(c); I am a Georgia Certified Court Reporter here as an independent contractor of JPA Reporting, LLC who was contacted by Veritext Chicago Reporting Company to provide court reporting services for the proceedings; I will not be taking these proceedings under any contract that is prohibited by O.C.G.A. 15-14-37(a) and (b) or Article 7.C. of the Rules and Regulations of the Board; and by the attached disclosure form I confirm that neither I nor JPA Reporting, LLC are a party to a

contract prohibited by O.C.G.A. 15-14-37(a) and (b) or Article 7.C. of the Rules and Regulations of the Board.

This 5th day of December, 2013.

LISA A. MESSINA
CERTIFIED COURT REPORTER
GEORGIA CERTIFICATE NO. CCR-A-421

DISCLOSURE OF NO CONTRACT

I, Lynn Pyles, do hereby disclose pursuant to Article 10.B of the Rules and Regulations of the Board of Court Reporting of the Judicial Council of Georgia that JPA Reporting, LLC was contacted by the party taking the proceedings to provide court reporting services for these proceedings and there is no contract that is prohibited by O.C.G.A. 15-14-37(a) and (b) or Article 7.C. of the Rules and Regulations of the Board for the taking of these proceedings.

There is no contract to provide reporting services between JPA Reporting, LLC or any person with whom JPA Reporting, LLC has a principal and agency relationship nor any attorney at law in this action, party to this action, party having a financial interest in this action, or agent for an attorney at law in this action, party to this action, or party having a financial interest in this action. Any and all financial arrangements beyond our usual and customary rates have been disclosed and offered to all parties.

This 5th day of December, 2013.

_____

LYNN PYLES, FIRM REPRESENTATIVE
JPA REPORTING, LLC

STATE OF GEORGIA )
) SS:
COUNTY OF FULTON )

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

| | |
|---|---|
| ADIDAS AG, | |
| Petitioner, | Patent No. |
| vs. | 7,347,011 |
| NIKE, INC., | |
| Patent Owner. | |

I, SABIT ADANUR, state that I have Read the foregoing transcript of the testimony given by me at my deposition on the 3rd day of December, 2013; that said transcript constitutes a true and correct record of the testimony given by me at said deposition except as I have so indicated on the errata sheets provided herein.

_____
SABIT ADANUR

No corrections (Please initial) _____
Number of errata sheets submitted_____

SUBSCRIBED AND SWORN to
before me this _____ day
of _____, 2013.

_____
Notary Public

STATE OF GEORGIA )
) SS:
COUNTY OF FULTON )

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

| | |
|---|---|
| ADIDAS AG, | |
| Petitioner, | Patent No. |
| vs. | 7,347,011 |
| NIKE, INC., | |
| Patent Owner. | |

I, EDWARD C. FREDERICK, state that I have Read the foregoing transcript of the testimony given by me at my deposition on the 3rd day of December, 2013; that said transcript constitutes a true and correct record of the testimony given by me at said deposition except as I have so indicated on the errata sheets provided herein.

EDWARD C. FREDERICK

No corrections (Please initial) MCF

Number of errata sheets submitted _____

SUBSCRIBED AND SWORN to before me this 17th day of December, 2013.

_____ Notary Public

BARBARA POUGH NOTARY PUBLIC GWINNETT COUNTY GEORGIA MY COMMISSION EXPIRES MARCH 16, 2014

STATE OF GEORGIA )
) SS:
COUNTY OF FULTON )

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

| | |
|---|---|
| ADIDAS AG, | |
| Petitioner, | Patent No. |
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SABIT ADANUR

No corrections (Please initial) S.A.
Number of errata sheets submitted _____

SUBSCRIBED AND SWORN to
before me this 2nd day
of January, 2014.

Notary Public

BARBARA POUGH NOTARY PUBLIC GWINNETT COUNTY, GEORGIA MY COMMISSION EXPIRES MARCH 16, 2014



Patent Owner NIKE, Inc. Exhibit No. 2023 - page 1
Skechers EX1013-p. 6739
Skechers v Nike

adidas AG
Petitioner
v.
Nike, Inc.
Patent Owner

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Case IPR2013-00067
U.S. Patent No. 7,347,011

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Oral Hearing

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# Petitioner's Demonstrative Slides

Petitioner adidas AG - Exhibit 1027

## Proposed Claim 47 with Claim Amendments Relative to Issued Claim 16

**Claim 47.** (Substitute for independent claim 16) An article of footwear comprising

- an upper incorporating a [weft-knitted] flat knit textile element, the flat knit textile element
- (1) having flat knit edges free of surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed,*
- some of the flat knit edges joined together to form an ankle opening in the upper for receiving a foot, the ankle opening having an edge comprised of one of the flat knit edges; and
- (2) having a first area and a second area with a unitary construction, the first area being formed of a first stitch configuration, and the second area being formed of a second stitch configuration that is different from the first stitch configuration to impart varying properties to the textile element; and a sole structure secured to the upper.

***Features Shown in Red, Green & Blue Text Are the Only Features that Owner Relies On To Distinguish Proposed Claim 47 from Nishida**


*Source: Paper 31, pp. 1-2, 6-8; Paper 37, p. 8 (citing Ex. 2010, ¶ 101; Ex. 1015, p. 87)*

Petitioner adidas AG - Exhibit 1027

## Proposed Claims 47-50 Introduce New Matter

- The proposed amendment introduces a negative limitation.

- "flat knit edges free of surrounding textile structure **such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed**"

- Written description support for negative claim limitations requires:
  - Explicit disclosure in the specification of excluding the feature; and
  - Reasons or advantages for excluding the feature.
  - *Santurus, Inc. v. Par Pharm., Inc.*, 694 F.3d 1344, 1351 (Fed. Cir. 2012); *Ex parte Lazaridis*, No. 2010-005137, at 5 (P.T.A.B. Mar. 1, 2013); *Ex parte Miyashita*, No. 2010-010626, at 6 (P.T.A.B. Apr. 2, 2013).

## Proposed Claims 47-50 Introduce New Matter

- Specification states only that the textile element "may be formed from a larger textile element." Ex. 1002, 5:43-44.

- The specification describes Figures 8, 10, 11 as merely showing the "***general shape***" of the textile element 40, 40', 40" after removal from a larger textile element, and there is no explanation of these elements being "knit to shape."

Textile element **40** exhibits the general shape depicted in FIG. **8** prior to the formation of seams **51-54**. Following

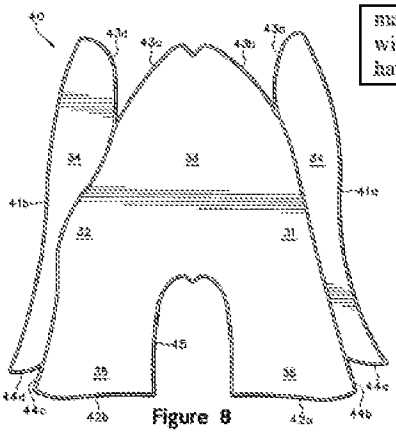


Figure 8

machines. With reference to FIG. **10**, a textile element **40'** with the general shape of textile element **40** is depicted as having various areas with different textures. For example, a

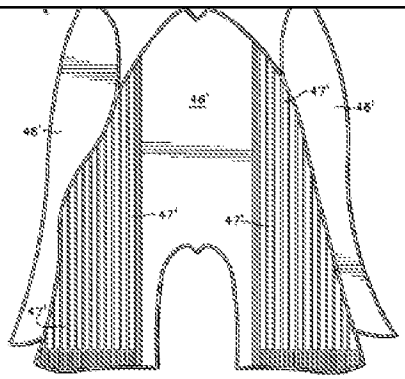


Figure 10

A textile structure **40"** is depicted in FIG. **11** and has the general shape of both textile element **40** and textile element **40'**. Textile element **40"** includes areas with three different

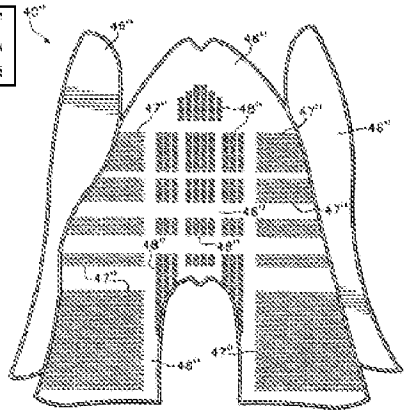


Figure 11

adidas AG Petitioner v. Nike, Inc. Patent Owner • IPR2013-00067 • U.S. Patent No. 7,347,011

*Source: Paper 31, p. 4 (citing Ex. 2010 ¶¶ 62-67; Ex. 1002, 5:43-44); Paper 37, pp. 4-5 (citing Ex. 1002, 5:58-60 (text box), 6:66-8:14, 9:7-11, 9:12-14 (text box), 9:35-38 (text box), 9:39-48, 11:19-41, Figs. 8, 10, 11)*



Petitioner adidas AG - Exhibit 1027

## Proposed Claims 47-50 Introduce New Matter

- Owner's expert admitted that the textile element 40 shown in Figures 8, 10, or 11 do not specifically show a "knit to shape" textile element, and could just as easily represent a textile element 40 formed by the process taught in Figure 9.

Q. Would you agree that one of skill in the art looking at figure 8, figure 10, or figure 11 would view those uppers as being produced either through what you call this knit to shape process or through a cutting process; is that fair?

MR. PRATT: Object to form.

BY THE WITNESS:

A. They could be flat knit to shape or -- I don't want to say a cutting process, but what's shown in figure 9 could also be represented by figure 8 once it's removed. However, the edges would obviously be very different.

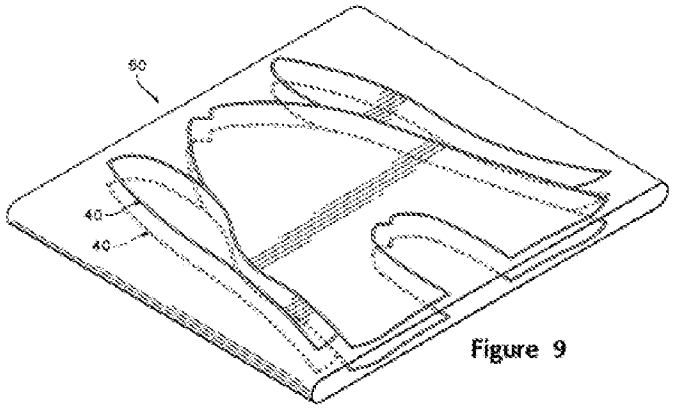


Figure 9

## Proposed Claims 47-50 Are Indefinite

| **Term** | **Owner's Proposed Construction:** | **Petitioner's Proposed Construction:** |
|---|---|---|
| flat knit edges | requiring that edges of the textile element have flat knit edges | edges of a knitted textile that are knit in flat form, |
| free of surrounding textile structure | *without* surrounding textile structure | *which have been removed* from a surrounding textile structure |
| such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed | such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed | so that the edges are free of surrounding textile structure |



*Source: Paper 37, pp. 6-7 (citing Ex. 1002, 5:58-60, 6:66-8:14, 9:7-14, 9:35-48, 11:19-41; Ex. 2010, ¶ 68); Paper 31, p. 4 (citing Ex. 2010, ¶¶ 62-67)*

Petitioner adidas AG - Exhibit 1027

## Owner's Proposed Construction

Owner's proposed construction:

- requiring that edges of the textile element have flat knit edges
- *without* surrounding textile structure
- such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed

"Knit to Shape"

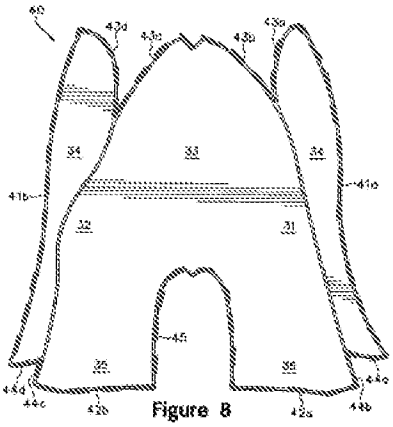


Figure 8

"Removing from a Larger Structure"

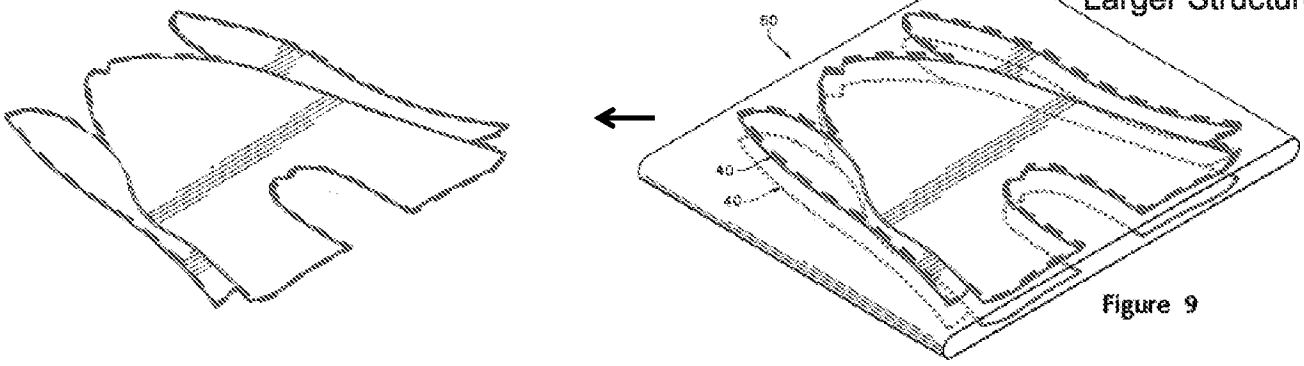


Figure 9



*Source: Paper 37, pp. 6-7 (citing Ex. 1015, pp. 68-98; Ex. 2010, ¶ 68); Paper 31, p. 4 (citing Ex. 2010, ¶¶ 62-67)*

Petitioner adidas AG - Exhibit 1027

## Owner's Proposed Construction

- Owner's expert admits that he did not consider that the proposed claim construction could also include a textile element after it had been removed from a larger textile structure.

> Q. And I understood that. I'm just saying where -- from the language in the claim, where are you getting that timing constraint that you're looking at, at the textile element, before it's removed from the machine?
>
> MR. PRATT: Objection, form.
>
> BY THE WITNESS:
>
> A. I would say I hadn't thought of that because I was thinking of a final piece, but I would think when everything was complete, ready to be removed from the machine, when this figure 8 as an example would be flat knit to shape ready to be removed from the machine.



*Source: Paper 37, p. 7 (citing Ex. 1015, p. 68-98; Ex. 1015, 69:6-18 (text box))*

Petitioner adidas AG - Exhibit 1027

Skechers EX1013-p. 6747
Skechers v Nike

## Petitioner's Proposed Construction

Petitioner's Proposed Construction:

- edges of a knitted textile that are knit in flat form,
- *which have been removed from* a surrounding textile structure
- so that the edges are free of surrounding textile structure

"Removing from a Larger Structure"

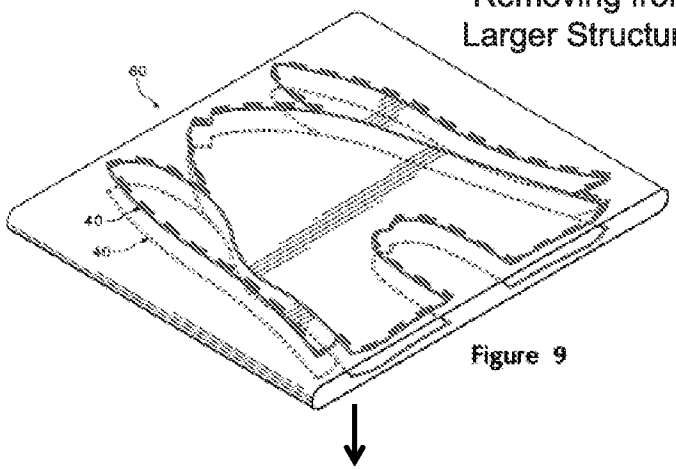
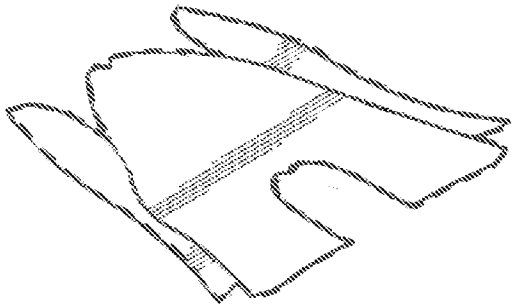



Figure 9




*Source: Paper 37, p. 6 (citing Ex. 1002, 5:58-60, 6:66-8:14, 9:7-14, 9:35-48, 11:19-41)*

Petitioner adidas AG - Exhibit 1027

Skechers EX1013-p. 6748
Skechers v Nike

## The Term "Flat Knit Edges" Is Also Indefinite

- "flat knit edges" is amenable to at least two plausible constructions.
- Petitioner's Proposed Construction: "edges of a knitted textile that are knit in flat form."
- Owner's Expert's Suggestion: edges of "knit to shape" textiles.

> Q. Does the term "flat knit edges" appear within the '011 Patent?

> BY THE WITNESS:
>
> A. I don't think the term "Flat knit edges" specifically appears, but "Flat knitting" appears numerous times through the patent, and one skilled in the art would understand that if figures 9, 10, and 11 were knit to shape, they would have flat knit edges.



*Source: Paper 37, pp. 7-8 (citing Ex. 1016, ¶ 38; Ex. 1015, 89:9-94:6); Ex. 1015, 83:4-15 (text boxes)*

Petitioner adidas AG - Exhibit 1027

## Proposed Claims 47-50 Are Anticipated By Nishida Under the Broadest Reasonable Interpretation

**Claim 47.**

- an upper incorporating a flat-knit textile element,
- the flat knit textile element (1) having flat knit edges

> In FIGS. **1** and **2**, a web of material is identified by **1**, and is produced by a conventional textile process, tier example, by weaving and/or knitting and/or embroidering. The web of material **1** can be provided with a single or with a plurality of layouts **2** of the shape of a shoe upper **3**, as it is represented from the side, for example, in FIG. **3**.

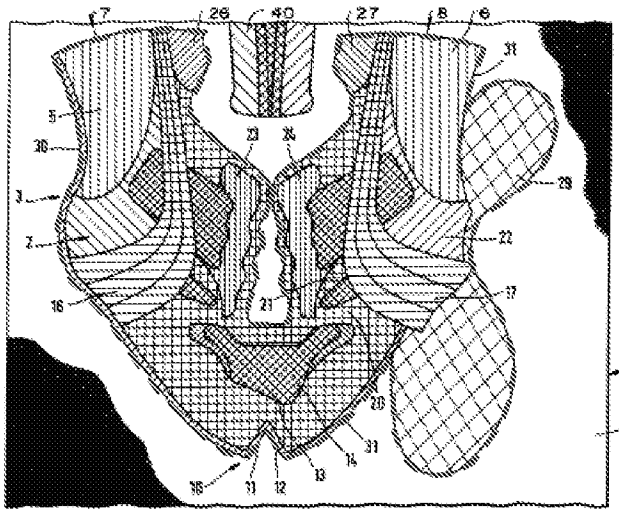


Fig. 1

Based on Broadest Reasonable Construction: "edges of a knitted textile that are knit in flat form, which have been removed from a surrounding textile structure so that the edges are free of surrounding textile structure."



*Source: Paper 37, pp. 8, 12-14 (citing Ex. 1001, ¶ 72; Ex. 1005, Abstract, 3:6-12 (text box), 3:31-33; Fig. 1)*

Petitioner adidas AG - Exhibit 1027

## Proposed Claims 47-50 Are Anticipated By Nishida Under the Broadest Reasonable Interpretation

**Claim 47.**

- free of surrounding textile structure
- such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed,

outside heel counter 9 (FIG. 3). After cutting out layout 2 from the web of material 1, the edges 7 and 8 are stitched together and a heel seam thus is formed. Then,

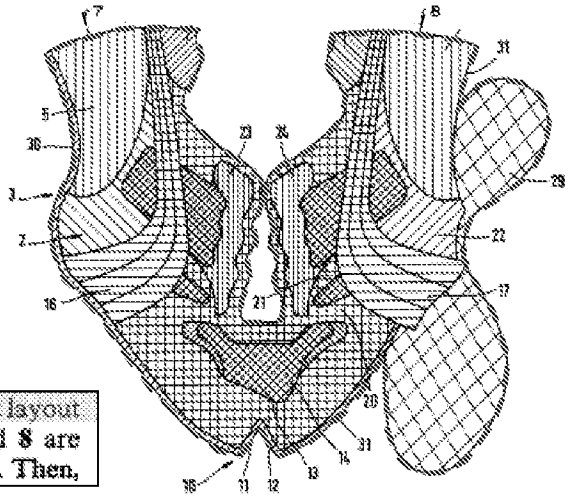


Fig. 1

Based on Broadest Reasonable Construction: "edges of a knitted textile that are knit in flat form, which have been removed from a surrounding textile structure so that the edges are free of surrounding textile structure."


*Source: Paper 37, pp. 8, 12-14 (citing Ex. 1006, 3:6-12, 3:31-33 (text box), Fig. 1)*

Petitioner adidas AG - Exhibit 1027

Skechers EX1013-p. 6751
Skechers v Nike

## Proposed Claims 47-50 Are Obvious Over Nishida Under Owner's Proposed Construction

- The '011 Patent and Nishida contain similar language regarding advantages of reducing waste so both are equally suggestive of "knit to shape" textile elements.

'011 Patent

element of material. From the perspective of manufacturing, utilizing multiple materials to impart different properties to an article of footwear may be an inefficient practice. By forming textile element 40 to be a single, unitary element of material, however, efficiency is increased in that upper 20 may include a single textile element, rather than numerous joined elements.

Nishida

It is of further advantage in the process according to the present invention that the individual patterns or partial patterns already can be produced directly in the production of the web of material in the desired shoe size, by which the cutting waste can be still further limited, since the individual patterns or partial patterns in the provided size can directly adjoin one another.

Based on Owner's Proposed Construction: "requiring that edges of the textile element have flat knit edges without surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed."


*Source: Paper 37, p. 9 (citing Ex. 1002, 11:12-18 (text box); Ex. 1023 ¶¶ 11-13 (further citing Ex. 1005, 1:10-37, 2:15-25, 2:27-32 (text box)); Ex. 2010 ¶¶ 177-179; Ex. 1015, pp. 79-80)*


Petitioner adidas AG - Exhibit 1027

Skechers EX1013-p. 6752
Skechers v Nike

# Proposed Claims 47-50 Are Obvious Over Nishida In View of Schuessler I and Schuessler II Under Owner's Proposed Construction

## Claim 47.

- An upper incorporating a flat-knit textile element,

## Nishida:

In FIGS. **1** and **2**, a web of material is identified by **1**, and is produced by a conventional textile process, tier example, by weaving and/or knitting and/or embroidering. The web of material **1** can be provided with a single or with a plurality of layouts **2** of the shape of a shoe upper **3**, as it is represented from the side, for example, in FIG. **3**.

## Schuessler I:

In the knitting operation, I form on the top or front side of the swatch an area of close stitches indicated by the numeral **14**; that is, from line **14** to the upper or front edge of the swatch the stitches are tightly formed, while to the rear of line **14** the stitches are loosely formed. The loose and tight stitches may be formed in accordance with the disclosure in U. S. Patent No. 2,150,730 issued to Carl F. Schuessler on March 14, 1939, for Knitting machine. In this application is dis-

## Schuessler II:

This invention relates to flat and circular knitting machines, **and more particularly to the loop forming mechanism of these machines. For the purpose of illustration,** the flat machine alone will be described.

Based on Owner's Proposed Construction: "requiring that edges of the textile element have flat knit edges without surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed."


*Source: Paper 37, pp. 10-11, 12-14 (citing Ex. 1023 ¶¶ 14-15; Ex. 1005, Abstract, 3:6-12 (text box); Ex. 1020, 1:48-2:2 (text box); Ex. 1021; 1:1-5 (text box))*


Petitioner adidas AG - Exhibit 1027

## Proposed Claims 47-50 Are Obvious Over Nishida In View of Schuessler I and Schuessler II Under Owner's Proposed Construction

**Claim 47.**

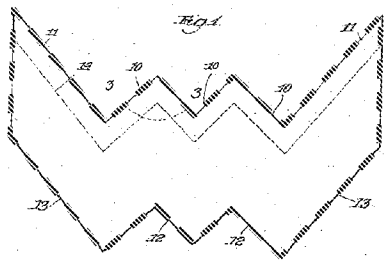
- the flat knit textile element (1) having flat knit edges
- free of surrounding textile structure
- such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed,

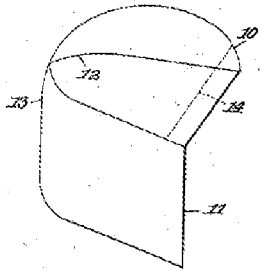
Schuessler I:

about the face. A further object is to provide a simple and expeditious method for forming helmets in a continuous manner, the helmets being completed from the swatches as knitted without requiring cutting, and requiring the joining of only a few edges. Other specific objects and ad-

opposite sides, it is believed that no one has yet conceived the idea of employing this as a means for forming an integral helmet with selvage edges, the swatch being converted into a helmet solely by joining some of the edges.

Fig. 2.





Based on Owner's Proposed Construction: "requiring that edges of the textile element have flat knit edges without surrounding textile structure such that the flat knit edges are not surrounded by textile structure from which the textile element must be removed."



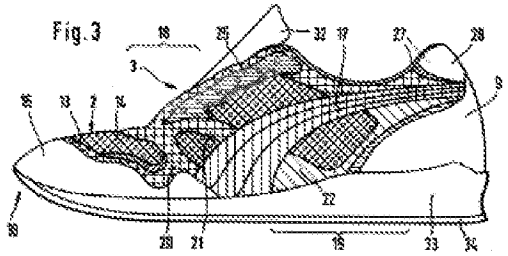
*Source: Paper 37, pp. 10-11, 12, 13-14 (citing Ex. 1023 ¶¶ 14-15; Ex. 1020 1:22-27 (text box), 2:41-45 (text box), Figs. 1-2)*

Petitioner adidas AG - Exhibit 1027

## Proposed Claim 49 Is Disclosed by Nishida

**Claim 49.**

- The article of footwear recited in claim [16] 47, wherein
- at least one of the first stitch configuration and the second stitch configuration forms [an aperture] a plurality of apertures in the [weft-knitted] flat knit textile element,
- the apertures formed by omitting stitches in the flat knit textile element and positioned in the upper for receiving laces.




In the production of web of material **1** or after its production, and optionally after cutting out of layout(s) **2**, layout(s) **2** can be provided with an embroidery, especially with an English embroidery (i.e., the type of embroidery by which a hole pattern is welded and which is commonly used for the sewing of button holes), of a trademark or another mark or identification on suitable or preferred places.


*Source: Paper 37, pp. 13-15 (citing Ex. 1001, ¶ 72; Ex. 1005, 4:31-38 (text box), 3:43-52, 6:25-31, Fig. 3)*

Petitioner adidas AG - Exhibit 1027

Skechers EX1013-p. 6755
Skechers v Nike

# Owner Does Not Dispute That The Remaining Elements of Claim 47 Are Disclosed by Nishida

| '011 Patent Claims | Description of Prior Art |
|---|---|
| 47. An article of footwear comprising: | **Nishida** discloses an article of footwear. (Ex. 1001, ¶ 72 (same element in claim 16); Ex. 1005, Abstract, Fig. 3.) |
| an upper incorporating a [weft-knitted] flat-knit textile element,... | **Nishida** discloses an upper incorporating a flat knit textile element. (Ex. 1001, ¶ 72 (similar element in claim 16); Ex. 1005, Abstract, 3:6-12.) |
| some of the flat knit edges joined together to form an ankle opening in the upper for receiving a foot, | **Nishida** discloses that some of the flat knit edges are joined together to form an ankle opening in the upper for receiving a foot. (Ex. 1001, ¶ 72 (a similar element in claim 1); Ex. 1005, Abstract, 3:6-12, 3:31-42, Fig. 3.) |
| the ankle opening having an edge comprised of one of the flat knit edges; and | **Nishida** discloses the ankle opening having an edge comprised of one of the flat knit edges. (Ex. 1001, ¶ 72 (a similar element in claim 1); Ex. 1005, Abstract, 3:6-12, 3:31-42, Figs. 2-3.) |
| (2) having a first area and a second area with a unitary construction, | **Nishida** discloses an upper incorporating a knit textile element having first and second areas with a unitary construction. (Ex. 1001, ¶ 72 (same element in claim 16); Ex. 1005, Abstract, 3:6-12, 3:15-26, 4:12-18, Figs. 2-3.) |
| the first area being formed of a first stitch configuration, and the second area being formed of a second stitch configuration that is different from the first stitch configuration to impart varying properties to the textile element; and | **Nishida** discloses that the first and second areas may be formed of different stitch configurations to impart varying properties to the textile element. (Ex. 1001, ¶ 72 (same element in claim 16); Ex. 1005, 3:15-4:18, 4:47-60, 5:41-45, 5:63-6:2, 6:4-41.) |
| a sole structure secured to the upper. | **Nishida** discloses that a sole structure may be secured to the upper. (Ex. 1001, ¶ 72 (same element in claim 16); Ex. 1005, Abstract, 4:39-46, Fig. 3.) |

# Owner Does Not Dispute That The Remaining Elements of Claims 48 and 50 Are Disclosed by Nishida

| | |
|---|---|
| 48. The article of footwear recited in claim [16] 47, wherein at least one of the first stitch configuration and the second stitch configuration forms an aperture in the [weft-knitted] flat knit textile element and | **Nishida** discloses that at one stitch configuration may form a net-like structure (i.e. having apertures) in the knit textile element. (Ex. 1001, ¶ 72 (a similar element in claim 19); Ex. 1005, 3:43-52, 6:25-31.) |
| the joined edges shape the flat knit textile element to form a lateral region, a medial region, an instep region and a heel region of the upper. | **Nishida** discloses that joined edges shape the flat knit textile element to form a lateral region, a medial region, an instep region and a heel region of the upper. (Ex. 1005, Abstract, 3:15-4:46, Figs. 1-5.) |
| 50. The article of footwear recited in claim [16] 47, wherein the [weft-knitted] flat knit textile element is one of an exterior layer, an intermediate layer, and an interior layer of the upper, and | **Nishida** discloses that the upper may include two or more layers, and the knit textile element may form at least a portion of the interior layer. (Ex. 1001, ¶ 72 (a similar element in claim 20); Ex. 1005, 3:6-9, 3:62-4:1.) |
| the joined edges shape the flat knit textile element to form a lateral region, a medial region, an instep region and a heel region of the upper. | **Nishida** discloses that joined edges shape the flat knit textile element to form a lateral region, a medial region, an instep region and a heel region of the upper. (Ex. 1001, ¶ 72 (a similar element in claim 2); Ex. 1005, Abstract, 3:15-4:46, Figs. 1-5.) |

## Proposed Claims 47-50 Enlarge The Scope of Original Claim 16

- Because "flat knit" is not *exclusively* a sub-type of weft knitting, flat knit covers types of flat warp knitting and flat milanese knitting (shown in RED shading) that are outside the scope of weft knitting.

Table 2 Comparison of claim term constructions

| | | Arrangement of Needles in the Knitting Machine | |
|---|---|---|---|
| | | In one line (flat) | In a circle (circular) |
| Direction of thread | Lengthwise in the fabric (warp) | FLAT WARP | |
| | Diagonal in the fabric (milanese) | FLAT MILANESE | |
| | Crosswise in the fabric (weft) | FLAT WEFT | |


*Source: Paper 37, pp. 1-2 (citing Ex. 1016 ¶¶ 36-37)*

Petitioner adidas AG - Exhibit 1027

## Petitioner's Expert Testimony Regarding "Flat Knit Edges" Should Be Excluded

- Owner improperly questioned Dr. Frederick about "flat knit edges," a term that does not appear in issued claims 1-46 of the '011 patent. Ex. 2009, p. 116.

> Q. And if the structure shown in Figure 8 was made by a flat knitting machine, then the edges that are shown in Figure 8 would be flat knitted, correct?
>
> A. That's right.
>
> Q. And edges that are flat knitted, would they require further processing before the edges were joined to form various seams?
>
> MR. KADABA: Objection to form.
>
> A. I don't know.

- Petitioner objected to the line of questioning as soon as the improper subject matter became clear, as this was a new line of questioning that commenced at the top of page 116 following a break.


*Source: Paper 49 pp. 2-3, 5 (citing Ex. 2009 p. 116 (text box)); Paper 54 p. 2*

Petitioner adidas AG - Exhibit 1027

Skechers EX1013-p. 6759
Skechers v Nike

## Petitioner's Expert Testimony Regarding "Flat Knit Edges" Should Be Excluded

- Owner's expert cited to Dr. Frederick's improper testimony as the only support for his conclusion that the textile elements in Figures 8, 10, and 11 have "flat knit edges" that are formed directly by the flat knitting machine (i.e., "knit to shape").

> 65. Moreover, one of ordinary skill in the art would understand that such textile elements knit to the shape of Figures 8, 10 and 11 using flat knitting would have flat knit edges because the edges, rather than being formed by cutting from a larger textile structure, are formed directly by the flat knitting machine. (*E.g.*, Ex. 2009 at 116). Such flat knit embodiments shown in Figures 8, 10 and 11 are


*Source: Paper 49 p. 3 (citing Paper 31, p. 4 Ex. 2010 ¶ 65 (text box))*

Petitioner adidas AG - Exhibit 1027

Skechers EX1013-p. 6760
Skechers v Nike

## Petitioner's Expert Testimony Regarding "Flat Knit Edges" Should Be Excluded

- "Flat knit edges" is the only feature on which Owner's expert relies to distinguish proposed claim 47 over Nishida.

> A. So I just want to be clear. So if this object, No. 40, was sitting on this table today --
> Q. Uh-huh.
> A. -- and it was made through flat knitting and --
> Q. Uh-huh.
> A. -- was it flat knit to shape or removed?
> Q. No. It was made as a big flat knit square panel.
> A. Okay.
> Q. And then you cut out the shape.
> A. So once you've cut through these edges, if you're cutting through all these edges to remove it, it no longer meets the criteria as shown in -- in the claims.
> Q. Okay. Which criteria?
> A. In particular it would no longer have flat knit edges.

- Owner cannot assert that "flat knit edges" is the key distinction over the prior art (and therefore lies outside the scope of claims 1-46), and conversely argue that questions about "flat knit edges" did not exceed the scope of Dr. Frederick's direct testimony because the term was within the scope of claims 1-46.


*Source: Paper 51, pp. 3-4; Paper 54 pp. 3-4 (citing Paper 31[1], pp. 6-8; Ex. 2010 ¶ 101; Ex. 1015, pp. 68-98: 73:5-22 (text box))*

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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adidas AG
Petitioner

v.

Nike, Inc.
Patent Owner

Patent No. 7,347,011
Filing Date: March 3, 2004
Issue Date: March 25, 2008
Title: ARTICLE OF FOOTWEAR HAVING A TEXTILE UPPER

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*Inter Partes* Review No. 2013-00067

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# CERTIFICATE OF SERVICE UNDER 37 C.F.R. § 42.6(e)(3)



Skechers EX1013-p. 6762
Skechers v Nike

The undersigned certifies that on February 6, 2014, the Petitioner's Oral Hearing Demonstratives with Certificate of Service Under 37 C.F.R. § 42.6(e)(3) (22 pages) were served by emailing a copy to counsel at the email addresses listed below:

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**NOTE: This exhibit is identical to exhibit no. 2002 marked during the July 23, 2013, cross-examination deposition of Edward C. Frederick, except for the inclusion of this note and the addition of a footer to comply with 37 CFR §42.63(d).**

**EXHIBIT 1**

DOCKET NO: 356093US26RX

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

| | |
|---|---|
| In Re *Inter Partes Reexamination* of: | : |
| U.S. Patent No. 7,181,866 | : EXAMINER: WEHNER, CARY ELLEN |
| Control No: 95/001,320 | : |
| Issued: February 27, 2007 | : GROUP ART UNIT: 3993 |
| For: Outsole | : |

# DECLARATION OF DR. EDWARD C. FREDERICK

1. I, Dr. Edward C. Frederick, make this declaration in connection with the Request for Reexamination by K-Swiss Inc. ("Requester") of U.S. Patent No. 7,181,866 ("the '866 patent").

2. I make this declaration based upon personal knowledge. I am over age 21 and otherwise competent to make this declaration.

3. The statements herein include my opinions and the bases therefore, which relate to the '866 patent and various references that disclose features found in the claims of the '866 patent. Although I am being compensated for my time in preparing this declaration, the opinions herein are my own, and I have no stake in the outcome of the reexamination proceeding.

## I. BACKGROUND AND BASES FOR OPINION

### A. Personal Background

4. I am President of Exeter Research, Inc. in Brentwood, New Hampshire. I have over thirty years of experience in the sporting goods industry, including extensive experience in footwear design and biomechanics, as well as footwear development and manufacturing. Further, I have been an active researcher in footwear design and biomechanics and published more than one hundred articles in international journals, books and, conference proceedings. In addition, I am a co-inventor on seven issued U.S. patents relating to footwear.

5. A copy of my *curriculum vitae* is attached hereto.

NIKE
EXHIBIT
2002
IPR 2013-00067

**B. Documents Reviewed**

6. In forming my opinions, I have reviewed (i) the March 3, 2010 Request for *Inter Partes* Reexamination of the '866 patent (and the exhibits thereto); (ii) the USPTO's (the "Patent Office") April 2, 2010 Decision on Request for *Inter Partes* Reexamination and Office Action rejecting all of the issued claims of the '866 patent; (iii) the April 30, 2010 Glide'n Lock GmbH (the "Patent Owner") Response to *Inter Partes* Reexamination Office Action (the "Response") (and the exhibits thereto); and (iv) the May 3, 2010 Supplemental Response filed by the Patent Owner.

**C. Level of Ordinary Skill in the Art**

7. Counsel for Requester has informed me that the content of a patent or other printed publication (*i.e.*, a reference) should be interpreted the way a person of ordinary skill in the art would have interpreted the reference at the time the '866 patent application was filed in the United States. I have been asked by Requester's counsel to assume that the person of ordinary skill is a hypothetical person who is presumed to be aware of all the pertinent information that qualifies as prior art. In addition, the person of ordinary skill in the art makes inferences and creative steps. He or she is not an automaton, but has ordinary creativity.

**D. Claim Construction**

8. I understand from counsel for Requester that, in a reexamination proceeding, the claims are to be given their broadest reasonable construction consistent with the patent's specification. I also understand that limitations from the specification are not to be read into the claims.

**E. Standard for Anticipation and Obviousness**

9. Counsel for Requester has informed me that a patent claim is invalid as anticipated if every limitation of a claim is found identically (either expressly, implicitly, or inherently) in a reference. A reference inherently discloses the subject matter that a person of ordinary skill in the art would have recognized as necessarily being present in the subject matter disclosed in the reference.

10. Counsel for Requester has also informed me that, by law, a patent may not be obtained though the invention is not identically disclosed or described as set forth in a prior art reference, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the



Patent Owner NIKE, Inc. Exhibit No. 2002 - page 2
Skechers EX1013-p. 6765
Skechers v Nike

invention was made to a person having ordinary skill in the art to which said subject matter pertains. I have also been informed that, in order for a patent claim to have been obvious, there needs to be an articulated reason with some rational underpinning why collectively the prior art references would have rendered the claimed invention obvious. Depending on the real-world context of the invention described in a patent, various factors or reasons can suffice as a reason to modify or combine the subject matter disclosed in prior art references.

11. These factors and reasons include the following: (a) obvious to try, (b) common sense, (c) combining or substituting known elements from the prior art to obtain predictable results, (d) ordinary creativity, (e) whether the need or problem addressed by the patent was known in the prior art, (f) use of known techniques to improve similar devices in the same way, (g) a teaching, suggestion, or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or combine reference teachings, and (h) 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 these factors are identified in the U.S. Supreme Court's decision in *KSR v. Teleflex*.

12. I understand that the Patent Office follows its published guidelines for determining whether a patent claim would have been obvious at the time the invention was made to a person of ordinary skill in the art. Those guidelines are in the Patent Office's November 6, 2007 "Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*" ("*KSR* Guidelines").
(http://www.uspto.gov/web/offices/pac/mpep/documents/2100_2141.htm#sect2141). I have read those guidelines, and I have applied them below when I analyze a claim for obviousness.

13. Although I have relied upon the Patent Office's *KSR* Guidelines, it is also my opinion that, at the time the '866 patent application was filed, the motivations, suggestions, or teachings in the prior art for combining references or modifying the prior art were strong enough that my conclusions concerning obviousness would be the same, irrespective of the *KSR* Guidelines.

## II. OVERVIEW OF THE '866 PATENT

14. The '866 patent discloses and claims an outsole for athletic shoes that can be elastically deformed in the tangential direction.

15. The '866 patent defines deformation in the tangential direction as deformation



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Skechers v Nike

in the direction tangential or parallel to the plane of the outsole or its outer surface which is caused by shearing. Col. 1, lines 8-11. The '866 patent distinguishes such deformation from deformation in the direction perpendicular to the plane of the outsole or its outer surface which is caused by compression. Col. 1, lines 11-14. On a horizontal surface, the tangential direction approximately coincides with the horizontal direction, and the perpendicular direction approximately coincides with the vertical direction. Col. 1, lines 14-17.

16. The '866 patent acknowledges that athletic shoes with elastically resilient outsoles were known in the prior art. Col. 1, lines 21-23.

17. The objective of the '866 patent is to eliminate a floating effect while also being sufficiently soft and resilient in the tangential direction. Col. 1, lines 50-54. The '866 patent states that this objective is attained with an outsole that (1) can be deformed in the tangential direction, and (2) is only rigid to a tangential deformation beyond at least one critical point of deformation in the region that is deformed to this critical point. Col. 1, lines 55-59. The '866 patent discloses several different embodiments that seek to achieve both of the above-referenced items (1) and (2). For example, Figures 1 and 3 illustrate an embodiment of a running shoe 2 that is equipped with an outsole 1 that is formed by a plurality of "profile-like hollow elements 3 that contain tubular parts 3.1." Col. 3, lines 11-14. As discussed in more detail below, it is unclear to me how the elements 3 in Figures 1 and 3 are "profile-like," or how they "contain" the tubular parts 3.1. The tubular parts 3.1 are fixed to the underside of an intermediate sole 4 of the running shoe 1 with webs 3.2. Col. 3, lines 14-15. Figure 1 depicts the outsole (a) while not being subjected to a load, (b) while being subjected to a transversely forward load, and (c) while pushing off. Col. 2, lines 42-45.

18. The '866 patent describes that if the running shoe 2 is subjected to a transversely forward load when it contacts the ground (as illustrated in Fig. 1b), the tubular parts 3.1 are completely compressed leading to a "frictional engagement between their upper shell 3.1.1 and their lower shell 3.1.2." Col. 3, lines 29-36. Such "frictional engagement" generates high resistance to additional deformation of the tubular parts 3.1 so that the runner is in contact with the ground 5 in a way that minimizes horizontal shift and improves stability. Col. 3, lines 36-44. The '866 patent indicates the frictional engagement generates such a high resistance to an additional deformation of the tubular parts 3.1 that they practically can only be additionally deformed by the remaining elasticity of the material, *i.e.*, to a negligible degree.

19. Figure 3 of the '866 patent depicts the hollow elements 3 according to Figure 1 while (a) not being subjected to a load, (b) being subjected to a tangential load, and (c)



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being subjected to vertically downward acting load. Col. 2, lines 10-14.

20. Figure 4 of the '866 patent depicts the outsole 6 with hollow elements 6.1 that are arranged between and connected to an upper layer 6.2 and a lower layer 6.3. The '866 patent further discloses that the two layers 6.2 and 6.3 extend over the entire surface of the outsole. Col. 4, lines 19-25.

21. The '866 patent discloses that the desired effects can be achieved by a configuration in which a closed volume is used instead of elastic elements that are open to the air outside of the sole. Figure 6 depicts an upper layer 8.1 and a lower layer 8.2 that are connected by peripheral side elements 8.3 such that a closed volume 8.4 is formed. Col. 4, lines 58-61. The '866 patent discloses that this closed volume is filled with a fluid such as air or a gel. Col. 4, lines 62-63. The '866 patent states "it is important that the outsole can be deformed under the loads that occur while running to such a degree that, as shown in part b), the upper layer 8.1 and the lower layer 8.2 can contact one another in the region subjected to the load. A frictional engagement with the above-described properties is also produced in this case if a material with a high coefficient of friction is chosen for both layers." Col. 4, line 63 to col. 5, line 3.

22. Figure 7 of the '866 patent depicts the outsole 9 with "toothing" arranged between upper layer 9.1 and lower layer 9.2 that produces "positive engagement." Col. 5, lines 13-18.

23. The '866 patent includes claims 1-10, of which claims 1 and 9 are the only independent claims.

24. Counsel for Requester has informed me that each of the '866 patent claims are in reexamination.

25. The '866 patent includes claims 1-10, of which claims 1 and 9 are the only independent claims. Claims 1 and 9 are reproduced below:

> 1. An outsole for a shoe, the shoe disposed along a longitudinal axis in a longitudinal direction parallel to a ground surface in use, the outsole comprising:
>
> a resilient member having an inner surface, an outer surface and, with respect to a direction perpendicular to the longitudinal direction, an upper portion and a lower portion, the outer surface of the lower portion proximate the ground surface in use,
>
> the resilient member having first and second configurations, the first configuration having the inner surface of the upper portion spaced from the inner surface of the lower portion, the resilient member elastically absorbs shoe loads oblique to the perpendicular



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direction by relative motion in the longitudinal direction between the upper portion and the lower portion in the first configuration, the second configuration having the inner surface of the upper portion engaged with the inner surface of the lower portion due to absorbed shoe loads, the engagement substantially preventing relative motion in the longitudinal direction between the upper portion and the lower portion.

9. A device for wearing on a foot, comprising:

a member adapted to grasp the foot, the grasping member disposed along a longitudinal axis in a longitudinal direction parallel to a ground surface in use; and

an outsole, the outsole comprising:

a resilient member having an inner surface, an outer surface and, with respect to a direction parallel to the longitudinal direction, an upper portion and a lower portion, the outer surface of the lower portion proximate the ground surface in use,

the resilient member having first and second configurations, the first configuration having the inner surface of the upper portion spaced from the inner surface of the lower portion, the resilient member elastically absorbs loads oblique to the ground perpendicular direction by relative motion in the longitudinal direction between the upper portion and the lower portion in the first configuration, the second configuration having the inner surface of the upper portion engaged with the inner surface of the lower portion due to absorbed shoe loads, the engagement substantially preventing relative motion in the longitudinal direction between the upper portion and the lower portion.

## III. OVERVIEW OF THE PRIOR ART

### A. Okabe

26. Japanese Patent Application Publication No. H-07-284403 to Okabe ("Okabe") is directed to a sole structure for footwear (Ex. C[1] at 1).

27. Okabe discloses an outsole 2 depicted in Figures 1, 3, and 4 that extends parallel to a ground surface in a longitudinal direction when it is in use. Okabe further discloses a resilient member that includes portions of the outsole 2 and the midsole 3. Further, cavities 6a and 6b are formed between recessed parts 7a and 7b established on the upper surface of the outsole 2 and the lower surface of the midsole 3. (Ex. C at Figures 1-4, paragraph [0021]).

28. As shown in Figures 3 and 4, and as stated in paragraph [0020], the lower surface of the outsole 2 makes contact with the ground. Moreover, Okabe Figures 3 and 4 show the resilient member (cavity 6a or 6b) in two different states. Okabe describes the

[1] All references to exhibits in this declaration are identical to the exhibits referenced in the Request for Reexamination.



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depiction in Figure 3 as follows: "when the load is small, the tops of the rubber pins 8 and the bottom surface of the midsole 3 are separated, and only the air cushion created by the air in the cavities works against the load." (Ex. C at Paragraph [0022]).

29. Okabe teaches that support by an air cushion alone will result in instability in a horizontal direction: "Although establishing airtight cavities inside the shoe sole yields advantages such as a soft air cushion effect and a close fit between the sole and the unevenness of the ground, inadequate support in the horizontal direction produces a feeling of instability as if stepping on an air cushion." (Ex. C at Paragraph [0006]).

30. Okabe illustrates a second state in which the rubber pins 8 contact the midsole 3 under increased load. (Ex. C at Fig. 4). Specifically, Okabe teaches that "when the bottom surface of the midsole 3 descends due to an increase in load and touches the tops of the rubber pins 8, the cushioning effect caused by the elastic deformation of the midsole 3 and each of the rubber pins 8 works together with the air cushion effect, and the characteristic instability experienced with the air cushion effect alone is improved as a result." (Ex. C at Paragraph [0022]).

31. Okabe illustrates a walking shoe. (Ex. C at Fig. 1). In this respect, Okabe discloses a structure in which a flexible midsole 3, which is glued to the upper surface of the outsole 2, is adhered to the insole 4 of the walking shoe 1, and a replaceable sole insert 5 is placed on the upper surface of the insole 4. As illustrated in Figure 1, the walking shoe 1 in Okabe includes a main body that grasps a foot.

**B Szentes**

32. International Publication No. WO 90/00021 to Szentes et al. ("Szentes") is directed to an outsole for a shoe. (Ex. D at 1).

33. Szentes discloses that it is known that outsoles that include a plurality of elongated channels can create a feeling of instability for a wearer during use. Specifically, Szentes discloses that wearing the shoe disclosed in Sakutori (Ex. M), which includes an outsole that has a plurality of elongated channels, "results in an unsure and wobbling walk." (Ex. M, p. 3, line 33 to page 4, line 3).

34. Sakutori discloses a shoe 10 that includes a sole 14 that includes a plurality of elongated channels 16. (Ex. M, p. Sakutori at col. 2, lines 25-33). Each of the channels 16 includes an inlet 20 at the side edge of the sole 14 that allows air flow from the ambient of the shoe 10. (Ex. M, p. Sakutori at col. 2, lines 25-33).

35. Szentes recognizes the source of the instability in prior art designs, such as



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Sakutori, is the result of the opposing faces of compressed cushioning sliding on each other when the person wearing the footwear applies their weight: "in so far as surfacial parts of the two layers facing each other are sliding easily on one another on effect of sliding force components, as a consequence, the person using the footwear has the sence [sic] of uncertainity [sic]." (Ex. D, at p. 5, lines 19-23).

36. Szentes discloses an outsole 1 for a shoe that is illustrated in Figures 1-5. As shown in Figures 1-5, the shoe extends in a longitudinal direction that is parallel to the bottom of the shoe, and thus the ground, in use.

37. Szentes discloses a resilient member (the combination of the upper layer 2, the lower layer 3 and the cavity 4) having an inner surface, an outer surface and, with respect to a direction perpendicular to the longitudinal direction, an upper portion (upper layer 2) and a lower portion (lower layer 3), the outer surface (ribs 14) of the lower portion proximate the ground surface in use.

38. As shown in Figure 2, the inner surface of the upper layer 2 is spaced from the inner surface of the lower layer 3 in the unloaded state. Szentes also discloses that the upper layer 2 changes shape as the shape of the foot changes during a walking motion. (Ex. D at p. 10, lines 8-12). Szentes further discloses the sole 1 of the footwear returns to its original position after the load is removed. (Ex. D at p. 10, lines 12-13).

39. As further shown in Figure 2, Szentes illustrates an embodiment in which notches 7 and ribs 8 are formed on the inner surface of the lower layer 3. Szentes teaches that the problem identified in the prior art is solved with the inclusion of ribs 8 that "prevent sliding of the two layers on one another, when the upper layer 2 is lying onto the lower layer 3 in the loaded state, under the effect of the force component transferred by the foot from the upper layer 2, being parallel with the longitudinal direction or cross-direction of the shoe." (Ex. D at p. 10, lines 24-29).

40. Szentes teaches with reference to the embodiment in Figure 3, "Ribs 8 formed and enclosed by the notches 7 prevent sliding of the surfaces of the upper layer 2 and the lower layer 3 lying on each other." (Ex. D at p. 11, lines 11-13).

41. Szentes discloses such footwear as including an upper part 6 wrapped around a foot that extends parallel to the ground. (Ex. D at Figs. 1-4).

**C. Pagani**

42. U.K. Patent Application Publication No. GB 2 001 843 ("Pagani") is directed to soles for footwear, such as boots and shoes. (Ex E. at p. 1, lines 5-7).



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43. As shown in Figures 1 and 2, Pagani discloses an outsole 10 that includes a sole tread 10 that is affixed to a foot base 15. (Ex. E, Figs. 1-2). The sole tread 10 includes a plurality of through-channels 11 that are formed in triangular embossments 12.

44. The inner surface of the upper portion of each of the channels 11 is spaced from the inner surface of the lower portion of each of the channels 11, and the sloping walls 14 are oblique to the ground in an unloaded state. (Ex. E, Figs. 1-2).

45. Pagani teaches that the channels "provide an array of air-chambers which improve the softness of the sole and its adherence to the ground." (Ex. E, p. 1, lines 33-38). Pagani also teaches that "[t]he channels 11 make the sole tread especially resiliently yieldable...and the triangular embossments 12 tend to yield under the wearer's weight so as to bring their sloping walls 14 in frictional contact with the ground." (Ex. E, p. 1, lines 67-73).

**D. Takahashi**

46. Japanese Utility Model Application Publication No. S49-096158 ("Takahashi") is directed to a shoe sole for rubber shoes. (Ex. H, at p. 1, line 10).

47. Takahashi discloses a number of embodiments in which a plurality of ridge bodies 7 containing passage holes 6 that run from one side surface 4 to the opposite side surface 5 are arranged in parallel in the ball section 2 and/or heel section 3 of a shoe sole 1. (Ex. H, Figs. 1-6). In each of these embodiments, the passage holes 6 define an inner surface and the bottom of the sole 1 defines an outer surface.

48. Takahashi discloses that "a plurality of passage holes (6) pass through the ball section (2) and/or heel section (3) which experience the most load when worn. This, in combination with the elasticity of shoe sole material, produces favorable feel with dramatically improved cushioning relative to conventional shoe soles that are formed from a completely unitary body" and "because the plurality of ridge bodies (7) are arranged in parallel on the tread surface of the ball section (2) and/or heel section (3), the shoe sole of the present invention has the additional merits of allowing smooth stopping and comfortable walking, because strong frictional forces arise due to the action of forces whereby protrusions in the road surface are clinched between adjacent ridge bodies (7), (7)." (Ex. H, at 1-2).

**E. Inohara '393**

49. U.S. Patent No. 4,523,393 ("Inohara '393") is directed to a sport shoe sole. Specifically, Figure 13 of Inohara '393 discloses a sports shoe A that includes a shoe sole C that is affixed to a shoe upper B.



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50. Inohara '393 discloses a number of embodiments in which air chambers are formed by grooves in resilient material. For example, Inohara '393 discloses, with reference to Figures 1 and 2, "air from the outside of the sole is always present in each of the grooves 4 and 5 formed in the interlayer body 3, which provides an air resilience co-operating with the sponge resilience obtained from the inlerlayer sole 2 and the interlayer body 3. The synergistic effect between the sponge resilience and the air resilience can moderate the rebounding resilience acted upon from the surface of the ground and the like against the landing pressure resulted by the moving action of a racer, which amounts 3 to 6 times as much as the body weight of the racer," and "the air included in each of the above grooves 4 and 5 are released externally upon compression of the interlayer body 3." (Ex. I, at col. 3, lines 37-49).

51. As air is expelled from an aperture 7 in Figures 7 and 8 of Inohara '393, or from an aperture 12 in Figure 13 of Inohara '393, the collapsing motion of the aperture 7 or 12 inherently includes a component of relative motion in the longitudinal direction between an upper portion of the respective aperture and a lower portion of the respective aperture. This relative motion results from the horizontal component of the loading that comes with forward motion of a user.

## IV. COMPARISON OF THE '866 PATENT'S CLAIMS AND THE PRIOR ART

### A. Okabe Anticipates Claims 1-10 of the '866 Patent

52. In my opinion, each of the elements of claims 1-10 of the '866 patent is disclosed in Okabe as explained in the Request for Reexamination and adopted in the April 2, 2010 Office Action. I have been asked by counsel for Requester to address the Patent Owner's arguments that Okabe fails to teach each of the claimed elements of the '866 patent.

53. Okabe discloses an outsole 2 depicted in Figures 1, 3, and 4. As illustrated in Figures 3 and 4, the outsole 2 extends parallel to a ground surface in a longitudinal direction when it is in use.

54. Okabe discloses a resilient member (cavity 6a or 6b) that has an inner surface (the interior of a respective one of the cavities 6a or 6b) and an outer surface (the outer surfaces of the outsole 2 and the midsole 3). Okabe further discloses the midsole 2 is an upper portion and the outsole 3 is a lower portion in a direction perpendicular to the longitudinal direction of the resilient member, and the outer surface of the lower portion (lower surface of the outsole 2) is proximate the ground surface in use.

55. Okabe Figures 3 and 4 show the resilient member (cavity 6a or 6b) in two



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different states. Figure 3 of Okabe discloses a first configuration in which the inner surface of the upper portion (the top surface of the interior of the cavity 6a) is vertically spaced from and is able to horizontally move relative to the inner surface of the lower portion (the bottom surface and rubber pins 8 of the interior of the cavity 6a).

56. Figure 4 of Okabe illustrates a second state in which the rubber pins 8 contact the midsole 3 under increased load. Okabe discloses a second configuration in which (1) the upper portion (midsole 3) is engaged with the inner surface of the lower portion (rubber pins 8 extending from outsole 2) due to absorbed shoe loads, and (2) the relative motion (instability) between the upper portion (midsole 3) and lower portion (outsole 2) is prevented by the engagement of the rubber pins 8 with the midsole 3.

57. Figure 4 of Okabe illustrates a second state in which the rubber pins 8 contact the midsole 3 under increased load.

58. Okabe teaches that "when the bottom surface of the midsole 3 descends due to an increase in load and touches the tops of the rubber pins 8, the cushioning effect caused by the elastic deformation of the midsole 3 and each of the rubber pins 8 works together with the air cushion effect, and the characteristic instability experienced with the air cushion effect alone is improved as a result." (Ex. C. at Paragraph [0022]).

59. In the configuration illustrated in Figure 4 of Okabe, the pins 8 create an area of concentrated pressure that penetrate the soft material on the opposing smooth surface of midsole 3 thus causing interlock between the upper portion (midsole 3) and lower portion (outsole 2).

60. In my opinion, given a sufficient load due to use that is vigorous enough (*e.g.*, running, jumping, stopping suddenly) and/or a user that is heavy enough, the combination of the pins 8 and the midsole 3 of Okabe would be completely compressed after an initial elastic absorption of the load in the form of a vertical and horizontal deformation. Further, in this state, the frictional engagement of the pins 8 with the midsole 3 would generate such a high resistance to additional deformation that they practically could only be additionally deformed by the remaining elasticity of the material, *i.e.*, to a negligible degree.

61. Regarding claim 6 of the '866 patent, it is my opinion, based on the disclosure in Okabe, that the resilient member of Okabe would be elastically deformed by more than 20% in the second configuration.

62. Regarding claim 7 of the '866 patent, the use of certain materials in a shoe sole, such as wood, would not allow deformation of the shoe sole that is more than 50%. However, Okabe discloses that "when the load is small, the top parts of the rubber pins 8



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elastically deform and bear most of the load, and as the load increases, the bases of the rubber pins gradually begin to elastically deform, which makes it possible to maintain a reasonable level of cushioning to accommodate a wide spectrum of changes in load ranging from small to large load...[t]he elasticity of each rubber pin 8 is maintained even after the midsole 3 reaches its limit of elastic deformation, and the midsole 3 has a thickness that exceeds the depth of each of the recessed parts 7a and 7b of the outsole 2 in each region, so the upward thrusting force of the rubber pins 8 is transmitted to the bottom of the foot of the wearer after it is dispersed by the midsole 3, which prevents the comfort from diminishing." (Ex. C, Paragraphs [0022]-[0023]). Based on my independent evaluation of the structure and material properties described in Okabe and in view of the materials typically available for purposes of shoe construction, I conclude that Okabe discloses deformation that is at least as much as the depth of the recessed parts 7a and 7b when a wearer undertakes vigorous activity and that this would be more than 50% of the cavities 6a and 6b.

63. Regarding claim 9 of the '866 patent, Okabe Figure 1 illustrates a walking shoe 1 that includes a main body that grasps a foot. With respect to the further outsole limitations in claim 9, Okabe anticipates for the same reasons as set forth above in connection with claim 1 of the '866 patent.

**B. Szentes Anticipates Claims 1, 2, and 6-10 of the '866 Patent**

64. In my opinion, each of the elements of claims 1, 2, and 6-10 of the '866 patent is disclosed in Szentes as explained in the Request for Reexamination and adopted in the April 2, 2010 Office Action. I have been asked by counsel for Requester to address the Patent Owner's arguments that Szentes fails to teach each of the claimed elements of the '866 patent.

65. Szentes discloses an outsole 1 for a shoe. (Ex. D, Figures 1-5). As shown in Figures 1-5, the shoe extends in a longitudinal direction that is parallel to the bottom of the shoe, and thus the ground, in use.

66. Szentes discloses a resilient member (the combination of the upper layer 2, the lower layer 3 and the cavity 4) having an inner surface, an outer surface and, with respect to a direction perpendicular to the longitudinal direction, an upper portion (upper layer 2) and a lower portion (lower layer 3), the outer surface (ribs 14) of the lower portion proximate the ground surface in use.

67. Szentes discloses the resilient member (the combination of the upper layer 2, the lower layer 3 and the cavity 4) having first and second configurations.



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68. As shown in Figure 2, the inner surface of the upper layer 2 is spaced from the inner surface of the lower layer 3 in the unloaded state. Szentes discloses that, during walking, "the sole will be supported so as if we walked on a material of carpet - or sand character." (Ex. D, p. 10, lines 7-8). Szentes also discloses that the upper layer 2 changes shape as the shape of the foot changes during a walking motion. (Ex. D, p. 10, lines 8-12). Walking inherently generates loads from the foot (shoe loads) that are oblique to the perpendicular direction as walking involves both vertical and horizontal motion. Szentes further discloses the sole 1 of the footwear returns to its original position after the load is removed. (Ex. D, p. 10, lines 12-13).

69. As the upper part 2 moves towards the lower layer 3 during loading, the outsole of Szentes elastically absorbs loads oblique to the perpendicular direction by relative motion in the longitudinal direction between the upper layer 2 and the lower layer 3.

70. Szentes discloses that, in a loaded state, the inner surface of the upper portion (upper layer 2) is engaged with the inner surface of the lower portion (the ribs 8 of the lower layer 3) due to absorbed shoe loads (the loaded state). Szentes further discloses that this engagement substantially prevents relative motion in the longitudinal direction between the upper portion (upper layer 2) and the lower portion (lower layer 3).

71. In my opinion, Szentes does not teach away from relative motion between the upper layer 2 and the lower layer 3 in the longitudinal direction in either the unloaded state or as the upper part 2 moves towards the lower layer 3 during loading. Indeed, based on my understanding of Szentes, relative motion in the longitudinal direction does occur between the upper layer 2 and the lower layer 3 as the upper part 2 moves towards the lower layer 3 during loading. Such relative motion would inherently occur as a result of the deformation of the upper layer 2 as it moves towards the lower layer 3.

72. Regarding claim 6 of the '866 patent, it is my opinion, based on the disclosure in Szentes, that the resilient member of Szentes would be elastically deformed by more than 20% in the second configuration.

73. Regarding claim 7 of the '866 patent, the use of certain materials in a shoe sole, such as wood, would not allow deformation of the shoe sole that is more than 50%. However, Szentes discloses, with reference to the embodiment illustrated in Figure 3, "in course of the deformation of the upper layer 2 every single part of the material should be subjected to the stretching strain." (Ex. D, p. 11, lines 20-22). Based on my independent evaluation of the structure and material properties described in Szentes and in view of the materials typically available for purposes of shoe construction, I conclude that the entirety of



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Szentes' upper layer 2 will undergo elastic deformation during loading when a wearer undertakes vigorous activity, which would be more than 50%.

74. Regarding claim 9 of the '866 patent, Szentes discloses a grasping member (upper part 6) that is disposed along a longitudinal axis in a longitudinal direction parallel to a ground surface in use. With respect to the further outsole limitations in claim 9, Szentes anticipates for the same reasons as set forth above in connection with claim 1.

### C. Pagani in Combination with Szentes and Okabe Renders Claims 1-10 of the '866 Patent Invalid as Obvious Under 35 U.S.C. § 103

75. Each of the elements of claims 1-10 of the '866 patent is either disclosed or suggested by the combined teachings of Pagani and Szentes.

76. Pagani discloses a footwear sole tread. More particularly, Pagani discloses an outsole 10 that includes a sole tread 10 that is affixed to a wooden foot base 15. (Ex. E, Figs. 1-2).

77. Pagani discloses a resilient member (a portion of the tread 10 that includes a channel 11) that has an inner surface (an interior surface formed by the channel 11), an outer surface (the sloping walls 14), and, with respect to a direction perpendicular to the longitudinal direction, an upper portion and a lower portion (each of the channels 11 can be divided into an upper and lower portion). Pagani further discloses that the outer surface of the lower portion (the sloping walls 14) are proximate the ground surface in use.

78. Figures 1 and 2 of Pagani illustrate a first configuration of a resilient member (a portion of the tread 10 that includes a channel 11) in which the sole is in an unloaded state, and Pagani further describes a second configuration of the tread 10 in which the embossments 12 yield so as to bring the sloping walls 14 in contact with the ground. Further, in the first configuration (the unloaded state), as shown in Figures 1 and 2 of Pagani, the inner surface of the upper portion of each of the channels 11 is spaced from the inner surface of the lower portion of each of the channels 11.

79. Pagani discloses that the channels "provide an array of air-chambers which improve the softness of the sole and its adherence to the ground" and "[t]he channels 11 make the sole tread especially resiliently yieldable...and the triangular embossments 12 tend to yield under the wearer's weight so as to bring their sloping walls 14 in frictional contact with the ground." (Ex. E, p. 1, lines 33-38; and page 1, lines 67-73). As shown in Figure 2 of Pagani, the sloping walls 14 are oblique to the ground in an unloaded state.

80. When a person undertakes forward motion by, for example, walking or



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running, this motion includes both horizontal and forward motion, the net direction of which is oblique to the direction that is perpendicular to the ground.

81. When a person undertakes forward motion when wearing a footwear as described in Pagani, the sloping walls 14, which were initially oblique to the ground in an unloaded state, are brought into frictional contact with the ground. This deformation inherently includes a component of relative motion in the longitudinal direction between the inner surface of the upper portion of each of the channels 11 (which are on a side of the tread 10 that is affixed to the wooden base 15) and the inner surface of the lower portion of each of the channels 11 (which are on a side of the tread 10 that includes the sloping walls 14 that move from an orientation that is oblique to the ground to an orientation in which they contact the ground).

82. Pagani discloses a resilient member (the portions of the tread 10 that include the channels 11) that elastically absorbs shoe loads oblique to the perpendicular direction by relative motion in the longitudinal direction between the upper portion and the lower portion in the first configuration.

83. Pagani does not explicitly disclose that the inner surface of the upper portion of the channels 11 are engaged with the inner surface of the lower portion of the channels 11 due to absorbed shoe loads in the second configuration. In my opinion, a shoe could undergo very large loads depending on the weight of the user and the type of activity. Since Pagani discloses that the "[t]he channels 11 make the sole tread especially resiliently yieldable" and "the triangular embossments 12 tend to yield under the wearer's weight so as to bring their sloping walls 14 in frictional contact with the ground," it necessarily follows that the structure of the tread 10 is capable of undergoing a complete collapse of at least one of the channels 11 of the tread 10 such that an inner surface of the upper portion of a given channel 11 is engaged with the inner surface of the lower portion of the given channel due to absorbed shoe loads when the absorbed shoe loads are sufficiently large. (Ex. E, p. 1, lines 33-38; and p. 1, lines 67-73).

84. Although Pagani does not explicitly disclose that engagement due to a collapsed channel 11 substantially prevents relative motion in the longitudinal direction between the upper portion and the lower portion of the collapsed channel, the complete collapse of the channel 11 would inherently result in frictional engagement between the upper and lower portions of the channel 11. To the extent the frictional engagement resulting from the collapse of the channel 11 still results in relative motion between facing upper and lower portions that creates an unstable feel to a wearer, both Okabe and Szentes provide common



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sense solutions. For example, as explained above, Szentes discloses that it is known that outsoles that include a plurality of elongated channels can create a feeling of instability for a wearer during use. Specifically, Szentes discloses that wearing the shoe disclosed in Sakutori (Ex. M), which includes an outsole that has a plurality of elongated channels, "results in an unsure and wobbling walk." (Ex. M, p. 3, line 33 to page 4, line 3). Sakutori discloses a shoe 10 that includes a sole 14 that includes a plurality of elongated channels 16. (Ex. M, p. Sakutori at col. 2, lines 25-33). Each of the channels 16 includes an inlet 20 at the side edge of the sole 14 that allows air flow from the ambient of the shoe 10. (Ex. M, p. Sakutori at col. 2, lines 25-33).

85. The channel structure of the sole in Sakutori is similar to that in Pagani and, in my opinion, the design in Pagani would suffer the same problems of instability that Szentes identifies in Sakutori.

86. As explained above, Szentes identifies the source of the instability in prior art designs. As a solution to this problem, Szentes teaches that including ribs on an inner surface of a lower layer that engage an inner surface of an upper layer during loading can prevent these surfaces from sliding relative to each other.

87. It would have been obvious to one of ordinary skill in the art at the time of the invention of claim 1 of the '866 patent to include a structure that corresponds to the ribs disclosed in Szentes on the inner surface of the lower portion of the channels 11 of Pagani for the purpose of improving the stability of the sole tread 10 of Pagani, because Szentes recognizes a problem with sliding during use in the design of soles that include channels of the type described in Pagani and teaches that including ribs that prevent sliding during use solves that problem.

88. In the resulting modified device of Pagani, when a sufficient load is applied to the sole tread 10, the inner surface of the upper portion of the channels 11 would be engaged with the ribs (or pins) on the inner surface of the lower portion of the channels 11 due to absorbed shoe loads in the second configuration. Further, as disclosed in Szentes, such engagement would substantially prevent relative motion in the longitudinal direction between the upper portion and the lower portion.

89. Regarding claim 6 of the '866 patent, it is my opinion, based on the disclosure in Pagani, that the resilient member of Pagani is elastically deformed by more than 20% in the second configuration.

90. Regarding claim 7 of the '866 patent, the use of certain materials in a shoe sole, such as wood, would not allow deformation of the shoe sole that is more than 50%.



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However, Pagani discloses that the "[t]he channels 11 make the sole tread especially resiliently yieldable" and "the triangular embossments 12 tend to yield under the wearer's weight so as to bring their sloping walls 14 in frictional contact with the ground." (Ex. E, p. lines 33-38; and page 1, lines 67-73). Therefore, the structure of the tread 10 is capable of undergoing a complete collapse of at least one of the channels 11 of the tread 10 such that an inner surface of the upper portion of a given channel 11 is engaged with the inner surface of the lower portion of the given channel due to absorbed shoe loads when the absorbed shoe loads are sufficiently large. Based on my independent evaluation of the structure and material properties described in Pagani and in view of the materials typically available for purposes of shoe construction, it is my opinion that Pagani discloses deformation that would be more than 50% when a wearer undertakes vigorous activity.

91. Regarding claim 9 of the '866 patent, Pagani discloses "a sole tread for an article of footwear" and also discloses "footwear provided with such a sole tread." (Ex. E, at p. 1, lines 8-9 and 16-17). Although Pagani does not explicitly disclose the footwear includes a member adapted to grasp the foot, such members are well known aspects of footwear. With respect to the further outsole limitations in claim 9, Pagani in view of Szentes renders such claim limitations obvious for the same reasons as set forth above in connection with claim 1.

### D. Takahashi in Combination with Szentes Renders Claims 1-10 of the '866 Patent Invalid as Obvious Under 35 U.S.C. § 103

92. Each of the elements of claims 1-10 of the '866 patent is either disclosed or suggested by the combined teachings of Takahashi and Szentes.

93. Takahashi relates to a shoe sole for rubber shoes. (Ex. H, p. 1, line 10) and refers to the "the elasticity of shoe sole material" in its disclosure. (Ex. H, p. 1, line 10; and p.2, line 1).

94. Takahashi discloses a resilient member (any individual portion of the sole 1 that includes at least one of the passage holes 6) that has an inner surface (the passage hole 6), an outer surface (the bottom of the sole 1), and, with respect to a direction perpendicular to the longitudinal direction, an upper portion and a lower portion (each of the passage holes 6 can be divided into an upper and lower portion). As shown in Figures 1-3 of Takahashi, the bottom of the sole 1 is proximate to where a ground surface (not depicted) would be during use.

95. Takahashi inherently includes two different configurations: a first



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configuration in which the passage holes 6 are deformed as loads are absorbed, and second configuration immediately thereafter in which the passage holes 6 are completely collapsed when sufficient load is applied. With respect to the first configuration, Takahashi discloses (1) the inclusion of the passage holes 6 improves cushioning, and (2) the ridge bodies 7 are able to clinch protrusions in the road.

96. When a person undertakes forward motion by, for example, running, this motion includes both horizontal and forward motion, the net direction of which is oblique to the direction that is perpendicular to the ground. Thus, in my opinion, the shoe loads that are cushioned by the sole 1 of Takahashi are shoe loads that are oblique to the perpendicular direction.

97. In my opinion, the deformation of the ridge bodies 7 inherently includes a component of relative motion in the longitudinal direction between an upper portion of a respective passage hole 6 and a lower portion of the respective passage hole 6. The deformation of the ridges 7 during loading of the shoe sole 1 would necessarily include deformation in the longitudinal direction that decreases the size of the open spaces in the sole 1 between each adjacent passage hole 6. In fact, this deformation would be necessary for the ridges 7 to perform the clinching disclosed in Takahashi. (Ex. H, at the paragraph spanning pages 1 and 2).

98. Takahashi discloses a resilient member (any individual portion of the sole 1 that includes at least one of the passage holes 6) that elastically absorbs shoe loads oblique to the perpendicular direction by relative motion in the longitudinal direction between an upper portion and a lower portion in the first configuration.

99. Takahashi does not explicitly state the inner surface of the upper portion of the passage hole 6 is engaged with the inner surface of the lower portion of the passage hole 6 due to absorbed shoe loads in a second configuration. In my opinion, however, a shoe could undergo very large loads depending on the weight of the user and the type of activity. Since Takahashi discloses "a shoe sole for rubber shoes" and refers to the "the elasticity of shoe sole material" in its disclosure, the structure of the sole 1 is capable of undergoing a complete collapse of at least one of the passage holes 6 such that an inner surface of the upper portion of passage hole 6 is engaged with the inner surface of the lower portion of the passage hole 6 due to absorbed shoe loads when the absorbed shoe loads are sufficiently large.

100. Although Takahashi does not explicitly disclose that engagement between the inner surface of the upper portion of the passage hole 6 and the inner surface of the lower portion of the passage hole 6 substantially prevents relative motion in the longitudinal



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direction between the upper portion and the lower portion of the passage hole 6, the complete collapse of the passage hole 6 would inherently result in frictional engagement between the upper and lower portions of the passage hole 6. To the extent the frictional engagement resulting from the collapse of the passage hole 6 still results in relative motion between facing upper and lower portions that creates an unstable feel to a wearer, Szentes provides a common sense solution. For example, as explained above, Szentes discloses that it is known that outsoles that include a plurality of elongated channels can create a feeling of instability for a wearer during use. Specifically, Szentes states that wearing the shoe disclosed in Sakutori (Ex. M), which includes an outsole that has a plurality of elongated channels, "results in an unsure and wobbling walk." (Ex. D, at p. 3, line 33 to p. 4, line 3).

101. The channel structure of the sole in Sakutori is similar to that in Takahashi and, in my opinion, the design in Takahashi would suffer the same problems of instability that Szentes identifies in Sakutori.

102. As explained above, Szentes identifies the source of the instability in prior art designs. As a solution to this problem, Szentes teaches that including ribs on an inner surface of a lower layer that engage an inner surface of an upper layer during loading can prevent these surfaces from sliding relative to each other.

103. It would have been obvious to one of ordinary skill in the art at the time of the invention of claim 1 of the '866 patent to include the ribs disclosed in Szentes on the inner surface of the lower portion of the passage holes 6 of Takahashi for the purpose of improving the stability of the sole 1 of Takahashi.

104. In the resulting modified device of Takahashi, when a sufficient load is applied to the sole 1, the inner surface of the upper portion of the passage holes 6 would be engaged with the ribs on the inner surface of the lower portion of the passage holes 6 due to absorbed shoe loads in the second configuration. Further, as disclosed in Szentes, such engagement would substantially prevent relative motion in the longitudinal direction between the upper portion and the lower portion.

105. Regarding claim 6 of the '866 patent, it is my opinion, based on the disclosure in Takahashi, that the resilient member of Takahashi is elastically deformed by more than 20% in the second configuration.

106. Regarding claim 7 of the '866 patent, the use of certain materials in a shoe sole, such as wood, would not allow deformation of the shoe sole that is more than 50%. However, the structure of the sole 1 of Takahashi is capable of undergoing a complete collapse of at least one of the passage holes 6 such that an inner surface of the upper portion



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of the at least one of the passage holes 6 is engaged with the inner surface of the lower portion of the at least one of the passage holes 6 due to absorbed shoe loads when the absorbed shoe loads are sufficiently large. Based on my independent evaluation of the structure and material properties described in Takahashi and in view of the materials typically available for purposes of shoe construction, it is my opinion that Takahashi discloses a resilient member that would be elastically deformed by more than 50% in a second configuration when a wearer undertakes vigorous activity (in which at least one of the passage hole 6 is completely collapsed).

107. Regarding claim 9 of the '866 patent, Takahashi discloses a shoe sole for rubber shoes. Although Takahashi does not explicitly disclose the rubber shoes include a member adapted to grasp the foot, such members are well known aspects of footwear. With respect to the further outsole limitations in claim 9, Takahashi in view of Szentes renders such claim limitations obvious for the same reasons as set forth above in connection with claim 1.

### E. Inohara '393 in Combination with Szentes Renders Claims 1-10 of the '866 Patent Invalid as Obvious Under 35 U.S.C. § 103

108. Each of the elements of claims 1-10 of the '866 patent is either disclosed or suggested by the combined teachings of Inohara '393 and Szentes.

109. Inohara '393 discloses an outsole for a shoe in which the shoe is disposed along a longitudinal axis in a longitudinal direction parallel to a ground surface in use.

110. Inohara '393 discloses a resilient member (any portion of the sole C that includes an aperture, such as apertures 7 in Figures 7 and 8, or apertures 12 in Figure 13) that has an inner surface (an interior surface formed by the aperture 7 or 12), an outer surface (the outer surface of the sole C), and, with respect to a direction perpendicular to the longitudinal direction, an upper portion and a lower portion (each of the apertures 7 and 12 can be divided into an upper and lower portion). As shown in Figures 7 and 13 of Inohara '393, the outer surface of the sole C is proximate the ground surface in use.

111. Inohara '393 discloses a first configuration that has the inner surface of the upper portion spaced from the inner surface of the lower portion as the air is expelled from the grooves in the sole C, and that the combined sponge resilience and the air resilience in this configuration absorbs shoe loads of a racer.

112. Inohara '393 discloses a resilient member (any portion of the sole C that includes an aperture, such as apertures 7 in Figures 7 and 8, or apertures 12 in Figure 13) that



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elastically absorbs shoe loads oblique to the perpendicular direction by relative motion in the longitudinal direction between an upper portion and a lower portion in the first configuration.

113. Inohara '393 does not explicitly disclose the inner surface of the upper portion of the aperture 7 or the aperture 12 is engaged with the inner surface of the lower portion of the aperture 7 or the aperture 12 due to absorbed shoe loads in the second configuration. However, Inohara '393 does disclose that "the air included in each of the above grooves 4 and 5 are released externally upon compression of the interlayer body 3" and further discloses that "[r]epeating exhaustion and re-filling of air from and into the grooves enable to attain the intended purpose of moderating the compression load with long lasting effect." (Ex. I, at col. 3, lines 47-56). Thus, Inohara '393 discloses exhausting the air from the sole C. In order to exhaust air from the sole C, the structure of the sole C of Inohara '393 would necessarily have to be such that the inner surface of the upper portion of the aperture 7 or the aperture 12 approaches the inner surface of the lower portion of the aperture 7 or the aperture 12 during loading. It also necessarily follows that the amount of compression of the aperture 7 or the aperture 12 would depend on the amount of load that is applied.

114. Inohara '393 discloses "[i]t is generally considered that a load three times as much as the body weight of a runner (shoes wearer) is exerted on the heel of the sole upon running movement and, in jumping movement, the load applied on the heel at the shoe sole amounts to about 5-6 times as much as the body weight of a jumper." (Ex. I, at col. 1, lines 19-24). Therefore, the load on the sole C increases depending on the weight and activity of the racer. As the amount of compression of the aperture 7 or the aperture 12 would depend on the amount of load that is applied, it necessarily follows the air would be completely exhausted from the sole C upon loading if the jumper were heavy enough. In my opinion, under these circumstances, the inner surface of the upper portion of the aperture 7 or the aperture 12 is would contact (engage) the inner surface of the lower portion of the aperture 7 or the aperture 12.

115. Although Inohara '393 does not explicitly disclose that engagement between the inner surface of the upper portion of the aperture 7 or the aperture 12 and the inner surface of the lower portion of the aperture 7 or the aperture 12 substantially prevents relative motion in the longitudinal direction between the upper portion and the lower portion of the aperture 7 or the aperture 12, this engagement would inherently result in frictional engagement between the inner surface of the upper portion of the aperture 7 or the aperture 12 and the inner surface of the lower portion of the aperture 7 or the aperture 12. To the extent the frictional engagement still results in relative motion between facing upper and



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lower portions of the aperture 7 or the aperture 12 that creates an unstable feel to a wearer, Szentes provides a common sense solution. For example, as explained above, Szentes discloses that it is known that outsoles that include a plurality of elongated channels can create a feeling of instability for a wearer during use. Specifically, Szentes teaches that wearing the shoe disclosed in Sakutori (Ex. M), which includes an outsole that has a plurality of elongated channels, "results in an unsure and wobbling walk." (Ex. D, at p.3, line 33 to p.4, line 3).

116. The channel structure of the sole in Sakutori is similar to that in Inohara '393 and, in my opinion, the design in Inohara '393 would suffer the same problems of instability that Szentes identifies in Sakutori.

117. It would have been obvious to one of ordinary skill in the art at the time of the invention of claim 1 of the '866 patent to include the ribs disclosed in Szentes on the inner surface of the lower portion of the apertures 7 or 12 of Inohara '393 for the purpose of improving the stability of the sole C of Inohara '393.

118. In the resulting modified device of Inohara '393, when a sufficient load is applied to the sole C, the inner surface of the upper portion of the apertures 7 or 12 would be engaged with the ribs on the inner surface of the lower portion of the apertures 7 or 12 due to absorbed shoe loads in the second configuration. Further, as disclosed in Szentes, such engagement would substantially prevent relative motion in the longitudinal direction between the upper portion and the lower portion.

119. Regarding claim 6 of the '866 patent, it is my opinion, based on the disclosure in Takahashi, that the resilient member of Takahashi is elastically deformed by more than 20% in the second configuration.

120. Regarding claim 7 of the '866 patent, the use of certain materials in a shoe sole, such as wood, would not allow deformation of the shoe sole that is more than 50%. However, the structure of the sole C of Inohara '393 is capable of undergoing a complete collapse of at least one of the apertures 12 such that an inner surface of the upper portion of the at least one of the apertures 12 is engaged with the inner surface of the lower portion of the at least one of the apertures 12 due to absorbed shoe loads when the absorbed shoe loads are sufficiently large. Based on my independent evaluation of the structure and material properties described in Inohara '393 and in view of the materials typically available for purposes of shoe construction, it is my opinion that Inohara '393 discloses a resilient member that is elastically deformed by more than 50% in a second configuration when a wearer undertakes vigorous activity (in which the at least one of the apertures 12 is completely



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collapsed).

121. Regarding claim 9 of the '866 patent, Inohara '393 discloses a sports shoe A that includes a shoe sole C that is affixed to a shoe upper B. As shown in Figure 13 of Inohara '393, the shoe upper B of the sports shoe A is adapted to grasp a foot. With respect to the further outsole limitations in claim 9, Inohara '393 in view of Szentes renders such claim limitations obvious for the same reasons as set forth above in connection with claim 1.

## V. NEWLY SUBMITTED DEPENDENT CLAIM 11

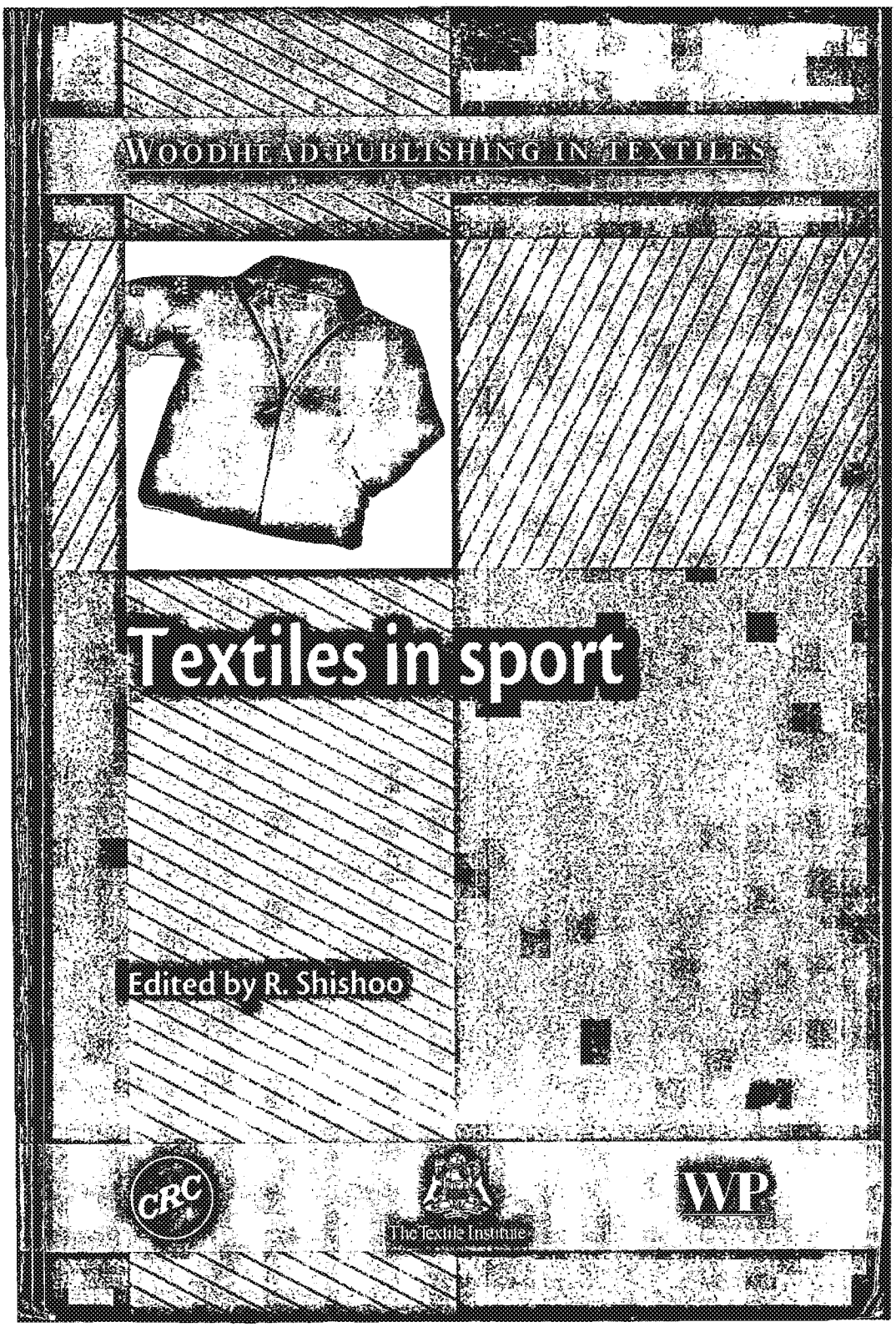
122. Regarding the patent owner's newly submitted dependent claim 11 ("[t]he outsole according to claim 3, wherein the resilient member comprises a profile like hollow element that contains a tubular part"), it is unclear to me what structure constitutes a "profile like hollow element," or exactly how this structure "contains" a tubular part.

123. Based on my review of the '866 specification, I am uncertain as to the scope of this claim such that it would be impossible to understand how to avoid infringement. In particular, it is unclear to me how the elements 3 in Figures 1 and 3 are "profile-like," or how they "contain" the tubular parts 3.1.

I, Dr. Edward C. Frederick, declare under penalty of perjury that the foregoing is true and correct.

Executed on May 25, 2010.






**NOTE: This exhibit is identical to exhibit no. 2004 marked during the July 23, 2013, cross-examination deposition of Edward C. Frederick, except for the inclusion of this note and the addition of a footer to comply with 37 CFR §42.63(d).**

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# Textiles in sport

Edited by
R. Shishoo



The Textile Institute



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# 16

# Textile use in sport shoes

E C FREDERICK and C WOJCIESZAK,
Exeter Research, Inc., USA

## 16.1 Introduction

The innovative use of textiles in sport shoes has played a major role at each significant stage in the evolutionary and revolutionary history of the branded athletic footwear industry. At every juncture, textiles have been used to provide more function or to add significant benefits for consumers. This has been the case over the 150-plus years of this industry; and textile innovations show no sign of diminishing in importance as a major source for the materials needed to create more functional and beneficial sport shoes.

### 16.1.1 Historical perspectives

Textiles have been used for centuries in footwear as a major component of the upper; most conspicuously in ladies fashion shoes (Riello, 2003). However, the modern history of textile use in athletic or 'sport' shoes began in the mid-1800s with the production of what later became known as 'sneakers'. These shoes were made with a cotton, usually canvas, upper and rubber bottoms. The first sport shoes with textile uppers were the 'croquet sandals' marketed in the 1860s (O'Keeffe, 1996).

Rubber-soled shoes with textile uppers were a conspicuous part of western culture in the mid-nineteenth century. Coye claims that the earliest reference to 'sneaks' appears in James Greenwood's account of 1873 London life, *In Strange Company*: 'sneaks ... are shoes with canvas tops and India-rubber soles' (Coye, 1986). Despite this bit of trivia, these and other types of sport shoes found in the late nineteenth century are more historical curiosities than indicators of a significant trend.

Right through the second half of the nineteenth and for well past the turn of the twentieth century, cotton canvas uppers were being made with rubber soles and sold as 'gymnasium shoes', but the volume of production of these shoes was relatively small. It took the emergence of the middle-class and the explosive growth of leisure time activities in the early twentieth century to create a mass-

market demand for sport shoes, especially those with textile uppers made for playing basketball.

According to Robert W. Peterson in *Cages to Jump Shots*, the earliest basketball players wore a hi-topped leather-soled gymnasium shoe. By 1900, the A.G. Spalding Company had developed the first basketball shoe: a canvas hi-top with a pitted rubber sole for better traction (Peterson, 1991).

The first mass-marketed sneaker in North America was the Converse All Star basketball shoe which first appeared in 1917. The Converse All Star consisted simply of a thick rubber sole and an ankle-covering canvas upper. By the mid-1960s, Converse commanded 80% of the athletic footwear market and the Converse All Star was still the shoe of choice for serious athletes. Even today the simple Chuck Taylor All Star is considered a classic, and Converse sells millions of pairs each year.

At about the same time that All Stars were being offered in 1917, the United States Rubber Company was marketing Keds, also a canvas-topped, rubber-soled shoe for sport and leisure. Other makers also emerged in this period and throughout the 1920s, such as Adidas in Germany in 1920. An industry was beginning to take shape.

The sport shoe industry came into being largely because of inexpensive shoes with rubber bottoms and textile tops. In fact, sport shoes with canvas uppers became a generic product through the early and mid-twentieth century.

The industry changed little, and modestly increasing annual sales were a fact of life for sport shoe companies until the 1960s. The majority of sales at that time were for canvas shoes with vulcanized rubber bottoms, and the shoe designs and their component materials, including the canvas used in the upper, were almost indistinguishable from the simple products that seemed so innovative fifty years before. That was soon to change, however, with the emergence of European brands such as Adidas and Puma.

These companies were marketing sport shoes with more expensive and luxurious leather uppers and innovative and functionally superior sole designs. These companies created a trend for more innovative, more functional, and more expensive footwear for sports. Canvas as an upper material was soon eclipsed by leather and later by synthetic fabrics.

The seeds were planted in the 1960s for a renaissance in the sport shoe industry but it wasn't until the mid-1970s that the North American and later European general public's increased interest in jogging and fitness began to change the face of shoe-making; and, as fate would have it, textiles played a major role. The health and fitness trend of the 1970s created an enormous demand for specialty shoes for sport and fitness; and paved the way for the emergence of sports shoe industry giants such as Nike and Reebok (Fritz, 1994).

From the first days of this fitness boom there was a marked increase in the reliance of sport shoe manufacturers on textiles to help create more innovative sports shoes. That reliance persists today. The market forces in play at that

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moment were: the demand for function and innovation, the willingness on the part of consumers to pay a premium for real innovation, and the economic opportunities created by a seemingly explosive increase in the market.

In 1967, Onitsuka Tiger (today known as ASICS Tiger) began selling jogging shoes with nylon uppers in Japan. Leather had been a scarce commodity in postwar Japan and the Japanese had become expert at using textile materials in shoes. Canvas was a poor choice for sport shoes because the moisture from the sweating foot promoted rot and discoloration of the fabric; and canvas uppers did not last long. The introduction of nylon fabric as a substitute for leather and as an improvement over canvas, was a major innovation.

Although it was slightly more expensive than canvas, nylon was lighter, more breathable, dried quicker, and was not susceptible to rot or as prone to staining. This use of durable synthetics and the subsequent development of new cushioning materials for the sole were the major innovations that jump-started the renaissance of the sport shoe industry in the 1970s.

Textile materials have, since the very beginning, had a significant effect on the sports footwear business and this has not changed over the past thirty years. In fact one could argue that the clever use of textiles in sport shoes in the 1980s and 1990s was the major factor driving innovation and increased sales.

By 1980 the branded athletic footwear business was smaller than a billion dollars (wholesale) in the US but growing at a rapid rate. Recent estimates from *Sporting Goods Intelligence* (Anon, 2004) put the branded athletic footwear industry size at over $8.25 billion (wholesale for 2003) with estimates for 2004 at over $9 billion. The global market is about twice that level ($18 billion wholesale in 2002 (Anon, 2003)). In part, this phenomenal growth can be attributed to the use of textile materials. Textile materials have been and are used in all parts of the shoe not just the upper. In the next section we will review the current uses of textile materials in sport shoes.

## 16.2 Current use of textiles in sport shoes

If we think of textiles as fabric-like materials made by weaving or felting or knitting or crocheting or braiding natural or synthetic fibers, we can identify a broad array of uses of textiles in footwear. For the purposes of this chapter, we can look at these uses regionally within the shoe, starting with the upper.

### 16.2.1 Uppers

The usual definition of a shoe upper is everything above the sole. In reality it is the part of the shoe that keeps the sole attached to the foot.

The economics of textile use in the upper are significant. As a rule of thumb, about 40% of the FOB (free on board) cost of sports shoes is in the materials that make up the upper alone. We estimate that the global branded footwear business

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currently buys about $10 billion dollars of footwear annually at FOB prices. Although there are no hard data on the size of the textile business devoted to supplying materials for use in footwear, our best estimate is that this business is in the order of $5 billion annually. These dollars are divided among materials supplied for use in linings, the body of the upper, and various uses in other parts of the shoe including the sole.

*Linings*

The inside surfaces of the upper are often lined with special materials to protect the foot and enhance comfort. Historically, leather, cotton and man-made synthetics such as tricot and vinyl were the most common lining materials used in footwear, although the use of leather linings in sports shoes constitutes a very small proportion of the total and has done so for more than twenty years. Cotton, although very absorbent, wears poorly because fungi and bacteria penetrate the material and eventually cause it to rot. The fungi and bacteria will also foster foot odor. These limitations make it a poor choice for a lining material in sport shoes.

Tricot has been very popular in shoe linings in the past because it is inexpensive. But it does not wear as well and tends to promote a hot and humid environment inside sport shoes. Other man-made fabrics, such as vinyl, cause these very same problems because they are impermeable. Cambrelle®-type non-woven lining materials, on the other hand, absorb several times their weight in water and dry out quickly. Furthermore, non-wovens usually have an extremely high resistance to fungus, rot, chafing, and cracking. This combination of benefits has made the non-woven materials very popular over the last twenty years; however, a new generation of more high-tech materials is pushing the non-wovens into the background.

*Push–pull* textile laminates, i.e., combinations of hydrophilic and hydrophobic (closer to the skin) layers, allow moisture to pass through the hydrophobic layer but absorb it in the hydrophilic layer. These lining systems are increasing in use in outdoor footwear and high-end sport shoes. One of the most commonly used push–pull systems is Dri-Lex, a material marketed by Faytex Corporation.

*Body of the upper*

The main structure of the upper is dominated by three principal regions: the vamp (area over the toes and ball of the foot), the tongue, and the rearpart (quarters and collar). Because the toes need to be protected from excess wear and abrasion, abrasion-resistant fabrics and impregnated fabrics are often used in the toe regions on tennis shoes or the high wear 'Ollie' area on skate shoes.

Most of the rest of the upper on a growing number of sport shoes incorporate special 'air meshes' which are polyester three-dimensional meshes. These

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materials are highly breathable and enhance shoe climate regulation. Unfortunately their excellent breathability is often compromised when they are combined with non-breathable foams or backing materials. Another problem area is the use of full-coverage adhesives to combine these breathable materials. The adhesives create a barrier to the movement of air across the upper.

One particular problem area for breathability has been the tongue. Because of the need for padding from lace pressure over the instep, shoemakers have long used a thick layer of foam inside the tongue to protect the foot. Because the instep is also an area where blood vessels come close to the surface of the skin, the tongue should also be especially breathable. To counteract this dilemma some shoemakers, such as Etnies, have taken to using an open-celled, highly porous foam combined with a breathable air mesh to create a tongue design that satisfies the need for both protection and breathability.

Another approach to keeping the foot cool or warm has been the use of a unique combination of materials that use the advantageous physics of a phase change to regulate temperature. Phase change materials, such as Outlast, ComforTemp, or Schoeller PCM, are used in the uppers of many footwear products. These textiles consist of a base fabric or non-woven material coated with patented compounds that either absorb heat or create it when they change states. These materials are able, at least in theory, to function in an adaptive manner. They are designed to give off heat when the microclimate gets too low or to absorb heat when the in-shoe climate is too warm. Concerns about weight, the endurance of the phase change function over a long period of use, and breathability are being addressed by the makers of these materials. We feel they have great potential to make sport shoes and boots much more comfortable.

Special breathable waterproof laminates such as Gore-Tex have been in use in footwear for more than twenty years. They seem to solve the impossible dilemma of keeping the upper material water resistant while allowing it to also breathe. The amount of vapor that can actually cross the Teflon-like barrier in Gore-Tex is not at the same level as truly breathable materials, but this is a compromise that many consumers have accepted in order to keep their feet dry.

Dri-Lex AeroSpacer is an example of the packaging of various upper technologies to produce multiple functional benefits. Dri-Lex is a patented (Fay, 1998) three-zone moisture management lining. Its unique knit construction creates an air chamber that promotes air circulation to ventilate and cool the foot. It was developed to eliminate the need for foam backing behind lining materials. The polyester face is connected to the Hydrofil® nylon backing fiber via an integral moisture/air moving chamber. This system is engineered to provide comfort next to the skin. Faytex, the supplier that has developed Dri-Lex, makes custom laminate packages for footwear manufacturers. These so-called super-laminates combine AeroSpacer with other technical fabrics such as push–pull or water-resistant layers, to create a functional upper material that makes up the complete body of the upper including everything from the lining to

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the exterior layer. This approach, the packaging of technical materials, is a major trend in high-end sport shoes.

*Shoelaces and other closures*

The shoestring closure system (string and lace holes) was first invented in England in the late 1700s, but shoelaces did not come into common use until the early twentieth century. Before shoestrings, shoes were commonly fastened with buckles or buttons. Shoelaces are most often either braided or woven from cotton, nylon or polyester. Other more specialty fibers are sometimes employed. For example, the use of Kevlar fibers in lacing some specialist mountaineering products for added strength and durability.

Velcro®-type hook and loop closures have seen increased use in recent years. Although it has always been a popular choice in children's sport shoes, hook and loop closures are being used more often and in combination with various lacing systems.

## 16.2.2 Textiles in the sole

The simplest definition of the sole includes everything under the foot. That would include: the footbed, or insole; the lower part of the upper attached to the sole; the midsole, a thick cushioning layer usually made predominately of polymeric foams; and the outsole which is the layer in contact with the ground or sport surface. Starting with the footbed we can observe that textiles play a role in every part of the sole.

*Footbed*

Textiles are used as top covers on footbeds, or as they are sometimes called, insoles. The most common materials chosen for this application are stretch nylon, polypropylene, or polyester fabrics which are laminated to the top of the footbed's foam core. The most functional top cover material is a four-way stretch nylon. Stretch materials seem to reduce blistering on the plantar surface of the foot, although there is no published evidence backing up this common assertion.

The concept behind using stretch top cover materials for blister prevention, is the reduction of shear forces between the skin and the top of the footbed. A stretch material should be able to move in the plane of these forces and act to reduce their magnitude, thereby reducing the potential for abrasion of the skin. Our own anecdotal evidence field testing four-way stretch top covers in comparison with two-way stretch top cover materials is that the frequency of reported hot spots following athletic activities is lower with four-way stretch top cover materials. Because these hot spots are harbingers of blister development,

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this is an indication that four-way stretch materials may at least have the potential to reduce blistering.

Another functional category of textiles used in the footbed is the absorbent, often non-woven materials, used to keep the sole of the foot dry. These materials also sometimes have anti-microbial treatments to discourage the growth of bacteria and fungi inside the shoe. Cambrelle®-type materials are the most common of the non-woven top cover materials.

*Strobel layer*

Textiles are also quite commonly used in footwear in the so-called strobel layer. Modern sport shoe construction techniques most often use a flexible material as a boundary layer between the upper and the midsole called a *strobel board*. In fact the strobel board is not a board at all but a flexible and sometimes deformable layer of non-woven material or fabric that is stitched along its border to the body of the upper. Most of the adhesive used to bond the sole to the upper is used between the strobel layer and the midsole. To make a good bond between the upper and the sole, the strobel layer must be rough enough in texture to maximize surface area, and made of materials that can form a good bond with the adhesives used. Non-woven fabric is often used in this layer, and in some applications a woven fabric with some stretch is preferred.

Stretch materials used in the strobel layer have the advantage of molding better to the shape of the wearer's foot, thus promoting self-molding of the sole to the particular contours of the individual's anatomy. The use of fabrics with some resiliency in the strobel layer also may enhance the mechanical cushioning characteristics of the sole and the perception of cushioning by the wearer. The main advantage of the strobel layer is that it allows the wearer's foot to have more intimate contact with the soft cushioning materials of the midsole.

These more flexible woven and non-woven materials used in the strobel layer were developed to replace the more traditional stiff insole board materials used into the 1980s and before. Although some board-lasted constructions are still used, the strobel method which creates a more resilient and softer layer underfoot is the dominant form of construction used in sport shoes today. Although the use of strobel construction in sport shoes is relatively recent, there were attempts to use textiles to achieve some of its functional benefits as far back as the early 1980s, with the use of a net material to encapsulate the midsole of a jogging shoe.

In the early 1980s an open net material was stretched over the midsole to improve shock attenuation (Stirtz and Dellinger, 1981). The concept of the so-called Dellinger web is that the multiple interconnected threads of the net would distribute some fraction of the impact forces brought to bear on the sole during foot contact. This sharing of impact forces with the midsole was intended to enhance overall shock attenuation. This invention, licensed to Adidas, is still

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used in some retro-style Adidas footwear, even though the patent has long since expired.

Fabrics have also been used to reduce the weight of the outsole, the heaviest component of most sport shoes. This has been done by injecting polyurethane lugs or vulcanizing rubber lugs onto a layer of fabric. The resulting unit is subsequently bonded to the midsole to form a lightweight and flexible sole unit.

Fabrics have also been used in other sandwich constructions of sole units to distribute forces, or to add resiliency or strength. In short, fabrics have found their way into shoe soles in a number of ways.

## 16.3 Wish list for future textile developments

When we in the footwear industry turn to textile manufacturers to supply innovative and functional technologies for the future, what will be on our wish list? In our opinion, we will ask for special textiles in three, very broadly defined and somewhat prosaic areas.

As footwear product people, we'll wish for any new material that will provide functional characteristics demanded by our consumers. As always, we will also welcome any textile that helps the company's bottom line by offering more functionality for less cost. Our second set of wishes is dictated by the fickle nature of consumers' taste in aesthetics. We will not squander any of our wishes on new colors, patterns or graphics. For the third wish, we'll depend on the textile industry's creativity to totally surprise us. Create a textile with palpable properties so exotic that we have not even dreamed of them yet.

### 16.3.1 Textiles to better meet the needs of the foot

Our job as footwear product people is easy to define but difficult to perform. Simply put, we provide footwear that pleases our customers. The challenges include, but are not limited to: physiological and biomechanical function, fit, material properties, joining (stitching, cementing, welding), process conflicts (time, temperature, chemistry, humidity, pressure, UV exposure, etc.), durability, logistics, consumer tastes, market forces and trends, costs, and even customs duties. For the purposes of keeping our wish list to a reasonable length, we'll focus on the broad physiological and biomechanical functional requirements of our customers.

*Meeting the foot's needs: in-shoe microclimate*

The ideal in-shoe microclimate is a boundary layer of air around the foot approximately 29°C (85°F) with low relative humidity. Many of the most intriguing and commercially potent textile innovations that dominated footwear innovation in the last several years have been designed to control this in-shoe

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climate. Textiles will continue to play a large role in regulating the comfort-critical in-shoe climate, especially when used as an upper, vamp, quarter, tongue, collar, lining, heel counter, footbed or footbed topcover.

The first challenge textiles face in optimizing this microclimate is the physiological character of the foot itself. The foot generates anywhere from 219 ml (7.4 oz) of sweat each day for a typical active adult, up to an astonishing 100 ml (3.4 oz) of sweat each hour while exercising. Additionally, the foot also affects the microclimate via heat loads generated metabolically by the intrinsic foot muscles and by heat carried by the blood vessels of the foot. Also, some heat is created by friction between the foot and shoe, especially at the foot-sock–footbed interface.

External environmental conditions also place demands on textile components. In addition to 100% relative humidity, extreme examples include ground surface temperatures ranging from 88 °C (190 °F) in Death Valley (Marchand, 1998) to −89 °C (−128 °F) at the Vostok Station in Antarctica (*Guinness Book of World Records*, 2005). Although most athletes do not encounter the extremes described above, they do perform in widely varying conditions. NASCAR stock car racing cockpit temperatures can reach 71 °C (160 °F). Tennis hard court and clay surface temperatures commonly reach 49 °C (120 °F). Snow sport environments are often in the −18 °C to −1 °C (0 °F to 30 °F) range. Participants in sports such as soccer or mountain biking may encompass most of that whole range of temperatures depending on the time of year.

Textile footwear structures need to balance the influences of all the factors described above. Specifically, to cool the foot, textiles should increase evaporative, convective, conductive, and radiational heat loss from the foot. The opposite is true when warming the foot. In all situations, feet are more comfortable when the microclimate's relative humidity is minimized. Additionally, drier feet are less likely to develop blisters.

- *Wish list item #1*: A material that automatically responds to temperatures outside the desired range of foot temperatures by opening up like stomata when temperature and humidity are high and closing up when temperatures are too low. The current phase change materials are adaptive in this way, but their capacity to significantly heat or cool the foot is well below the climate-regulating effects of simple air exchange.

### *Meeting the foot's needs: biomechanics*

Except for blister problems, keeping the athlete's foot cool and dry is a matter of comfort. Most sports make more immediate mechanical demands of their athletes' footwear. Force, mass, and acceleration are the names of these demands.

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Footwear components such as the upper, vamp, quarter, laces, and heel counter must be designed to deal with extreme lateral forces such as those exhibited by professional basketball players in experiments conducted in 1994 by McClay *et al.* (1994). McClay and her colleagues recorded peak lateral forces during shuffle movements as high as 1.9 body weights and peak braking forces as high as 3.8 body weights. This is critical data for the textile industry, considering the average basketball player at the time weighed 98 kg (216 lb). These data translate into horizontal plane shear forces of an order of magnitude of 4,000 N that are trying to tear the shoe upper from its sole. The athlete depends on the shoe to keep their foot centrally seated on the sole. The consequences of failure are decreased performance and increased risk of injuries such as ankle inversion sprains.

We are tempted simply to use more and heavier materials to provide protection from these high shear forces, but this would just bring on other problems. The large forces described above often mislead people into taking an additional 100 g (3.5 oz) of shoe weight for granted. After all, how large of an effect could this have on an athlete's performance? If all other factors are controlled, this small increase in shoe weight could increase a distance running athlete's oxygen consumption by about 1% (Frederick, 1984). To put this into perspective, let's examine the results from the 2004 Summer Olympics athletics events. The time difference between the gold and silver medals for every men's and women's race above the 800 m distance, including the walks, was less than 1%. Strong but light is the only acceptable solution for performance athletic footwear.

* *Wish list item #2*: Strong but super lightweight fabrics to be used to reinforce the upper against the high shear forces the foot encounters in top-level competition. Perhaps the use of engineered silk fibers in these special textiles will yield the desired properties.

### *Meeting the foot's needs: fit*

Shoemakers are fond of saying 'the last is first' to reinforce the importance of properly fitting footwear. The last is the foot-shaped form on which shoes are made, and the shape of the last is a critical part of the long list of factors that influence fit. Fit directly influences comfort, as demonstrated by the surprisingly comfortable fit of traditional Dutch wooden clogs. Proper fit is also a prerequisite of function, as it ensures every technical component interfaces properly with the foot.

Providing mass-produced footwear with good fit is a challenging goal. For example, our data show that if a shoe manufacturer expects to fit 90% of their male customers with size 9 feet, they will have to accommodate men weighing anywhere from 50 kg (110 lb) to 90 kg (198 lb). In addition to this individual

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variability, people typically have different sized left and right feet. Their feet change in length, width, girth, shape, and volume throughout the day and even during a given sport activity. Feet are active during sports: toes curl and splay; the forefoot flexes and twists relative to the rearfoot; the arch elongates and shortens; and the fat pad under the heel deforms and rebounds with each step. In short, foot shape is exceedingly dynamic and no static last shape can hope to produce perfect fit in all situations and at all times for all people.

Consider how the following concepts relate to the complex fit requirements of today's sport footwear:

- Closure: This initial facet of fit includes securing the athlete's foot into the shoe and customizing the fit such that they can rely on the physical properties of the shoe while participating in their sport. The athlete manually adjusts some aspect of the shoe, such as tightening a shoelace, cable, flap, or strap. Keep in mind that various regions of the foot may require dissimilar amounts of tension. Ideally, no further adjustment will be needed during play.
- High modulus: Textile components meant to provide support, need a sufficiently high Young's modulus in order to resist the large forces already described. Generally, textiles will face tensile loads, either flexibly as in a fabric, or rigidly as part of a composite system, in a structure such as a heel counter, with the matrix carrying the compressive load. Elongation of these structures will cause fit and function problems. Examples of sports requiring footwear with high modulus textiles components include soccer, court sports, running, skiing, inline skating.
- Low modulus: Textile components of this type will provide a comfortable fit by easily conforming to foot morphology for sports not requiring the support of a high modulus textile or in areas of the foot requiring little support. Examples include neoprene booties for kayaking or diving or the medial arch area in a running shoe.
- High elasticity: For the most part, footwear manufacturers need textile components to return to their original condition regardless of what forces athletes subject them to. If not, the support components will not function properly or at the very least, non-supportive components will become slack and begin to look baggy.
- Custom formed: Textile components intended to retain a custom molded shape of a portion of the foot are an exception to the high elasticity guideline. These components need a temporary condition of low modulus and low elasticity, allowing the component to be shaped as desired. After being shaped, the component should again follow the modulus and elasticity guidelines. Note that leather exhibits this custom molding trait. Wet, warm leather is surprisingly moldable and, after drying, stiffens, retaining the molded shape. Unfortunately leather is also hot and heavy, and it can become too stiff when it dries.

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- *Wish list item #3*: A material that conforms to the shape of any foot yet retains its functional properties. Ideally it would stiffen to add support when shear forces are high, but stay soft and flexible at low loads. Perhaps shear thickening dilatant materials would have some role here.

*Meeting the foot's needs: summary*

A typical sport shoe weighs in the region of 425 g (15 oz). The sole, consisting of the outsole, midsole, lasting board, and footbed typically account for 50% or more of the shoe's total weight. So, athletes depend on about 215 g (7.5 oz) worth of textiles to:

- provide a dry and 29 °C (85 °F) microclimate, regardless of the weather;
- securely maintain the relative position of the foot on the shoe while withstanding potential lateral and braking forces of 4,000 N;
- be part of a minimal weight shoe, which could provide an important competitive edge via decreased metabolic costs;
- comfortably conform to their individual, dynamic, foot shape while maintaining a secure, functional fit.

Textile footwear components need to meet consumers' requirements. Some of these varied requirements are readily noticed and understood by the consumer. Others are satisfied by components that perform functions that are just as important but not as readily seen or understood.

Rather than summarizing the material already present in this chapter we would like to offer some concluding suggestions for textile makers that will help us continue our long history of mutual success – some things to think about that will make happy sport shoe consumers and executives alike.

- Closure systems: easy opening, adjustable tension selection, abrasion resistant, self-tying, low moisture retention, flexible at all temperatures.
- Tongues: breathable, moisture-wicking, self-centering, custom molding, protective from high, localized lace pressure, waterproof, IR heat reflective.
- In general, make textiles that are: lighter, more breathable, better wicking, softer hand, stain repellent, stronger, more elastic, adaptive, individually customizable, low friction, shape memory, and with dilatant (shear thickening) properties, and of course cheaper and more durable.

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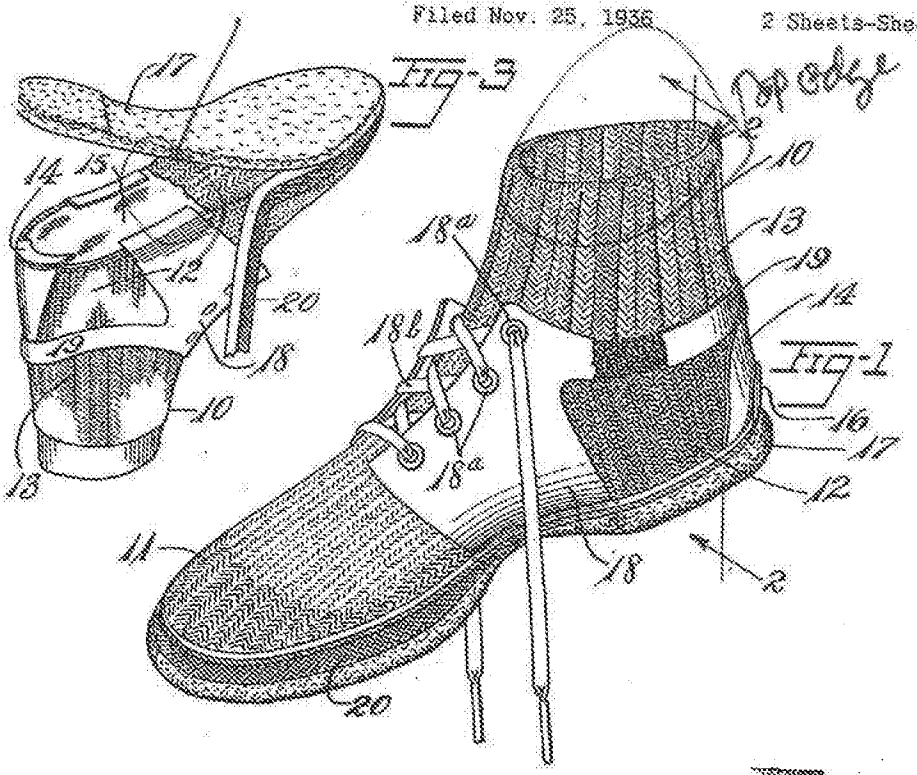
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**NOTE: This exhibit is identical to exhibit no. 2006 marked during the July 23, 2013, cross-examination deposition of Edward C. Frederick, <u>except</u> for the inclusion of this note and the addition of a footer to comply with 37 CFR §42.63(d).**

Feb. 14, 1939. A. A. GLIDDEN 2,147,197

ARTICLE OF FOOTWEAR

Filed Nov. 25, 1936 2 Sheets-Sheet 1



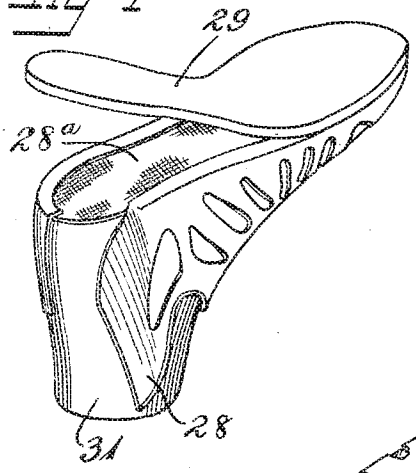

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Feb. 14, 1939. A. A. GLIDDEN 2,147,197

ARTICLE OF FOOTWEAR

Filed Nov. 25, 1936 2 Sheets-Sheet 2

Fig-7



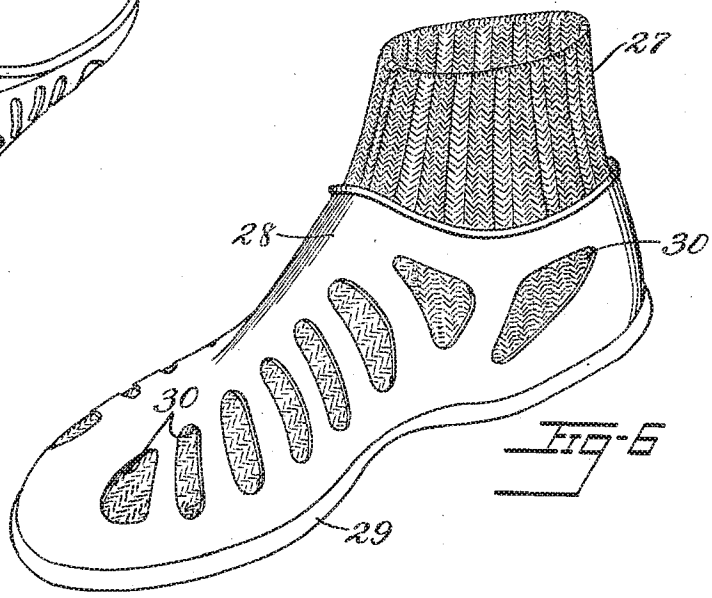




Fig-6

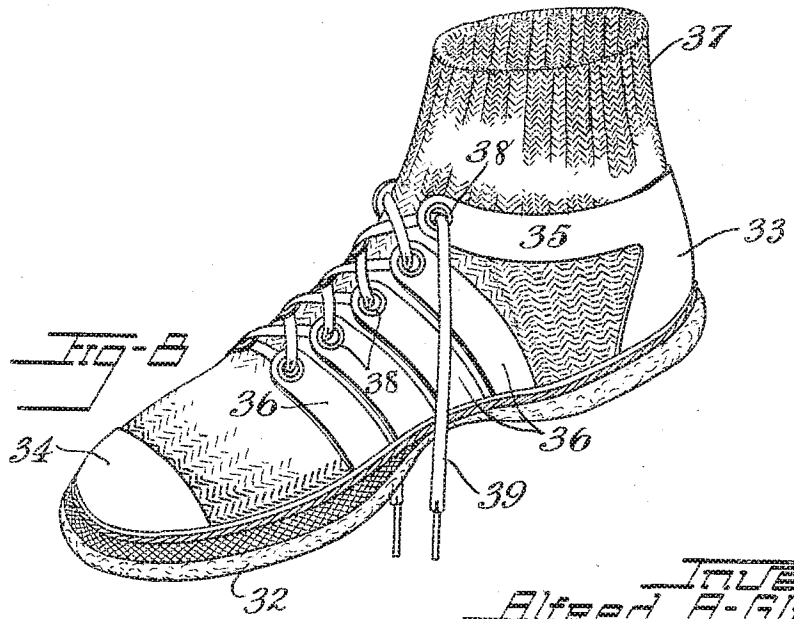



Fig-8

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Patented Feb. 14, 1939 2,147,197

# UNITED STATES PATENT OFFICE

2,147,197

## ARTICLE OF FOOTWEAR

Alfred A. Glidden, Watertown, Mass., assignor to Hood Rubber Company, Inc., Watertown, Mass., a corporation of Delaware

Application November 25, 1936, Serial No. 112,735

5 Claims. (Cl. 36—9)

This invention relates to articles of footwear and to methods of making the same, and is especially useful in the manufacture of shoes having textile uppers. Heretofore shoes for use in playing athletic games and for similar purposes, sometimes called sneakers or tennis shoes, have been manufactured from substantially non-stretchable canvas or similar woven material. It has been the practice to construct the uppers with a fabric lining attached to the upper by an intervening layer of rubber. In the manufacture of such shoes a great amount of waste has been involved in the cutting of the fabric parts, and due to the substantially nonstretchable nature of the textile material comprising the upper difficulty has been experienced in providing the proper shape to such shoes. The resulting shoes are of such a nonabsorbent nature and so impervious to moisture that discomfort has been caused to the wearer by perspiration. The woven materials which have been used in the uppers of such shoes are subject to objectionable shrinkage from repeated wetting and drying, adding further discomfort to the wearer.

The principal objects of the present invention are to provide comfort, stretchability, light weight, breathability and absorption properties in an article of footwear and to provide for economy of materials and convenience of procedure in the manufacture of the same. Other objects will appear from the following description and the accompanying drawings.

Of the drawings:

Fig. 1 is a perspective view of a shoe embodying and made in accordance with the invention, part of the rubber being broken away.

Fig. 2 is a detailed cross sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a perspective view of the shoe of Fig. 1 during a stage of its manufacture, the parts of the shoe being partially assembled upon a last.

Fig. 4 is a perspective view of another embodiment of the invention in its completed form.

Fig. 5 is a fragmentary view of a portion of the upper margin of a shoe illustrating a further embodiment in which an overcast stitching is applied to the margin.

Fig. 6 is a perspective view of a further embodiment of the invention in which the elastic textile upper is removable from the remainder of the shoe.

Fig. 7 is a perspective view illustrating the building of the rubber portions of the shoe of Fig. 6 upon a last, the rubber portion of the shoe being shown as partially completed.

Fig. 8 is a perspective view of a further embodiment of the invention in its completed form.

Referring to the drawings, the invention contemplates the construction of an article of footwear in which an upper of extensible and elastic textile material, such, for example, as knited material, and of such extent as to form the complete upper including the insole, is fabricated without substantial waste to the desired shape to accommodate the foot without uncomfortable wringles. A reinforcing structure, preferably of rubber is provided on the outer face of the upper in form-fitting contact therewith without wrinkling or buckling of either of the parts, while preferably leaving extensive portions of the textile upper exposed to provide breathability and facility of flexing.

Referring to the drawings:

In proceeding according to the method of this invention a complete and integral, extensible and elastic, unlined shoe upper 10 is formed, preferably by knitting, to final form and without waste, of yarn which may be of any suitable material, such for example, as cotton, wool, combinations of cotton and wool, animal fibers such as mohair, alpaca, cellulose filaments such as rayon, cellulose acetate or the like, vegetable fibers such as jute, sisal, hemp or especially prepared fibers such as combinations of rayon, shredded leather held together by resinous bodies, natural or artificial dispersions of rubber or other agglutinous material.

In fabricating the unitary upper, as by knitting, areas thereof which are normally subjected to greater wear and in which a lower degree of elasticity is desired, such as the toe 11 and the heel portion 12, may be more densely fabricated to provide therein heavier weight and less extensibility than in the other parts of the upper, as by changing the type of stitch or amount or thickness of the yarn in the knitting. Other areas, such as the ankle portion 13, are preferably made so as to provide softness and elasticity, as by making them of ribbed construction, as shown.

In the embodiment of Fig. 1 the entire upper, preferably including the insole, is fabricated as an integral, shaped, sock-like article although in some cases the insole portion may be omitted, if that is desired. In any event the complete article preferably is formed as nearly to the shape of the last on which the shoe is to be built as possible. The fabricated upper is slipped over the building last and the remaining parts of the shoe are assembled thereon and attached in form-fitting relation either by adhesion or by sewing



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operations. The upper may be wetted either before or after being applied to the last and then dried on the last in order to more closely conform it to the shape of the last.

In order to provide good ventilation and comfort it is desirable to leave as much of the elastic upper exposed as possible and all of the trimming pieces are reduced to a minimum. In the embodiment of Fig. 1, after the upper has been applied to the last, the parts, preferably of rubber including a counter 14, heel reinforcement 16, outsole 17 and a blucher saddle 18 having an integral heel strap 19, which encircles the rear of the shoe, are mounted in place upon the upper as illustrated in Fig. 3, and may be cemented thereto in the places where it is desired to attach the parts to the upper, and a foxing 20 is preferably applied around the lower portion of the shoe where it joins the outer sole. A filler or reinforcing layer 15, preferably of thin, rubberized fabric, may be provided to facilitate assembly and to provide a stronger union of the outsole to the textile upper and to provide greater smoothness of the inner sole bottom. The article is then vulcanized preferably while on the last and then removed therefrom. The eyelets 18a for receiving the shoe lace 18b may be applied to the margins of the blucher saddle 18 after vulcanization. The blucher saddle is permanently attached to the upper only at or near the sole leaving the eyeleted portion free. While rubber is the preferred material, some or all the parts applied to the upper in this and the other embodiments may in some cases be of any other suitable material, such as fabric, or natural or artificial leather. Where rubber is used, it may be unreinforced, or it may be reinforced, as by fabric, if desired.

In the embodiment of Fig. 4 the front of the upper has reinforcing stays 21 secured thereto, as by cementing or stitching, over the instep and extending to the top of the shoe, and the upper may be slit as at 22, preferably after vulcanization, to provide a vent extending from the top of the shoe to the instep in a forward direction, the stays being provided with eyelets 23 for lacing. A tongue 24 also may be provided. In some cases the tongue 24 and the slit 22 may be omitted, the stays being retained, however, to permit lacing, and for bracing. A strap 25 may be provided, extending around the back of the foot and secured at its ends to the stays. As shown, the shoe may be of the low type with the strap 25 extending along the top margin of the upper.

Where the cutting of the textile upper, to provide the slit 22, or for any other purpose, leaves a raw textile edge which might ravel or fray, the edges may be protected, as by an overcast stitch 26, as illustrated in Fig. 5, where the stitch is shown as extending not only along the margins of the slit, but also along the top margin of the upper at the leg opening.

Other modifications of the invention, in which the rubber portion of the shoe may be detachable from the textile upper to facilitate washing the upper, are illustrated in Figs. 6, 7 and 8.

In the embodiment of Figs. 6 and 7, the lower portion of the textile upper 27 is embraced by an integral rubber covering 28 having no lacings or other fastening means, but provided with a sole 29 and formed with ventilating and expansion-facilitating openings 30 which expose the textile upper.

Whether or not the rubber portion 28 is to be attached to the upper it is preferably built upon the textile upper while the latter is upon a last, as in the building of the embodiments shown in Figs. 1 and 4, or a last which corresponds in dimension and shape with the outside of the lasted textile upper 27 may be constructed, and the rubber portion may be assembled thereabout and vulcanized thereon, as illustrated in Fig. 7, in which a perforated sheet of material 28 is shown as being laid about the last 31, and the sole 29 is laid thereon in adhesive engagement with the sheet 28. A filler or reinforcing layer 28a, like 15 of Fig. 3, may be provided if desired, to facilitate uniting the sole 29 to the part 28 and to provide a smooth inner bottom. The vulcanized article will have the same inside dimensions and shape as the textile upper 27 and the two may be assembled without wrinkling of the upper or objectionable localized stretching of either of the parts. If desired, the rubber part 28 may then be cemented to the textile upper over all or a part of their contacting surfaces.

The embodiment of Fig. 8 may be constructed in similar manner. Here a sole 32 is provided with a counter 33, toe cap 34, heel straps 35, and sole straps 36, united to each other. This rubber structure may be assembled either upon a last having the textile upper 37 thereon, or upon a last formed to the same outside dimensions and shape as the outside of the lasted upper 37, and vulcanized thereon. If the rubber portion has been formed without the use of the textile upper, the upper is then placed therein. Eyelets 38 and a lacing 39 are provided for securing the shoe on the foot. In this embodiment, also, the upper may be either removable or cemented or otherwise attached in place over at least a portion of the area of contact with the rubber parts.

An article of footwear constructed according to the invention has decided advantages over articles of footwear heretofore produced. Because of the unlined, absorbent nature of the upper perspiration is readily absorbed and evaporated from the foot. The high porosity of the upper provides good ventilation, and the flexibility of the upper and its inherent elasticity provide a degree of comfort comparable to wearing well fitted socks without shoes, while the outsole, which may be of any desired type and may be of crepe soling or may be molded to provide any desired anti-skid surface, provides adequate traction and protects the feet in walking. Where the foxing 20 is extended for a substantial distance above the sole the shoe may be used upon wet floors without wetting the feet. Comfort to the wearer is contributed to in a large measure by the fact that the outer parts of the shoe, whether attached to the upper or not, are built to fit each other so that the shoe will fit the wearer without wrinkles or other undesirable non-foot-conforming malformations.

Since the entire upper of the shoe, including the insole, preferably is formed of continuous elastic textile material, such shoes may be worn directly over the feet without the use of stockings or socks. The stretchability of the upper, especially when an upwardly-extending, flexible rubber sole and foxing are provided, permits the elimination of half sizes and makes it easier to provide a good fit.

I claim:

1. A shoe having an upper of porous elastic material providing an elastic top portion, a less flexible midportion and substantially less flexible

atent Owner NIKE, Inc. Exhibit No. 2006 - page 4 Petitioner adidas AG - Exhibit 1007 - Page 4
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portions at the lower margin of its sides and at its toe and heel, a sole on said upper and a bracing structure secured to the sole and extending over the instep portion of the upper to restrain the upper from being excessively stretched, the bracing structure covering only a portion of the upper thereby leaving extensive ventilating area of the latter exposed.

2. A shoe having an upper of knitted material providing elasticity and ventilating porosity by virtue of the knitted construction, a sole on the upper, and a bracing structure secured to the sole and extending over the instep portion of the upper to restrain the upper from being excessively stretched, the bracing structure covering only a portion of the upper thereby leaving extensive ventilating area of the latter exposed and said upper having in the foot portion below the ankle a plurality of zones of knitted material of different degrees of stiffness merged integrally by knitted union with one another to provide localized reinforcement of the knitted material acting in cooperation with said bracing structure to resist excessive localized stretching while providing elasticity and ventilation of the upper.

3. A shoe having an upper of knitted material providing elasticity and ventilating porosity by virtue of the knitted construction, a sole adhered to the upper, and a bracing structure secured to the sole and adhered at least in part directly to said upper and extending over the instep portion of the upper to restrain the upper from being excessively stretched, the bracing structure covering only a portion of the upper thereby leaving extensive ventilating area of the latter exposed and said upper having at the margin of an adhered portion of said bracing structure a zone of increased density of knitting merging with a zone of the knitted material of less dense knitting spaced from the bracing structure to provide local reinforcement of the knitted material at the margin of the bracing structure against excessive localized stretching.

4. A shoe having an upper of such knitted construction as to provide an elastic top portion, a less flexible midportion and a substantially less flexible lower portion, the upper being porous for ventilation by virtue of the knitted construction, a sole on the upper, and a bracing structure secured to the sole and extending over the instep portion of the upper to restrain the knitted upper from being excessively stretched, the bracing structure covering only a portion of the upper thereby leaving extensive ventilating area of the latter exposed.

5. A shoe having a sock-like upper of such knitted construction as to provide an elastic top portion, a less flexible midportion, and substantially less flexible portions at the lower margin of its sides and at its toe and heel, a sole essentially of rubber adhered to the upper and a bracing structure essentially of rubber for restraining the upper from being excessively stretched, said structure comprising a portion adhered to the sole and extending over the instep of the upper and a portion adhered to the sole at the heel and extending forwardly around the upper, the bracing structure covering only a portion of the upper thereby leaving extensive ventilating area of the latter exposed.

ALFRED A. GLIDDEN.



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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**NOTE: This exhibit is identical to exhibit no. 2008 marked during the July 23, 2013, cross-examination deposition of Edward C. Frederick, except for the inclusion of this note and the addition of a footer to comply with 37 CFR §42.63(d).**



NIKE
EXHIBIT
2008
IPR 2013-00067

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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K-SWISS INC.
Requester, Respondent

v.

Patent of GLIDE'N LOCK GMBH
Patent Owner, Appellant

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Appeal 2012-009494
Reexamination Control 95/001,320
Patent US 7,181,866 B2[1]
Technology Center 3900

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*Before* JEFFREY B. ROBERTSON, DANIEL S. SONG and JOSIAH C. COCKS, *Administrative Patent Judges.*

SONG, *Administrative Patent Judge.*

DECISION ON APPEAL

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[1] Issued February 27, 2007 to Braunschweiler (hereinafter "'866 patent").



**Patent Owner NIKE, Inc. Exhibit No. 2008 - page 2**

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## STATEMENT OF THE CASE

The Patent Owner appeals under 35 U.S.C. §§ 134 and 315 (2002) from a Final Rejection of claims 1-11. We have jurisdiction under 35 U.S.C. §§ 134 and 315 (2002). In addition to the Appeal Brief ("App. Br."), the Patent Owner relies on a Rebuttal Brief ("Reb. Br.") and declarations of Mssrs. Bernhard, Corigliano and Sage in support of patentability. The Requester relies on its Respondent Brief ("Resp. Br.") and the declaration of Mr. Frederick in support of the Examiner's rejections. An oral hearing with the representatives of the Patent Owner and the Requester was held before the Patent Trial and Appeal Board on November 14, 2012, a transcript of which will be entered into the electronic record in due course.

## THE INVENTION

The claims of the '866 patent is directed to an outsole for a shoe. Independent claim 1 and dependent claims 8 and 11 read as follows, claim 11 having been added during reexamination (App. Br.; Claims App'x., emphasis added):

> 1. An outsole for a shoe, the shoe disposed along a longitudinal axis in a longitudinal direction parallel to a ground surface in use, the outsole comprising:
>
> a resilient member having an inner surface, an outer surface and, with respect to a direction perpendicular to the longitudinal direction, an upper portion and a lower portion, the outer surface of the lower portion proximate the ground surface in use,
>
> the resilient member having first and second configurations,



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the first configuration having the inner surface of the upper portion spaced from the inner surface of the lower portion, the resilient member elastically absorbs shoe loads oblique to the perpendicular direction by relative motion in the longitudinal direction between the upper portion and the lower portion in the first configuration,

the second configuration having *the inner surface of the upper portion engaged with the inner surface of the lower portion* due to absorbed shoe loads, *the engagement substantially preventing relative motion* in the longitudinal direction between the upper portion and the lower portion.

8. The outsole according to claim 1, wherein the engagement comprises *positive engagement*.

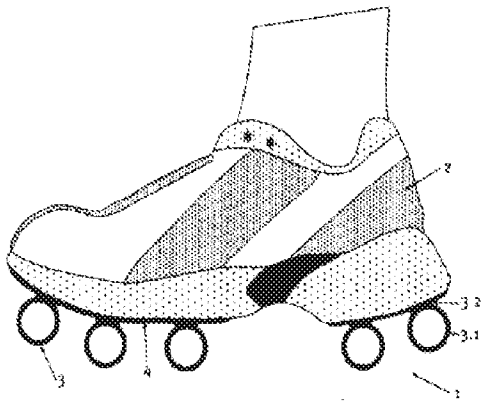
11. The outsole according to claim 3, wherein the resilient member *comprises a profile like hollow element that contains a tubular part*.

Independent claim 9 is similar to claim 1, but is directed to a device for wearing on a foot including an outsole.

*Findings of Fact Regarding the '866 Patent*

1. A. Figures 1a) to 1c) of the '866 patent are reproduced below.

Fig 1a)





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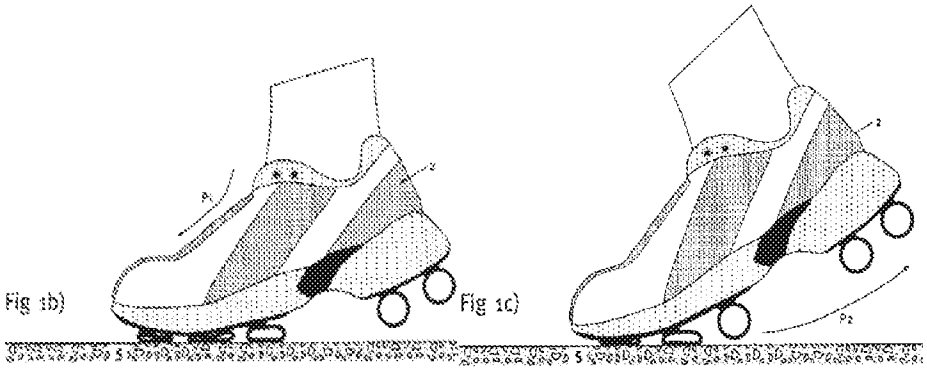



Figure 1a) shows a side view of a shoe 1 according to a first embodiment wherein the shoe is not subjected to a load, Figure 1b) shows the shoe while being subjected to a transversely forward load, and Figure 1c) shows the shoe while pushing off (col. 2, ll. 43-46; Figs. 1a)-1c)).

B. The '866 patent teaches that the objective of the disclosed invention is to provide "an outsole with a simple design which makes it possible to eliminate the above-described floating effect and can also be realized sufficiently soft and resilient in the tangential direction." (Col. 1, ll. 50-54).

C. The '866 patent states "[t]he outsole 1 is formed by a plurality of profile-like hollow elements 3 that contain tubular parts 3.1 and are fixed to the underside of an intermediate sole 4 of the running shoe with webs 3.2 that are integrally formed thereon, e.g., by means of bonding." (Col. 3, ll. 11-16).

D. According to the '866 patent, when the shoe 2 is loaded as it contacts the ground, the tubular parts 3.1 are "completely compressed after an initial elastic absorption of the load in the form of a vertical and horizontal deformation. This leads to a frictional



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engagement between their upper shell 3.1.1 and their lower shell 3.1.2 (see FIG. 3)." (Col. 3, ll. 29-37).

E. The '866 patent further states:

This frictional engagement generates such a high resistance to an additional deformation of the tubular parts 3.1 that they practically can only be additionally deformed by the remaining elasticity of the material, i.e., to a negligible degree.

...

In addition, the runner is able to push off from the position shown in FIG. 2 for the next step as illustrated in FIG. 1c) without any loss in distance, namely because the previously described frictional engagement between the tubular parts 3.1 practically makes it impossible for these parts to horizontally deform to a noteworthy degree in the direction of the load that occurs while pushing off and is indicated by the arrow P2.
(Col. 3, ll. 37-53).

F. Figure 7 of the '866 patent is reproduced below.

Fig 7)

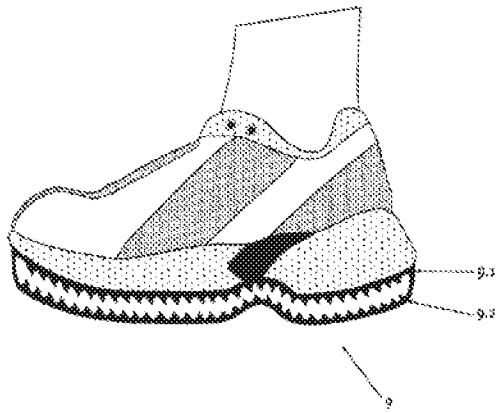



Figure 7 shows a partially sectioned representation of an outsole 9 according to another embodiment (col. 3, ll. 1-2; col. 5, ll. 13-18; Fig. 7).



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G. The embodiment of Figure 7 is described as having "toothing" between the upper layer 9.1 and the lower layer 9.2 (col. 5, ll. 17-18; Fig. 7).

H. In discussing Figure 7 as an example, the '866 patent states "[i]nstead of producing a frictional engagement as in the previously described embodiments, it would be possible to alternatively or additionally produce a positive engagement as shown[.]" (Col. 5, ll. 13-17).

I. The '866 patent further states "[f]rictional engagement means and positive engagement means may be utilized individually or in combination." (Col. 5, ll. 24-26).

## THE REJECTIONS

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

| | | |
|---|---|---|
| Inohara | US 4,523,393 | Jun. 18, 1985 |
| Takahashi | Japan S49-96158 (citations to the English translation of record) | Dec. 9, 1972 |
| Pagani | GB 2001843 | Feb. 14, 1979 |
| Szentes | WO 90/00021 | Jan. 11, 1990 |
| Okabe | Japan H07-284403 (citations to the English translation of record) | Oct. 31, 1995 |

The Examiner rejected the various claims as follows:

1. Claims 1-5 and 8-11 under 35 U.S.C. § 102(b) as anticipated by Okabe.



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2. Claims 1, 2 and 8-10 under 35 U.S.C. § 102(b) as anticipated by Szentes.

3. Claims 1-11 under 35 U.S.C. § 103(a) as being unpatentable over Pagani in view of Szentes.

4. Claims 1-11 under 35 U.S.C. § 103(a) as being unpatentable over Takahashi in view of Szentes.

5. Claims 1-11 under 35 U.S.C. § 103(a) as being unpatentable over Inohara in view of Szentes.

6. Claim 11 under 35 U.S.C. § 112, second paragraph, as being indefinite.

We AFFIRM-IN-PART.

## ISSUES

The following issues have been raised in the present appeal.

1. Whether the Examiner erred in finding that Okabe discloses a resilient member having a second configuration wherein the inner surfaces of the upper and lower portions engage to substantially prevent relative motion.

2. Whether the Examiner erred in finding that Szentes discloses a resilient member having a second configuration wherein the inner surfaces of the upper and lower portions engage to substantially prevent relative motion.



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3. Whether the Examiner erred in concluding that the claims would have been obvious based on the combination of Pagani and Szentes.

4. Whether the Examiner erred in concluding that the claims would have been obvious based on the combination of Takahashi and Szentes.

5. Whether the Examiner erred in concluding that the claims would have been obvious based on the combination of Inohara and Szentes.

6. Whether the Examiner erred in concluding that claim 11 is indefinite.

7. Whether the Examiner erred in denying entry of an amendment.

8. Whether the Examiner erred in finding the declarations submitted by the Patent Owner not commensurate with the scope of the claims.

## PRINCIPLES OF LAW

Claim Interpretation

Claims are to be given their broadest reasonable interpretation consistent with the specification, reading claim language in light of the specification as it would be interpreted by one of ordinary skill in the art. *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). This is the standard for claim interpretation in both original examination and re-examination. *See In re Yamamoto,* 740 F.2d 1569, 1571 (Fed. Cir. 1984).



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Claims are in compliance with 35 U.S.C. § 112, second paragraph, if "the claims, read in light of the specification, reasonably apprise those skilled in the art both of the utilization and scope of the invention, and if the language is as precise as the subject matter permits." *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1385 (Fed. Cir. 1986); *see also In re Moore*, 439 F.2d 1232, 1235 (CCPA 1971) ("[T]he definiteness of the language employed must be analyzed-not in a vacuum, but always in light of the teachings of the prior art and of the particular application disclosure as it would be interpreted by one possessing the ordinary level of skill in the pertinent art.").

Anticipation

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987).

Obviousness

"[P]atent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). The Court also noted that the "factfinder should be aware . . . of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning." *Id.* at 421. "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged



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from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994). In this regard, the entirety of the reference must be considered. *In re Wesslau*, 353 F.2d 238, 241 (CCPA 1965) ("It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.").

## ANALYSIS AND ADDITIONAL FINDINGS OF FACT

We address the various issues raised in the appeal *infra*, but in an order that differs from that presented by the parties.

### Entry of Amendment

The Patent Owner argues that the Examiner's denial of entry of its claim amendments filed on November 30, 2010 was improper based on two different grounds (App. Br. 25-29). However, the proper recourse for such matters is by petition to the Director as such actions of the Examiner are not within our purview. *In re Watkinson*, 900 F.2d 230, 232-33 (Fed. Cir. 1990) (The Board has no jurisdiction for matters within the discretion of the examiner and not tantamount to a rejection of claims). We further observe that the Patent Owner did, in fact, petition this matter (*see* Petition Under 37 C.F.R. §1.181 filed May 25, 2011), and received a decision (*see* Decision on Patent Owner's Petition mailed June 14, 2011).



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Claim Construction of "Oblique"

Claim construction of the limitation "elastically absorbs shoe loads oblique to the perpendicular direction" was argued by the Patent Owner in its Appeal Brief stating that "oblique to the perpendicular direction" must be construed to mean laterally oblique as shown in Fig. 2B instead of merely forward component of the load which the Patent Owner corresponds to "transversely forward load" (App. Br. 10-11). However, during the Oral Hearing, the representative of the Patent Owner took a contrary position and conceded that according to the specification of the '866 patent, the term "oblique" should be broadly interpreted to encompass any angle offset from the vertical in the longitudinal direction as well as the lateral direction.[2]

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[2] During the Oral Hearing, the Patent Owner's representative, Mr. Petri, in response to request for clarification the position of the Patent Owner as to the meaning of the limitation "oblique" stated:

> Well, I -- I'm right now tracking I think what the third-party requester had pointed out in their brief that, okay, let's focus on the oblique loads that are in the longitudinal direction. I think oblique, if you read the specification, oblique is broad enough to cover whether it's a longitudinal -- if there's an angle to the longitudinal direction or lateral direction, or maybe even any other direction. It's just something off of perpendicular. So when you're running, when your foot strikes the ground if you're going around a curve, for instance, you will have both a longitudinal force vector, a lateral force vector, and the vertical force vector. Those will combine to have an oblique load. And so I think in the context of this particular claim element, which is focusing on the relative motion in a longitudinal direction, we can focus on the oblique loads that are formed by the foot striking the ground in the longitudinal direction. But this doesn't exclude forces also being elastically absorbed that are caused by the foot striking the ground in a different direction.



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Thus, the Patent Owner's various arguments presented in the Appeal Brief directed to, and deriving from, the more limited construction of the term "oblique" initially advocated, are moot.

Indefiniteness of Claim 11

The Examiner rejected claim 11 under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner states that "it is unclear what a 'profile like hollow element' is" and that this term "makes no sense at all." (RAN 21). According to the Examiner, the claim includes elements not disclosed by its use of the phrase "profile like" so as to make the scope of the claim unascertainable (RAN 21). The Examiner also argues that "it is unclear how the hollow element 'contains' a tubular part" and that because claim 11 depends from claim 3 which recites that "the resilient member comprises a plurality of resilient members," it is unclear how the resilient member can comprise a "profile like hollow element that contains a tubular part." (RAN 21).

The Patent Owner disagrees and asserts that claim 11 is definite because the language is explicitly supported by the specification and shown in the original drawings Figures 2a) and 2b). (App. Br. 22-23; *see also* FFs 1A, 1C). The Patent Owner argues that "Figs. 2a)-2b) clearly show the profile-like nature of the hollow elements 3 and their respective tubular parts 3.1" so that a person of ordinary skill in the art would readily understand the

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(Oral Hearing Transcript to be entered into the electronic record in due course).



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limitation to "correspond to the elongated elements fixed to the underside of the sole." (App. Br. 23; *see also* Rebuttal Br. 8-11).

We agree with the Patent Owner that claim 11 is not indefinite. A "profile" is a view or contour of an object[3] and does not describe a structural object so that its applicability to defining the illustrated structures shown is not evident. The inclusion of the qualifier "like" does not help, and makes understanding the claim even more difficult. However, in determining definiteness, our inquiry is not just limited to the language of the claim. Rather, the claims are "read in light of the specification" to determine whether it reasonably apprises those skilled in the art as to its meaning and scope. *Hybritech*, 802 F.2d at 1385; *see also In re Moore*, 439 F.2d 1235. In this regard, we observe that the specification of the '866 patent also refers to the "profile-like hollow element 3" as a "hollow element 3" in numerous instances (*see, e.g.*, col. 3, ll. 17-29). Thus, the specification of the '866 patent makes clear that the structural recitation "profile like hollow element" is synonymous with "hollow element," the meaning of which is clear when viewed in conjunction with the figures of the '866 patent.

Furthermore, in contrast to the Examiner's conclusion, our opinion is that the limitation stating that the hollow element "contains a tubular part" is not indefinite because the specification of the '866 patent also makes clear that the hollow element 3 is comprised of two separate parts, namely, tubular parts 3.1 and webs 3.2 (*see* FF 1C). In this context, it is clear that the meaning of the term "contains" applicable to claim 11 is "2. to have as

[3] Random House Webster's College Dictionary (1992) defines "profile" as "3. an outlined view …; 4. an outline of an object …; 9. the look or general contour of something ….".



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contents or constituent parts; comprise; include." *Random House Webster's College Dictionary* (1992). Hence, the use of the term "contains" does not render claim 11 indefinite.

Finally, with respect to the dependency of claim 11, the recitation that the resilient member "comprises a plurality of resilient members" in claim 3 does not render the claim 11 indefinite. Claim 3 is merely directed to the number of resilient members while claim 11 is directed to the shape of the resilient member. Because claim 11 is dependent on claim 3 and refers to the "resilient member," the shape recited in claim 11 applies to the resilient member of claim 3, and correspondingly, to the "plurality of resilient members" recited therein.

Thus, in view of the above, we do not sustain the Examiner's indefiniteness rejection of claim 11.

Rejection of Claims 1-5 and 8-11 as Anticipated by Okabe

The Examiner rejects claims 1-5 and 8-11 as anticipated by Okabe (RAN 11, 22).

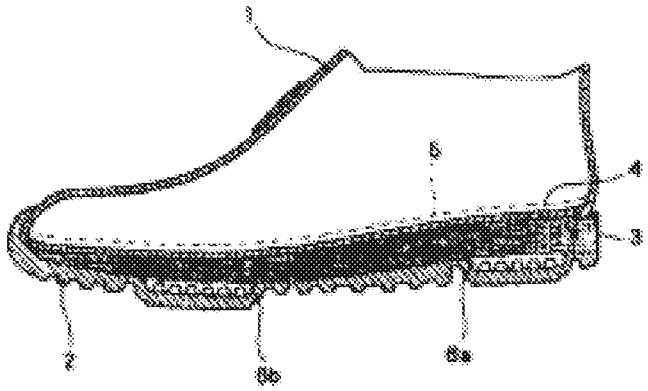
*Findings of Fact Regarding Okabe*

2. A. Okabe discloses a sole structure for a footwear (Title; Abstract). Figures 1, 2 and 4 are reproduced below.

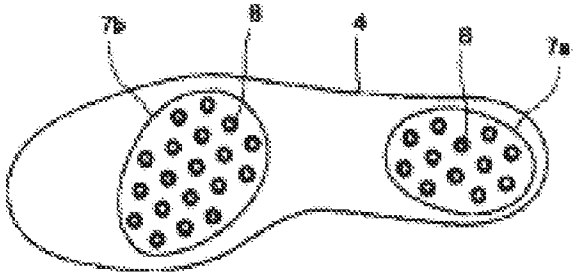


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【図2】



【図4】

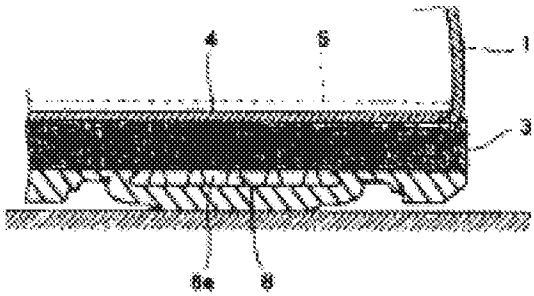


Figure 1 of Okabe shows a lateral cross sectional view of a walking shoe having an outsole 2, midsole 3 and cavities 6a, 6b formed there between (Pg. 4, col. 2). Figure 2 is a plan view of the outsole of Figure 1 (*Id.*). Figure 4 is a cross sectional view of the cavity 6a in which a load is applied to the shoe sole (*Id.*).

B. Okabe discloses that the sole includes "multiple circular truncated cone-shaped rubber pins 8" that "protrude upwardly from the bottom surface of the outsole 2." (¶ (0021)).

C. With respect to the rubber pins 8, Okabe further specifically states:

In this case, since each rubber pin 8 has a circular truncated cone shape, the elastic deformation of the rubber pins 8 does



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> not increase linearly in response to increases in load. In other words, when the load is small, the top parts of the rubber pins 8 elastically deform and bear most of the load, and as the load increases, the bases of the rubber pins gradually begin to elastically deform, which makes it possible to maintain a reasonable level of cushioning to accommodate a wide spectrum of changes in load ranging from small to large loads.
> (¶ (0022)).

D. In describing the problem addressed by the disclosed invention, Okabe states "[a]lthough establishing airtight cavities inside the shoe sole yields advantages such as a soft air cushion effect and a close fit between the sole and the unevenness of the ground, inadequate support in the horizontal direction produces a feeling of instability as if stepping on an air cushion." (¶ (0006)).

E. Okabe discloses that in Figure 4, "the bottom surface of the midsole 3 descends due to an increase in load and touches the tops of the rubber pins 8 … and the characteristic instability experienced with the air cushion effect alone is improved as a result." (¶ (0022)).

F. Okabe also states "[t]he elasticity of each rubber pins 8 is maintained even after the midsole 3 reaches its limit of elastic deformation, and the midsole 3 has a thickness that exceeds the depth of each of the recessed parts 7a and 7b of the outsole 2 in each region, so the upward thrusting force of the rubber pins 8 is transmitted to the bottom of the foot of the wearer after it is dispersed by the midsole 3, which prevents the comfort from diminishing." (¶ (0023)).



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G. Okabe further states that "[i]n FIG. 2, it is shown that airtight cavities 6a and 6b, whose planar shapes are roughly elliptical, are established one cavity each in two locations …." (¶ (0024)).

*Analysis*

The Examiner finds that pins 8 of Okabe define the inner surface of the lower portion of the outsole, and function to contact and engage the inner surface of the upper portion of the outsole to prevent relative motion therebetween (RAN 12, 25). According to the Examiner, Okabe discloses an outsole wherein the pins provide both frictional engagement with the inner surface of the upper portion as recited in dependent 2, as well as positive engagement as recited in dependent claim 9 (RAN 12). The Requester agrees and argues that Okabe discloses relative motion between the pins 8 and the midsole 3 when they are spaced apart in a first configuration but when some "sufficient load" is applied, the pins and the midsole would be frictionally engage so as to "generate[] such a high resistance to additional deformation that they practically can only be additionally deformed by the remaining elasticity of the material, *i.e.*, to a negligible degree." (Resp. Br. 5).

The Patent Owner disagrees and argues that the claims require a second configuration which encompasses the moment that the runner pushes off and at this moment, the recited resilient members "substantially prevent[] relative motion in the longitudinal direction between the upper portion and the lower portion." (App. Br. 6, 7, 10). According to the Patent Owner, the rubber pins 8 of Okabe which allow deformity upon loading, also inherently



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allow for deformity in the recited second configuration when the runner pushes off so that the outsole of Okabe does not "substantially prevent relative motion in the longitudinal direction" as recited in the rejected claims (App. Br. 10).

We disagree with the Patent Owner. We first observe that the claim states "substantial[]" prevention of relative motion, not absolute prevention. Indeed, the specification of the '866 patent makes clear that while the frictional engagement generates high resistance to additional deformation, a negligible degree of deformation can occur via "the remaining elasticity of the material." (FF 1E). Correspondingly, in applying the broadest reasonable construction in view of the specification, the "relative motion in the longitudinal direction" that is recited in the claims corresponds to relative motion of non-negligible magnitude such as that which causes the "floating effect" problem described in the specification of the '866 patent, but does not encompass small, relative motion of negligible magnitude that are not "noteworthy." (FF 1A, 1E).

Okabe clearly establishes that the rubber pins 8 contact the midsole 3 as the sole is subjected to loads during use (FF 2A, 2C, 2E). While Okabe does disclose that the rubber pins 8 deform and that the elasticity of each rubber pin 8 is maintained (FF 2A-2C, 2F), it also specifically discloses the load required for further deformation increases by virtue of its truncated cone shape (FF 2C). In other words, the load bearing capacity progressively increases as the rubber pin 8 is deformed. Furthermore, Okabe identifies a similar problem as that of the claimed invention, namely, the feeling of instability resulting from providing a cushioned effect, and teaches that this



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instability is improved by the provision of the rubber pins 8 disclosed therein (FF 2D, 2E).

Thus, in contrast to the assertions of the Patent Owner, the Okabe reference fairly discloses that relative motion between the rubber pins 8 and the midsole 3 is "substantially" prevented so as to not be "noteworthy" when the disclosed sole is used (which would include push-off), and any additional deformation by the rubber pins 8 is due to "the remaining elasticity of the material, i.e., to a negligible degree" in the manner explained in the specification of the '866 patent.

To the extent that the Patent Owner may be arguing that the '866 patent is the first in the art to recognize the desirability of such operation wherein the upper portion and the lower portion of a resilient member engage each other so as to substantially prevent relative motion, such recognition is inadequate to establish novelty. *See In re Wiseman*, 596 F.2d 1019, 1023 (CCPA 1979) ("[The Appellants] are, in effect, arguing that a structure suggested by the prior art, and, hence, potentially in the possession of the public, is patentable to them because it also possesses an *inherent*, but hitherto unknown, function which they claim to have discovered. This is not the law. A patent on such a structure would remove from the public that which is in the public domain by virtue of its inclusion in, or obviousness from, the prior art." (Emphasis in original)).

Correspondingly, the Examiner's anticipation rejection of independent claims 1 and 9 is sustained. In addition, with the exception of dependent claims 8 and 11 which are addressed *infra*, the Patent Owner does not present separate arguments with respect to the other claims rejected as



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anticipated by Okabe. Thus, the Examiner's anticipation rejection of dependent claims 2-5 and 10 are sustained as well.

*Dependent Claim 8*

The Patent Owner further argues with respect to dependent claim 8 that Okabe only discloses frictional engagement instead of the positive engagement recited by claim 8 (App. Br. 11, 12; Rebuttal Br. 2-4). According to the Examiner, "the contact between the pins 8 and the inner surface of the upper portion inherently includes frictional engagement" as recited in dependent claim 2, but also "engagement of the pins 8 by the inner surface of the upper portion creates a positive engagement" as recited in dependent claim 8 (RAN 12). Thus, the Examiner makes no distinction between "frictional engagement" and "positive engagement."

We do not agree with the Examiner. The specification of the '866 patent clearly distinguishes "frictional engagement" from "positive engagement," describing them as alternatives to each other which can also be provided in combination (FF 1H, 1I). In this regard, the example illustrated and discussed as having "positive engagement" is the embodiment shown in Figure 7 of the '866 which includes having preformed toothing on the upper layer 9.1 that engages the corresponding preformed toothing the lower layer 2 (FF 1F, 1G). As such, the broadest reasonable construction of "positive engagement" in view of the specification of the '866 patent is engagement achieved through the interaction of structural features of the engaged components. Such engagement is not disclosed in Okabe.



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