

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: TORSTEN WICH
U.S. Patent No.: 9,982,388 Attorney Docket No. 59054-0016IP1
Issue Date: May 29, 2018
Appl. Serial No.: 14/825,350
Filing Date: August 13, 2015
Title: FABRIC FOR A MACHINE TO PRODUCE A FIBER WEB AND
METHOD OF PRODUCING A FIBER WEB

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**PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT
NO. 9,982,388 PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42**

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LIST OF EXHIBITS

EX1001	U.S. Patent No. 9,982,388
EX1002	U.S. Patent No. 9,982,388 File History
EX1003	Declaration of Dr. Christopher Pastore
EX1004	U.S. Patent No. 7,473,336 (“Hawes”)
EX1005	U.S. Patent No. 8,043,477 (“Crook”)
EX1006	U.S. Patent No. 6,776,878 (“Yook”)
EX1007	U.S. Patent Application Publication No. 2014/0069549 (“Ryan”)
EX1008	WO International Publication No. 2006/045892 (“Virtanen”)
EX1009	[Reserved]
EX1010	[Reserved]
EX1011	Sabit Adanur, <i>Paper Machine Clothing</i> (1 st ed. 1997) (“Adanur”)
EX1012	DE Patent Application Publication No. 102004044568
EX1013	Certified Translation of EX1012 (“McGill”)
EX1014	International Application Publication WO89/12717 (“Sudre”)
EX1015	U.S. Patent Application Publication No. 2016/0069022 (“Lee”)
EX1016	U.S. Patent No. 5,939,176 (“Yook ’176”)
EX1017	[Reserved]

- EX1018 U.S. Patent No. 7,892,402 (“Hawes ’402”)
- EX1019 EP Patent Application Publication 0099836 (“Sarrazin”)
- EX1020 U.S. Patent No. 5,110,672 (“Zehle”)
- EX1021 Teknisk Information Fran Albany Nordiskafilt, SEAMTECH, Pressfiltar med söm (1996).
- EX1022 U.S. Patent No. 6,797,121 (“Hyvonen”)
- EX1023 Horrocks & Anand, *Handbook of Technical Textiles*, Woodhead Publishing (2000)
- EX1024 “Nylons (Polyamide)”,
<https://www.bpf.co.uk/plastipedia/polymers/Polyamides.aspx>
(2011), as archived at
<https://web.archive.org/web/20110724053756/https://www.bpf.co.uk/plastipedia/polymers/Polyamides.aspx>
- EX1025 Emery, *The Primary Structures of Fabrics*, The Spiral Press, New York (1966)
- EX1026 U.S. Patent No. 5,360,656

LISTING OF CLAIMS

Claim 1	
[1pre]	A fabric for a machine for producing a fiber web, comprising:
[1a]	a flat woven base material having a top side and a bottom side, two terminal ends separated from one another in a machine direction;
[1b]	said flat woven base material being folded in two folded layers with folds being separated from one another in the machine direction and defining an inside between the two folded layers and an outside;
[1c]	said two terminal ends being located under the bottom side surface and said two terminal ends being adjacent one another or overlapping one another, and wherein seam loops are located at said folds; and
[1d]	one or more sheet plies, wherein:
[1e]	all of said sheet plies are disposed outside said folded layers; and
[1f]	one, some or all of the sheet plies consist of or comprise a woven material or a non-woven component selected from the group consisting of a polymer film, a foam layer, a knitted structure and a warp-knit structure.
Claim 2	
[2]	The fabric according to claim 1, wherein said one or more sheet plies are two or more sheet plies.
Claim 3	
[3]	The fabric according to claim 1, configured for producing a fiber web selected from the group consisting of a paper web, a cardboard web, a tissue web and a pulp web.

Claim 4	
[4]	The fabric according to claim 1, wherein said sheet plies have a width substantially equal to a width in cross machine direction as the fabric and/or said sheet plies have a length substantially equal to a length in the machine direction as the fabric.
Claim 5	
[5]	The fabric according to claim 1, wherein said woven base material is a one-layer weave.
Claim 6	
[6]	The fabric according to claim 5, wherein said woven base material is a plain weave.
Claim 7	
[7]	The fabric according to claim 1, wherein said woven material is a one-layer weave.
Claim 8	
[8]	The fabric according to claim 7, wherein said one-layer weave is a plain weave.
Claim 9	
[9]	The fabric according to claim 1, wherein said woven base material and one, some or all of said sheet plies are formed of a same woven material.
Claim 10	
[10]	The fabric according to claim 1, which comprises one or more stitchings for securing said sheet plies to said woven base material.
Claim 11	
[11]	The fabric according to claim 1, wherein said two terminal ends are at least temporarily connected to one another.

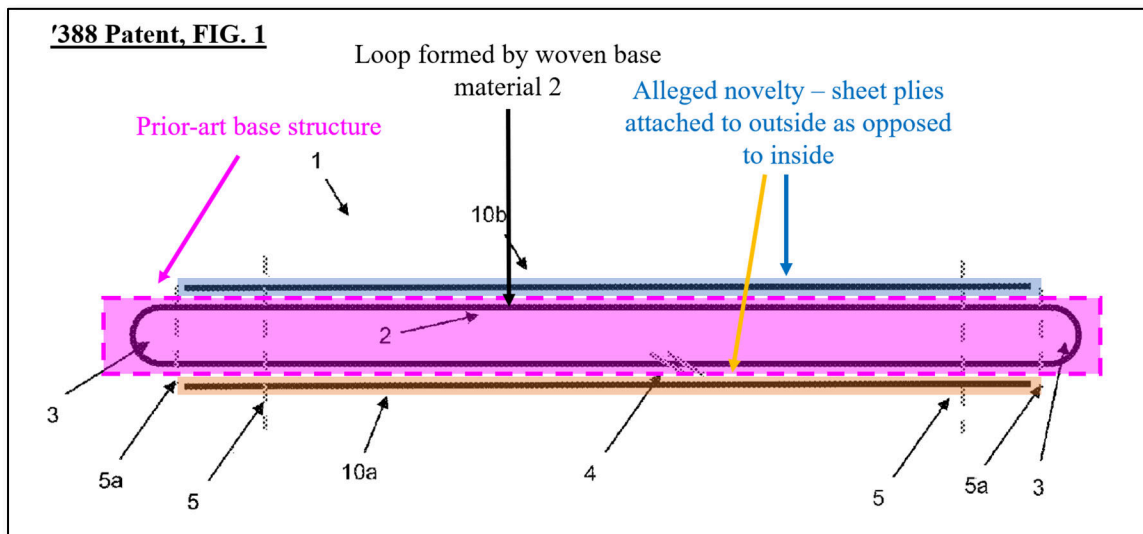
Claim 12	
[12]	The fabric according to claim 11, wherein said two terminal ends are connected to one another by a process selected from the group consisting of welded, stitching, and gluing.
Claim 13	
[13]	The fabric according to claim 1, which further comprises at least one layer of batt fibers.
Claim 14	
[14]	The fabric according to claim 1, wherein the fabric is configured to be on-machine seamable and comprises only one seam.
Claim 15	
[15]	A method for producing a fiber web, providing a web-producing machine with at least one fabric according to claim 1.

I. INTRODUCTION

Albany International Corp. (“Petitioner”) petitions for IPR of claims 1-15 (“the Challenged Claims”) of U.S. Patent No. 9,982,388 (“the ’388 patent”), assigned to Voith Patent GmbH (“Patent Owner”/“PO”).

The ’388 patent concerns a well-known type of fabric called “paper machine clothing” (PMC). PMCs are essential in the paper-making process for the manufacture of tissue, printer paper, and the like. PMCs serve as a type of “conveyor belt” on the paper-making machine: a web of fibers is carried on a series of PMC fabrics, during which time the fibers are formed into a sheet, pressed, and dried, to obtain a final paper product. EX1001, 1:9-57; EX1003, 26-33.

PMCs were used for many decades before the ’388 patent issued. EX1003, 26. Indeed, PO admitted that the base structure of the PMC claimed in the ’388 patent—a flat-woven fabric folded to form a closed loop—was well-known. EX1001, 1:40-52. The claims further recite “one or more sheet plies,” but adding sheet plies (e.g., layers of fabric) to a base structure was equally well-known. EX1002, 34-36; EX1005; EX1015. The only allegedly novel element of the Challenged Claims is that the sheet plies of the claims are attached exclusively to the *outside* of the prior-art base structure—as opposed to the *inside* of the loop—shown below.



But this too was known. The attachment of additional plies of fabric to the outside of a base fabric was a well-known technique called lamination, that “allow[s] a wider range of base fabric pressure uniformity” and other properties “critical for open and clean operation.” EX1011, 49.

KSR Int’l Co. v. Teleflex Inc., 550 U.S. 398 (2007), makes clear that patentability cannot rest on this simple modification—it is merely the application of a known technique (lamination on the outside) to a known product (prior-art base structure) ready for improvement. The Challenged Claims represent a textbook case of obviousness under *KSR*, and should be found unpatentable.

II. REQUIREMENTS FOR IPR UNDER 37 C.F.R. § 42.104

A. Grounds for Standing Under 37 C.F.R. § 42.104(a)

Petitioner certifies that the ’388 patent is available for IPR. Petitioner is not barred or estopped from requesting review of the Challenged Claims on the below-identified grounds.

B. Challenge and Relief Requested

Petitioner requests IPR of the Challenged Claims on the grounds below.

Additional explanation is provided in Dr. Chris Pastore's Declaration. *See* EX1003, 1-21, 301-303.

Ground	'388 Patent Claims	Basis for Rejection
1	1-15	§103 – Ryan, Yook
2A	1-15	§103 – Hawes, Crook
2B	7-9	§103 – Hawes, Crook, Yook
3A	1-8, 11-15	§103 – Hawes, Zehle
3B	7-10	§103 – Hawes, Zehle, Yook

The '388 patent has a filing date of August 13, 2015, and does not claim an earlier priority date. Thus, the '388 patent is assessed under post-AIA 35 U.S.C.

Each document applied in the invalidity grounds qualifies as prior art under 35 U.S.C. §102(a)(1) and §102(a)(2):

Reference	Publication Date
Ryan	3/13/2014
Yook	8/17/2004
Hawes	1/6/2009
Crook	10/25/2011
Zehle	5/5/1992

C. Claim Construction

Claims should only be construed to the extent necessary to resolve a

controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Here, Petitioner identifies no terms requiring construction. Instead, Petitioner uses the ordinary meaning ascribed to the words of the claims in view of the intrinsic evidence. Petitioner reserves the right to respond to any claim constructions advanced by PO.

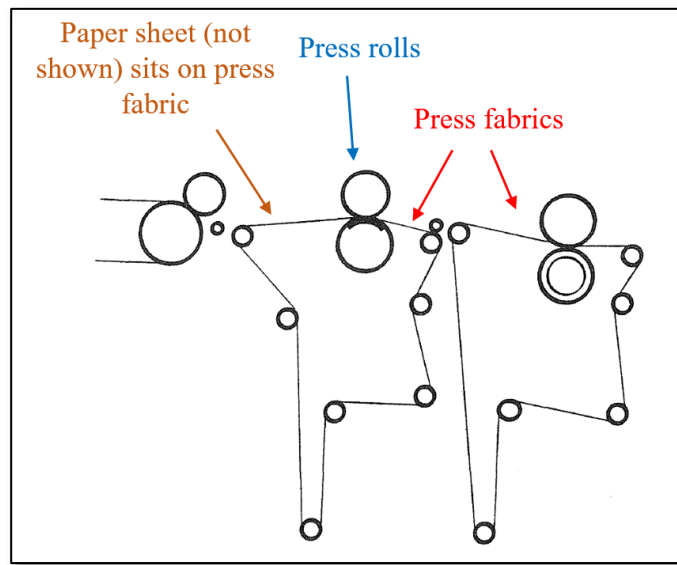
III. TECHNOLOGY BACKGROUND AND SUMMARY OF THE '388 PATENT

A. Paper Machine Clothing

The claims of the '388 patent are directed to PMC—specifically, fabric that is used in a paper-making machine to make paper. PMC has long been an integral part of the papermaking process. EX1011, 6-8, 9-10, 12. Dr. Pastore provides an overview of PMC and its use in papermaking. EX1003, 24-55.

1. Press Fabric

One type of PMC is “press fabric” or “press felt.” EX1011, 39; EX1003, 28. As Dr. Pastore explains, press fabric conveys a paper sheet through part of the paper-making machine where the paper sheet is pressed between opposing “press rolls.” EX1011, 13; EX1003, 28-29. The press rolls “apply pressure to push water out of the sheet.” EX1003, 29-30. The below illustration shows examples of press fabrics moving through press rolls of a paper-making machine.



Adanur (EX1011), FIG. 3.36¹

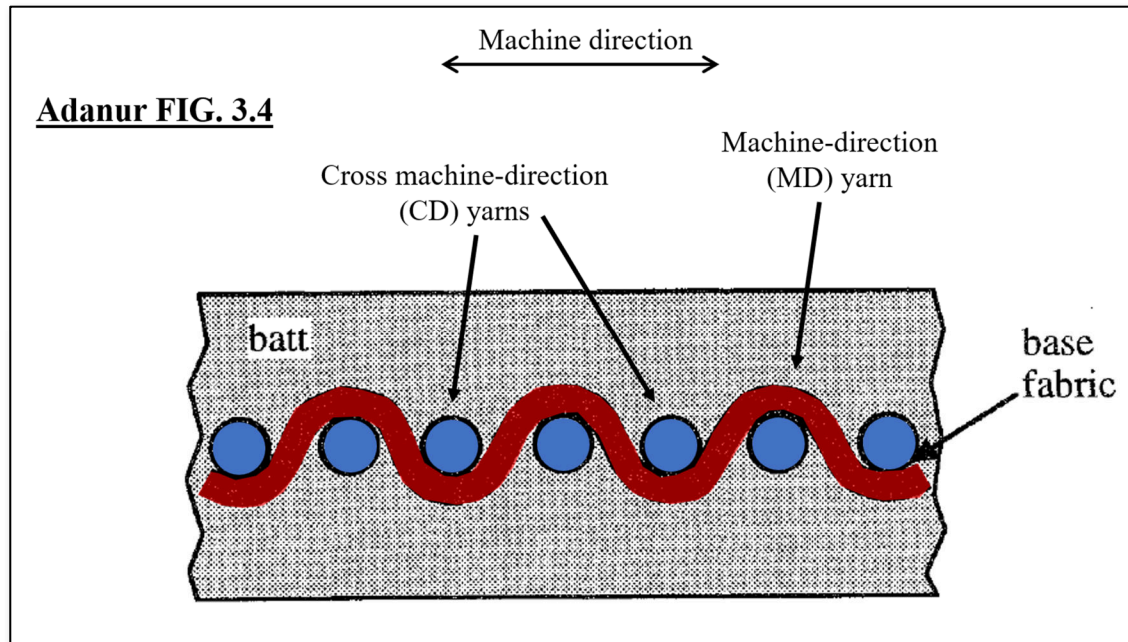
As Dr. Pastore further explains, given this role, “it has long been understood that the structure of the press fabric is important for obtaining desired paper characteristics.” EX1003, 31, 37; EX1011, 13, 39-76; EX1004, 3:62-4:2; EX1020, 1:52-2:29.

2. PMC Structure

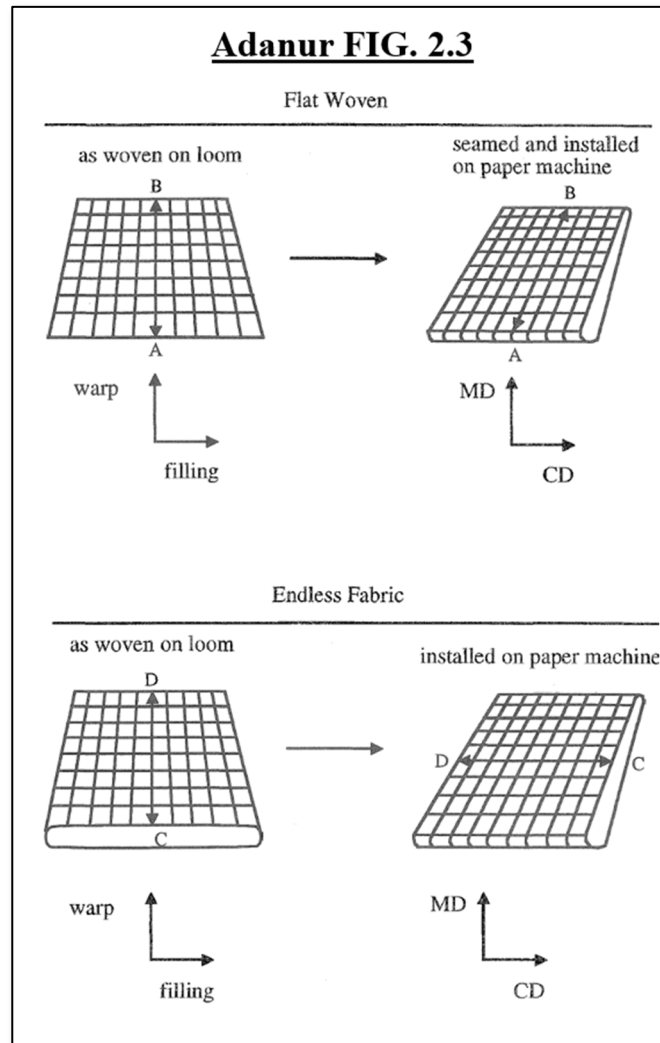
The annotated drawing below shows a cross-section of a PMC. Generally, the base fabric of PMC is composed of machine-direction (MD) threads (or “yarns”) (wavy red line) interwoven with cross machine-direction (CD) threads (blue circles). PMC also typically includes “batt”—a layer of fibers that are

¹ All color annotations added unless otherwise specified.

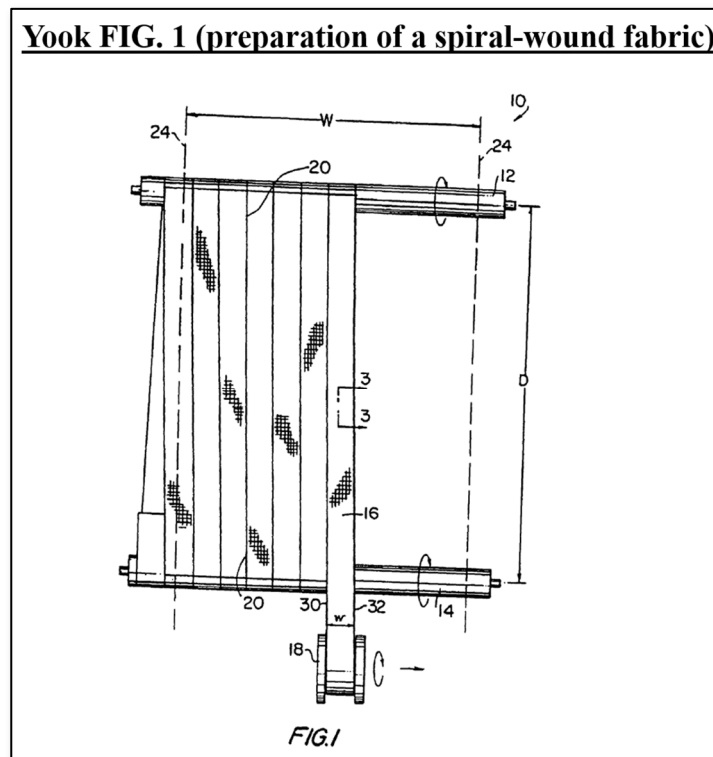
randomly bonded together rather than woven—surrounding the base woven fabric (gray shading). See EX1011, 14, 16-36, 45; EX1003, 36-41.



PMC is typically prepared by either “flat weaving” or “endless weaving.” EX1011, 16. Both processes are well-known in the art. EX1011, 16-17, 159; EX1003, 42. Shown below (bottom), endless weaving directly produces a continuous belt of fabric. *Id.*, 38-39. Flat weaving (top), on the other hand, produces a flat sheet of fabric. In a process called “seaming,” opposite ends of the flat-woven fabric are joined in the machine direction (i.e., “seamed”) to form a continuous belt for installation on a paper-making machine. *Id.*, 38-39.



As a third approach, a flat-woven fabric strip is wound in a spiral shape around two spaced-apart rolls, and adjacent turns of the fabric strip are joined to one another. *See* §IV.B.1; EX1003, 43. The result is a “multiaxial” or “spiral-wound” fabric that, although flat-woven, is endless as-wound and lacks terminal ends separated along the machine direction of the fabric. *Id.*

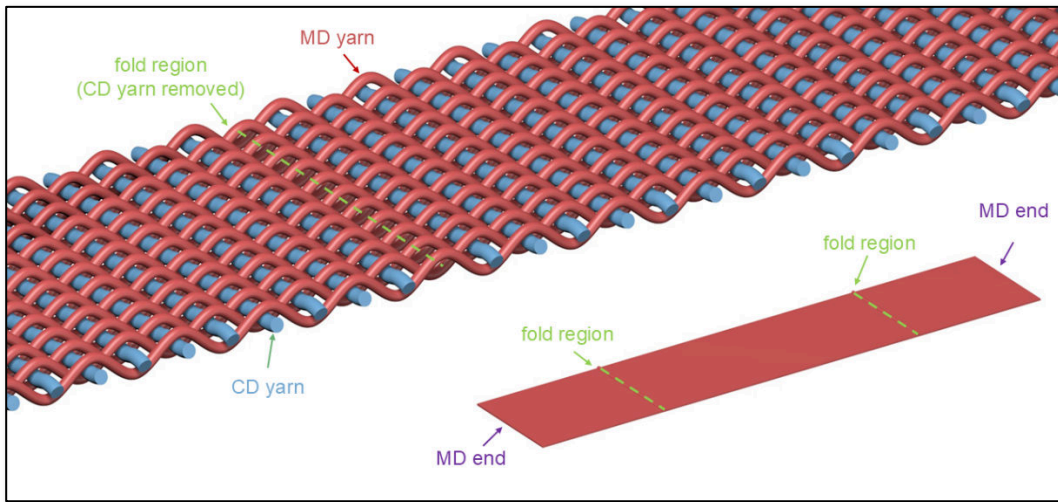


Notably, when installed on a paper machine, all three types of fabrics (flat-woven, endless-woven, and spiral-wound/multiaxial) are interchangeable and function substantially identically. EX1003, 44.

3. Process for Producing Flat-Woven PMCs

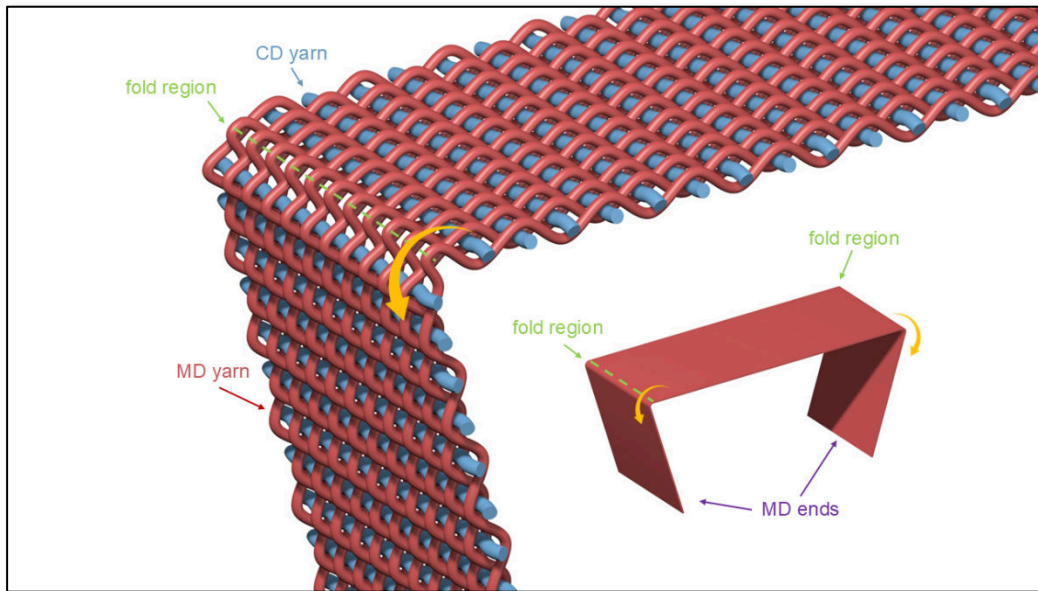
The illustrations below show the seaming process, which involves forming “seam loops” in a flat-woven fabric and joining the terminal ends of the fabric. The same seaming process is described in prior-art references Crook (EX1005) and Ryan (EX1007), and the '388 patent. At fold regions (green), some CD threads (blue) are removed from the fabric, such that only MD threads (red) remain.

EX1005, 4:45-52; EX1007, [0029]; EX1003, 46-48.



CD thread removal

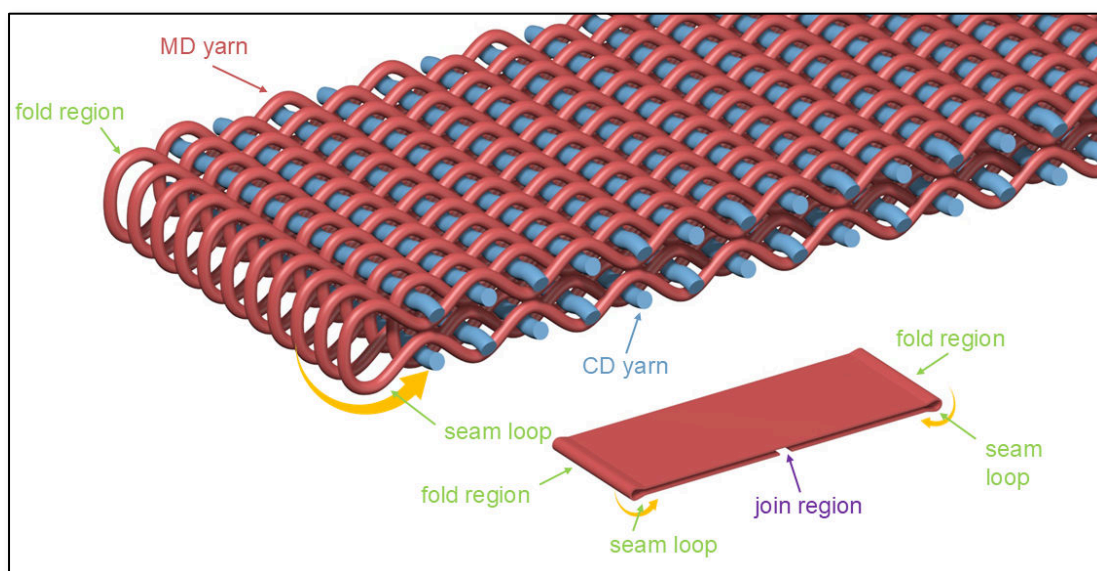
The fabric is folded at the fold regions, bringing its two free MD ends (purple) together at a “join” region. EX1005, 4:38-45, 5:6-8; EX1003, 49-50.



Fabric folding

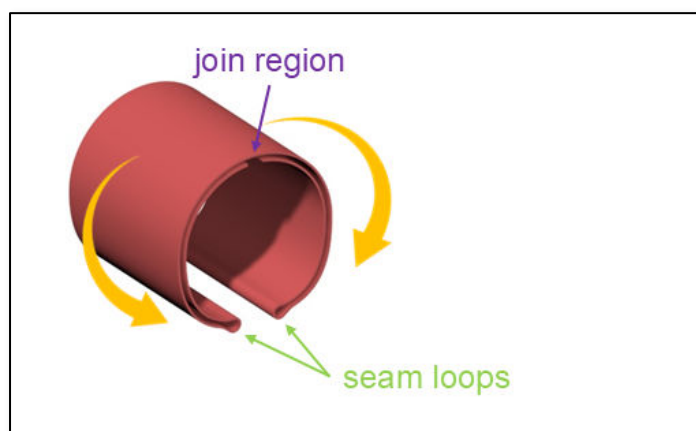
This process produces a two-layer structure, shown below. Further, as a result of folding and removal of CD yarns, “seam loops” (green arrows) are formed

by the MD threads at the fold regions. EX1005, 4:45-48; EX1001, 1:41-45;
EX1003, 50.

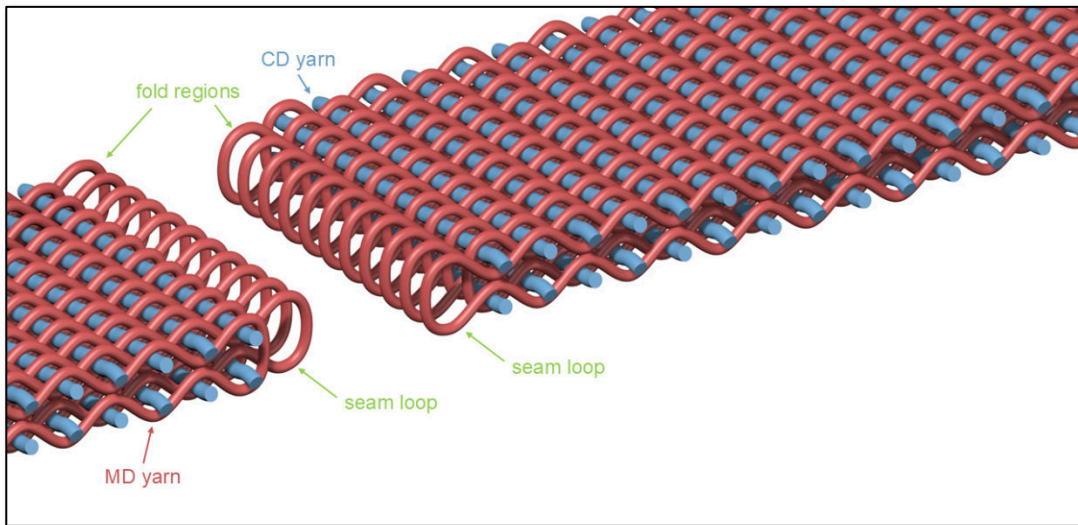


Seam loops at fold regions

This two-layer structure is then folded *again* so that the seam loops of both fold regions are brought together (green arrows), shown below. EX1005, 5:46-51; EX1001, 2:32-34; EX1003, 51.

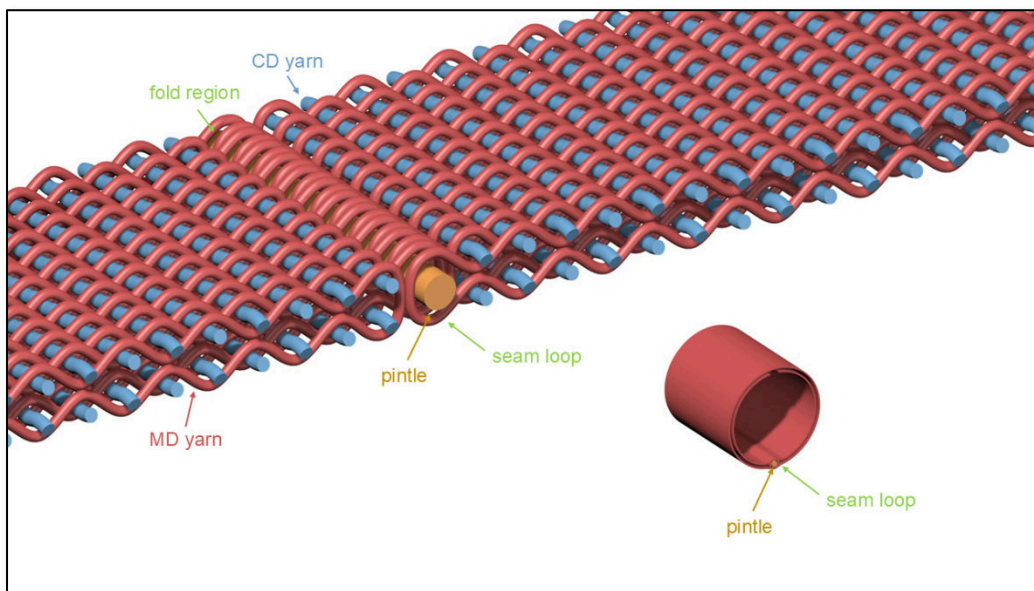


Joining seam loops



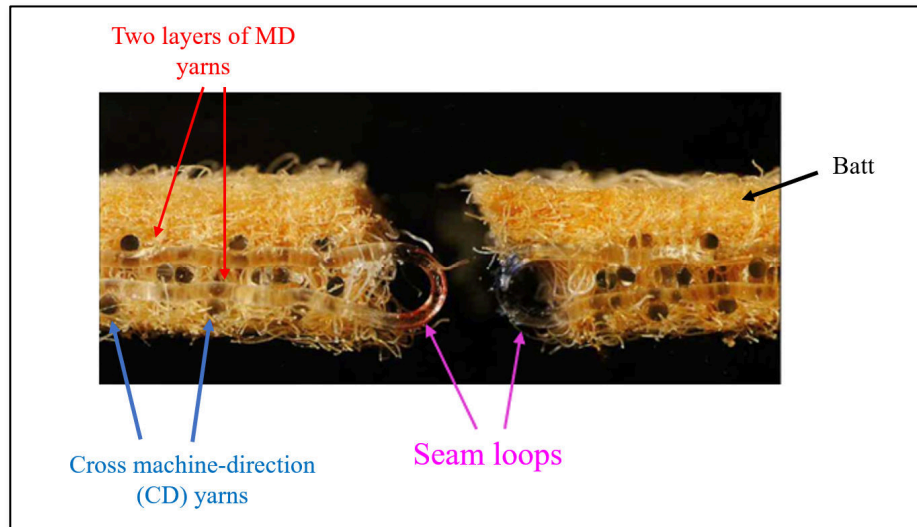
Joining seam loops

The seam loops from the two sides of the fabric are then interdigitated with one another, forming a single channel. EX1005, 5:48-51; EX1003, 52. A pintle, i.e., a pin or bolt, is inserted into that channel to connect the two ends of the fabric, forming the fabric into an endless belt as shown below. *Id.*

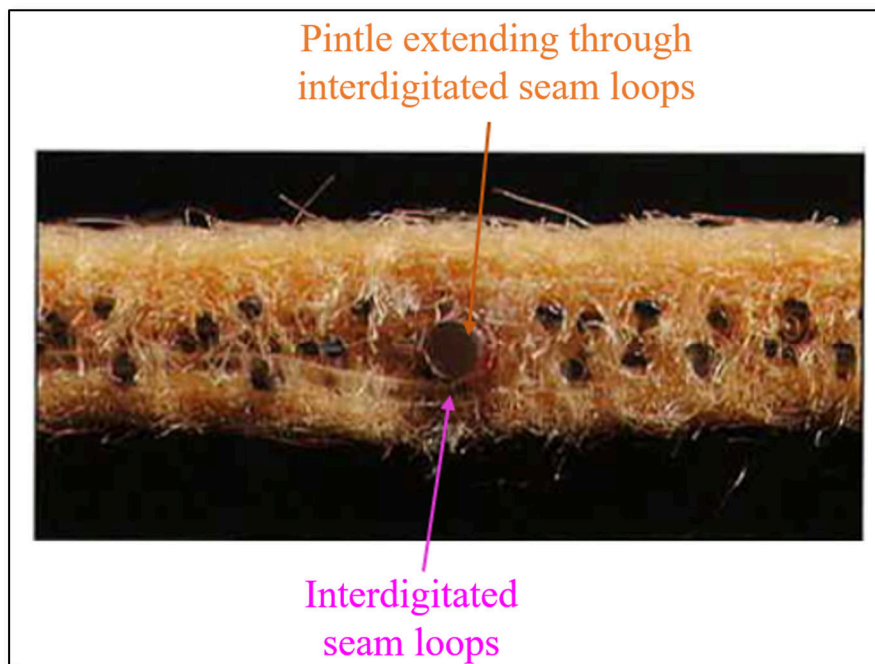


Pintle insertion for on-machine seaming

The photograph below shows a real example: Petitioner's SeamTech PMC, a two-layer "press fabric," with un-joined translucent seam loops. EX1021, 1 (below); EX1003, 45, 54. Batt is present on both sides of the fabric. EX1003, 54.



Next, the interdigitated seam loops are shown connected by a pintle. EX1021, 3 (below), *id.*, 4-5; EX1003, 55.

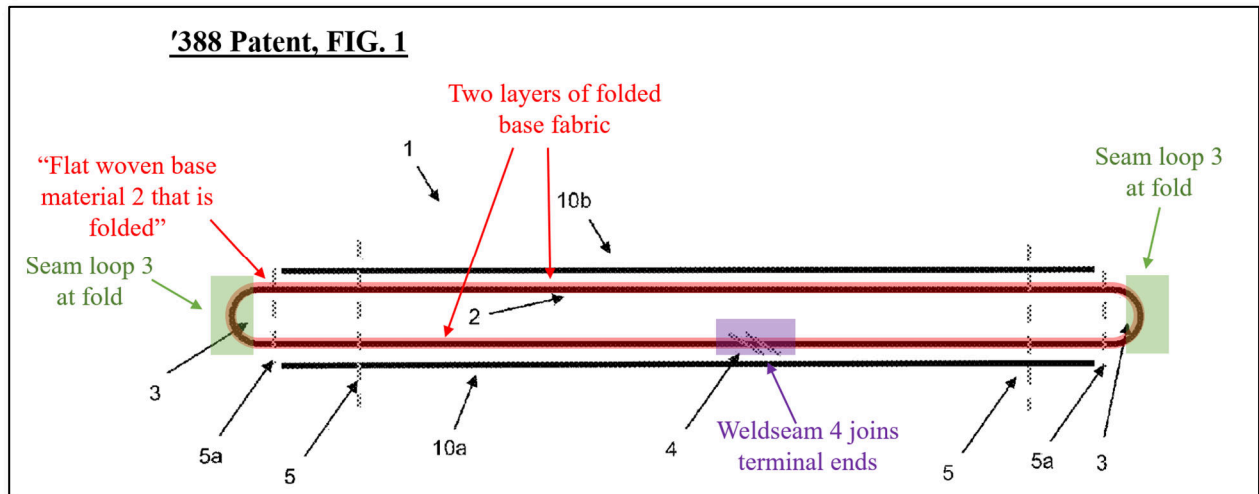


This process can advantageously be performed while the fabric is on a papermaking machine, making it “on-machine seamable.” EX1004, 2:22-34; EX1003, 53. This process is easier and safer than transferring an already-formed endless belt onto a machine. *Id.*

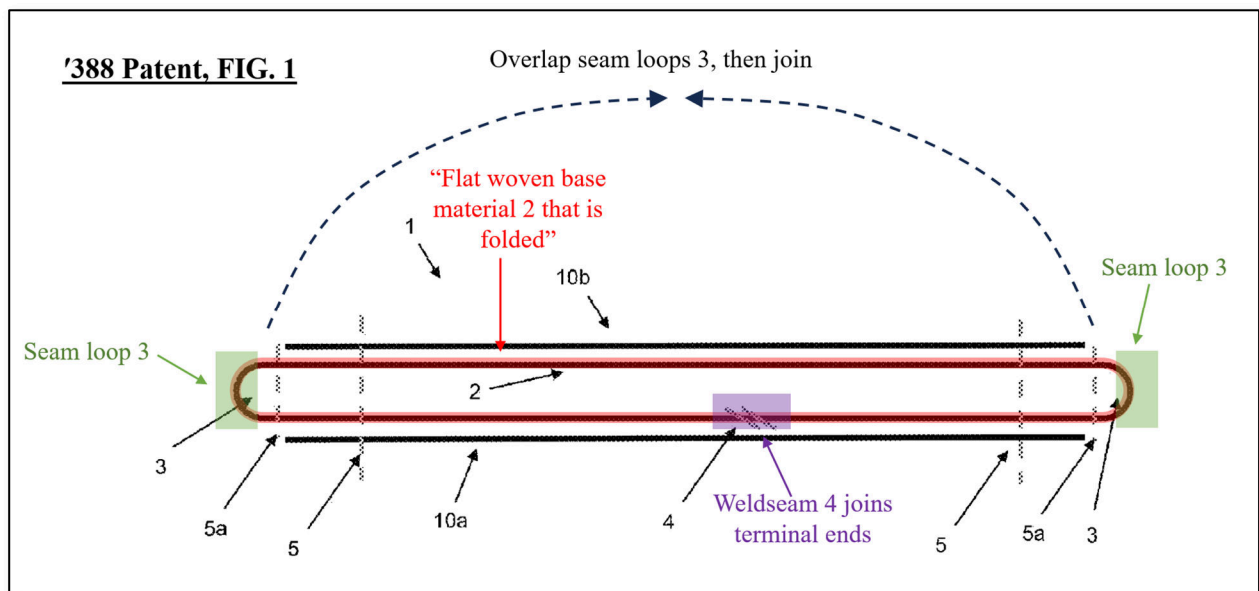
B. Summary of '388 Patent

The '388 patent relates to PMCs such as “forming fabric[s],” “press felts,” and “press fabrics,” that is, fabrics used as a conveyer belt to support a paper sheet (or “web”) during the papermaking process. EX1001, col. 1-2; EX1003, 56. The '388 patent concedes that “it is known...to use a simple, flat woven material and to fold it in order to produce a two ply base structure with seam loops for a seamable fabric.” EX1001, 1:41-45. This “known” structure includes all elements of claim 1 except the placement of the “one or more sheet plies” exclusively on the outside. EX1003, 57.

An example of the known prior-art structure is shown in FIG. 1, annotated below. EX1003, 58. This fabric is formed as described above. *Id.* Specifically, the fabric includes two woven layers (red) obtained by folding a flat-woven fabric onto itself. EX1001, 4:40-53; EX1003, 58. The two MD ends of the fabric (“terminal ends,” purple) are joined. EX1001, 4:43-45; EX1003, 58. At the folds, “seam loops” (green) are present. EX1001, 4:43; EX1003, 58.

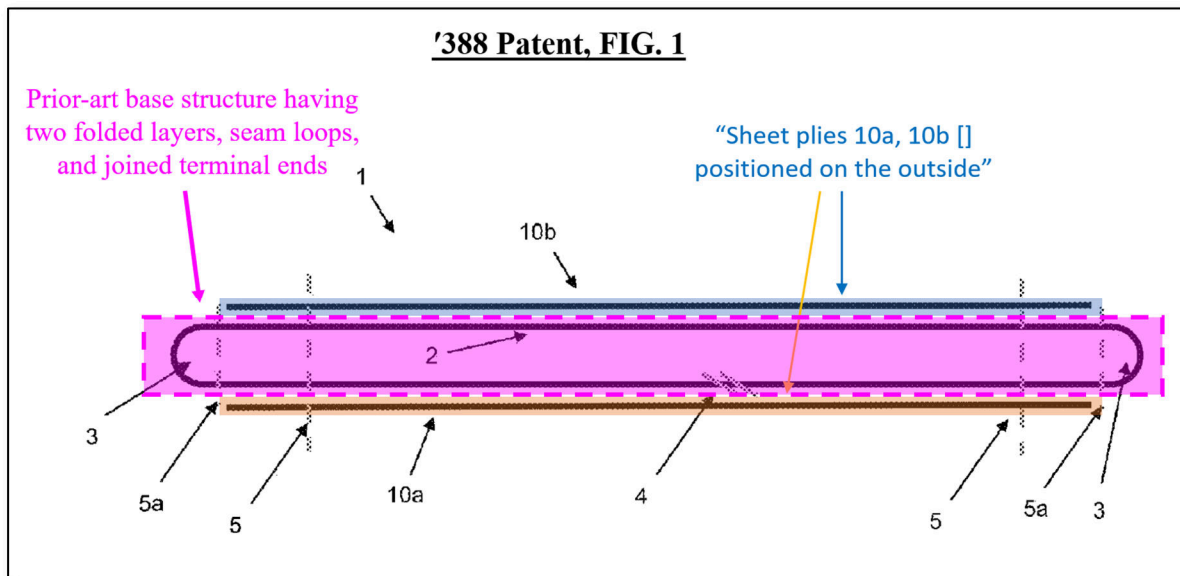


As discussed above, this well-known base structure was desirable because it permitted “on-machine seaming” of the fabrics, shown below. EX1003, 53, 59. For example, from the configuration of FIG. 1, the fabric could be looped around rolls of a papermaking machine to overlap the seam loops, after which the seam loops could be joined with a pintle, as shown below. EX1003, 59.



In addition to this prior-art base structure, the FIG. 1 fabric also includes two sheet plies 10a (orange), 10b (blue) “positioned on the outside,” shown below.

EX1001, 4:51-53; EX1003, 60.



The arrangement of these sheet plies exclusively on the outside (versus the inside) was the sole factor allegedly distinguishing the claimed subject matter over the prior art. EX1002, 15-16, 29; EX1003, 61.

As to these plies, the '388 patent alleges that prior-art fabrics “do not provide enough void volume to guarantee sufficient dewatering properties.” EX1001, 1:53-57; EX1003, 62. “Void volume” is the proportion of empty space in a fabric. EX1011, 38. In a press fabric, high void volume is desirable because void volume provides space to receive water pressed from paper sheets during manufacture. EX1011, 40; EX1003, 62. The '388 patent purports to improve the

fabrics by including “one or more sheet-like plies” that “provide additional void volume to the fabric.” EX1001, 2:35-38.

As discussed below, however, using outer sheet plies to improve void volume was well-known, for example, in “laminated” press fabrics. *See* EX1008, [0012]; EX1011, 40; EX1003, 63.

C. Prosecution History

The '388 patent issued on May 29, 2018, from U.S. Patent Application No. 14/825,350, filed on August 13, 2015. *See* EX1002. Claim 1 was rejected as anticipated by DE102004044568 (EX1012/EX1013, “McGill”), WO89/12717 (EX1014, “Sudre”), and Crook (EX1005). *Id.*, 58-62. Each document shows a similar folded fabric structure. EX1012, FIG. 1; EX1014, FIG. 4; EX1005, FIG. 3; EX1003, 64.

In response, applicant amended claim 1 to recite “at least one of the sheet plies is disposed on the outside.” EX1002, 47-49, 51. Applicant also argued that Sudre’s “non-woven batt” is not a “polymer film, foam layer, knitted structure, [or] warp knit structure,” as claim 1 was amended to recite. *Id.*, 48-49, 51; EX1003, 65.

A final Office Action rejected claim 1 as anticipated by Crook and US2016/0069022 (EX1015, “Lee”). *Id.*, 34-37. But in reference to a dependent claim, the Examiner found “[t]he prior art does not disclose or suggest...[that] *all* of the sheet plies are disposed on the outside.” *Id.*, 38. Claim 1 was amended to

recite that limitation, as the cited art illustrated sheet plies only either *inside* or *both* inside *and* outside the folded layers. *Id.*, 15-16, 38. The claims were then allowed. *Id.*, 29; EX1003, 66-67.

D. Level of Ordinary Skill

A person having ordinary skill in the art (“POSITA”) relating to the subject matter of the ’388 patent as of August 13, 2015, would have had at least (1) a Bachelor’s Degree (or higher) in material science, materials engineering, mechanical engineering, textile engineering, or a related field, and (2) a minimum of two years of working experience in textiles engineering, fibers and textiles manufacturing, or a related field. Additional education could substitute for professional experience, and vice versa. EX1003, 22-23.

IV. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. [Ground 1] Ryan-Yook Renders Claims 1-15 Unpatentable

1. Ryan

Ryan describes a “process for preparing a seam area for a PMC base fabric.” EX1007, [0011]; EX1003, 69. The process results in a “flat-woven PMC base fabric 10” (red) shown below. EX1007, [0029], FIG. 1; EX1003, 69.

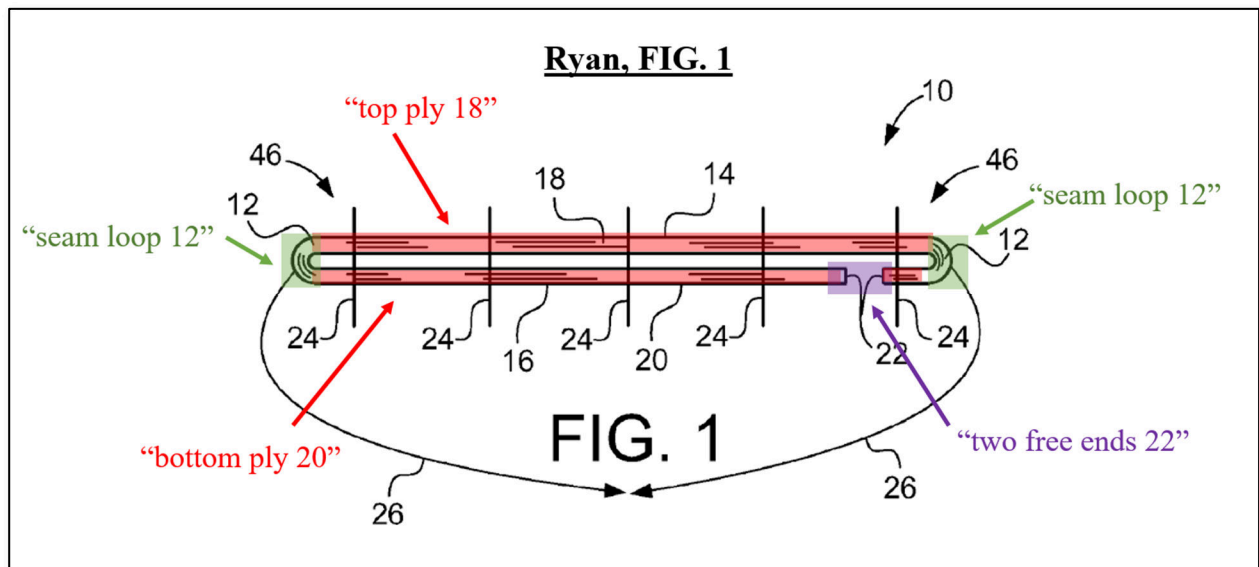
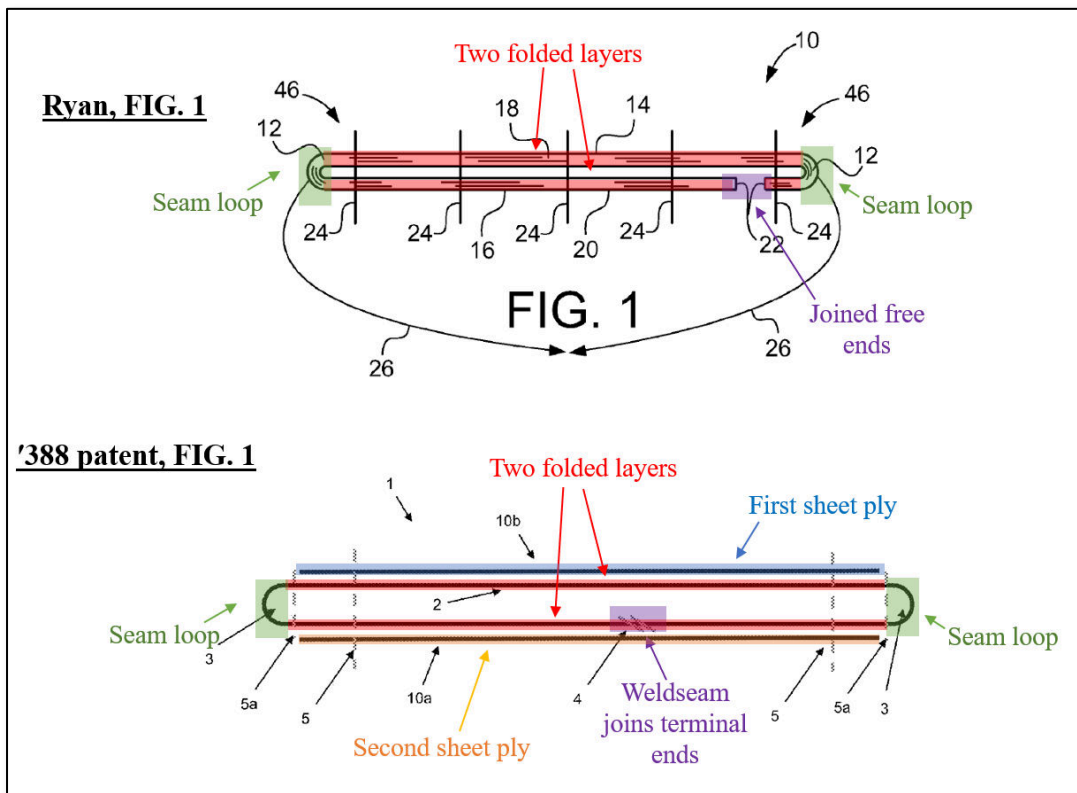


Figure 1 shows that Ryan's base fabric 10 is in all relevant ways identical to the base structure of the '388 patent's FIG. 1 discussed in §III.B. The "[b]ase fabric 10 has been folded to form a seam loop 12" (green). EX1007, [0031]; EX1003, 70. The folded fabric has a "top ply 18" (red) and a "bottom ply 20" (red) that connect at the seam loops/folds (green). EX1007, [0029]; EX1003, 70. Further, Ryan's "free ends 22" (purple) are adjacent at the bottom of the fabric and can be "joined." EX1007, [0029], [0042]; EX1003, 70.



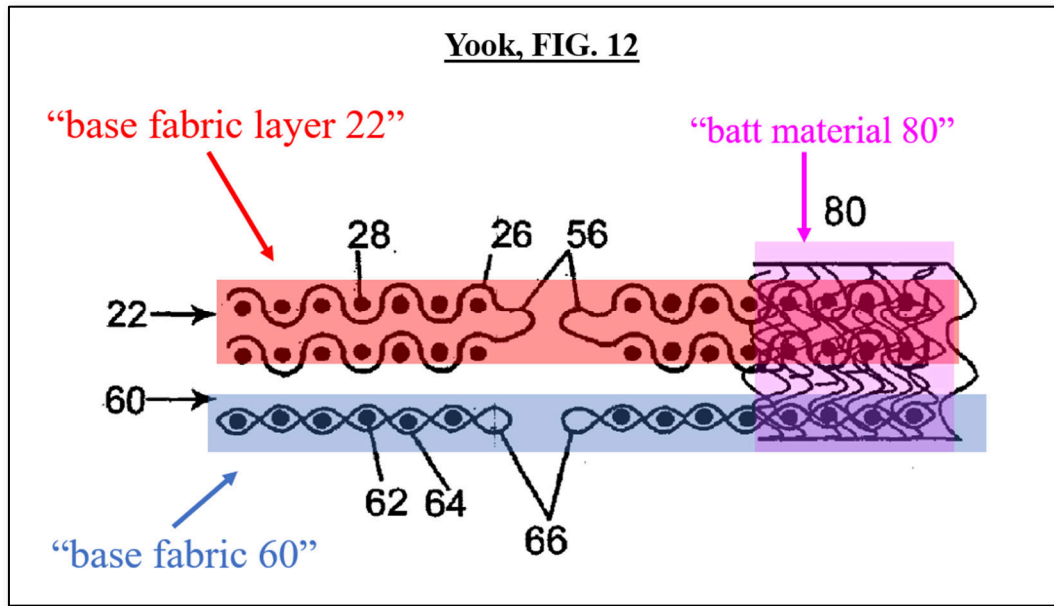
As shown above, Ryan's base fabric 10 matches the base fabric of the '388 patent, lacking only the '388 patent's outer sheet plies 10a (orange) and 10b (blue). EX1003, 71.

2. Yook

Yook describes a laminated press fabric. EX1006, 10:16-18, 10:26-28; EX1003, 72. As shown below, the press fabric includes a woven two-layer "base fabric layer 22" (red) and a woven one-layer "base fabric 60" (blue) attached to

one another by “batt material 80 [pink] needled into and through” both fabrics.

EX1006, Abstract, 10:16-18, FIG. 12 (substitute).²



Notably, FIG. 12 shows the base fabric 22 attached on the outside of base fabric 60. Yook, however, makes clear that either base fabric may be laminated to the outside. *Id.*, 10:16-21. Base fabric layer 22 is a spiral-wound fabric, whereas base fabric 60 can be any of a number of different fabric types. *Id.*, 8:17-20, 10:9-15; EX1003, 73.

A “laminated” fabric is simply a fabric having two or more layers attached to one another. EX1011, 49; EX1003, 89. One way to attach fabric layers together is by needling with batt, as Yook describes (i.e., pink in figure above). EX1006,

² All citations are to Yook’s substitute figures.

10:22-26; EX1014, 5:8-18; EX1005, 6:6-9; EX1003, 90. Although not identical to the claimed invention³, Yook's fabric shows how a single layer or double layer can be laminated to the outside of a folded base fabric. EX1006, 10:16-30, FIG. 12; EX1003, 91-92.

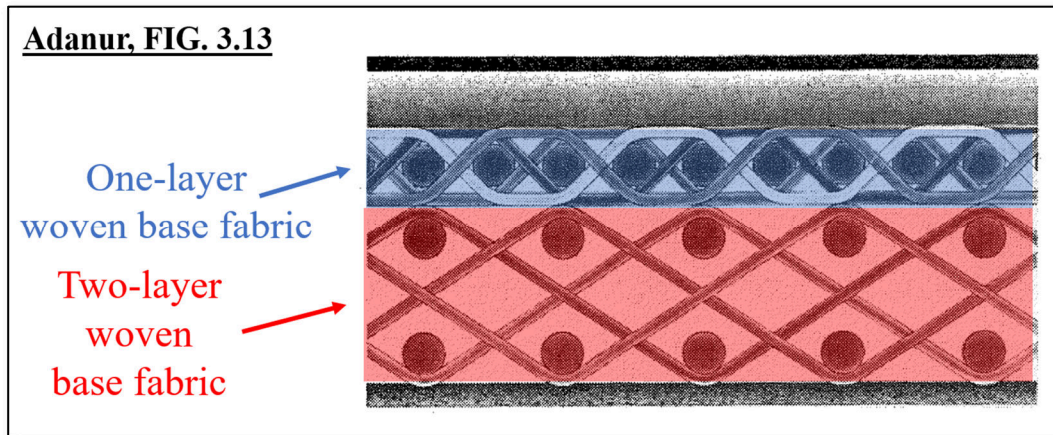
Laminated press fabrics were conventional in the art and provided well-known advantages for PMC. EX1003, 93. For example, Adanur, a 1997 textbook, describes that, in a laminated press felt, "two or more base fabric structures are included in the fabric." EX1011, 49. Adanur explains laminated fabrics are preferable because they "allow a wider range of base fabric pressure uniformity and low batt-to-base ratio which is critical for open and clean operation." *Id.* In addition, it was well-known that laminated fabrics provide "high void volume...to handle the water flow" associated with pressing. *Id.*, 154.

Adanur FIG. 3.13, below, illustrates a "[c]ross section of a laminated press fabric." *Id.*, 165. Like Yook's combination of base fabrics 22 and 60, Adanur's laminated press fabric includes a one-layer base fabric laminated to the outside of a two-layer base fabric. *Id.*, 49, 51; EX1003, 94. The only alleged novelty in the '388 patent's claims—attaching layer(s) to the outside of base fabrics—was

³ Yook's fabric lacks the claimed terminal ends in the machine direction.

therefore known at least *eighteen years* before the priority date of the '388 patent.

EX1003, 95.



Further advantages of laminated structures include a “relatively large water retention capacity” (associated with the high void volume of laminated fabrics), “good resistance against compression,” and “greater flexibility compared with a single-base structure.” EX1008, [0012]. EX1003, 96. Additionally, “it is easier to provide the laminated felts with a sufficient space for water” (associated with the high void volume of laminated fabrics), but “nevertheless [maintain] an even surface.” EX1022, 3:15-24; EX1003, 96. And multiple base fabrics of a laminated fabric can advantageously be selected with different characteristics depending on the positions of the base fabrics. EX1020, 5:16-23; EX1003, 97.

3. Ryan-Yook combination

As discussed further below, Ryan teaches all elements of claim 1 except for “*all of said sheet plies are disposed outside said folded layers.*” It would have been

obvious to a POSITA to apply Yook's teaching of a "first base fabric and a second base fabric laminated to one another" by attaching a second base fabric to the outside of Ryan's base fabric, thereby arriving at the claimed fabric. EX1006, Abstract; EX1003, 68, 74-75, 88, 98. This modification would have constituted "the mere application of a known technique to a piece of prior art ready for the improvement." *KSR*, 550 U.S. at 417.

4. Analysis of claims

(a) *Claim 1*

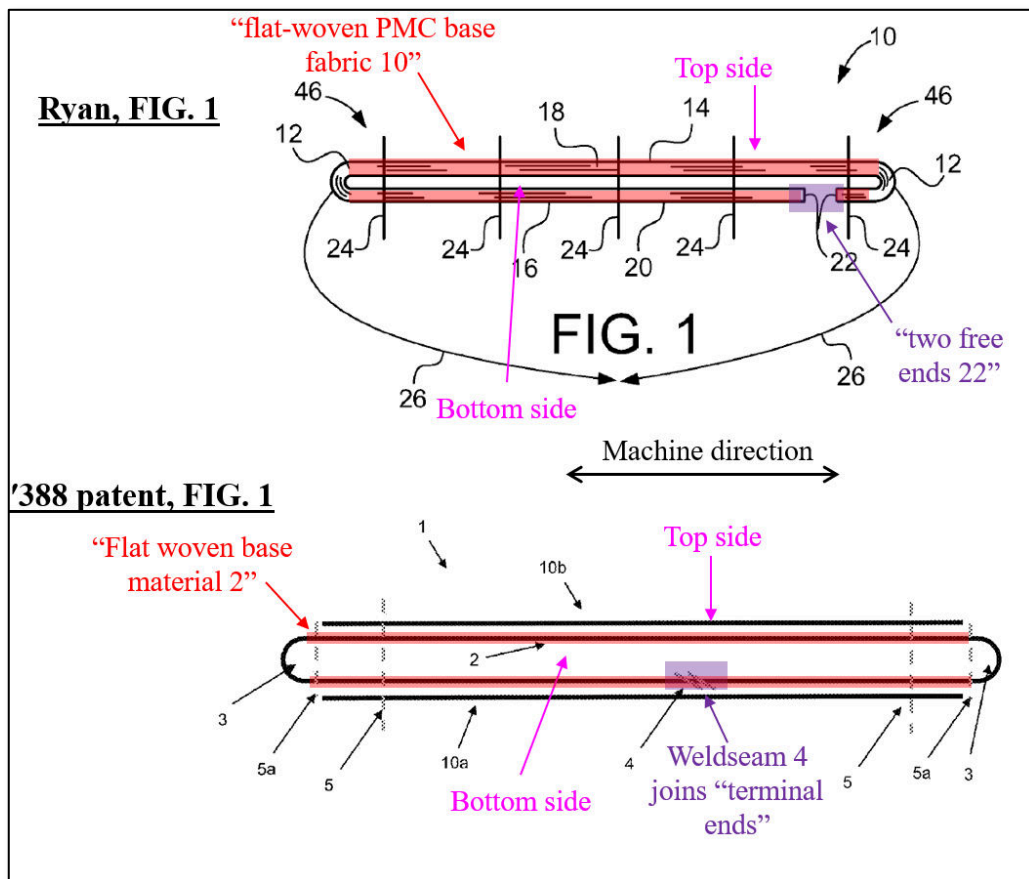
[Ipre]: A fabric for a machine for producing a fiber web, comprising:

To the extent the preamble is limiting, Ryan and Yook each disclose it. EX1006, 1:11-26; EX1007, [0002], [0015], [0029]; EX1003, 76. Yook describes that fabrics are used for producing a fiber web, explaining that "***a cellulosic fibrous web is formed*** by depositing a fibrous slurry...onto a moving ***forming fabric***" in a paper machine.⁴ EX1006, 1:11-14. Similarly, Ryan describes "the PMC base fabric can be used for forming...***a press fabric***" and states that the base fabric "faces the ***web of fibrous material***" during paper-making. EX1007, [0015], [0029]; EX1003, 77.

⁴ Emphasis added unless otherwise noted.

[1a]: a flat woven base material having a top side and a bottom side, two terminal ends separated from one another in a machine direction;

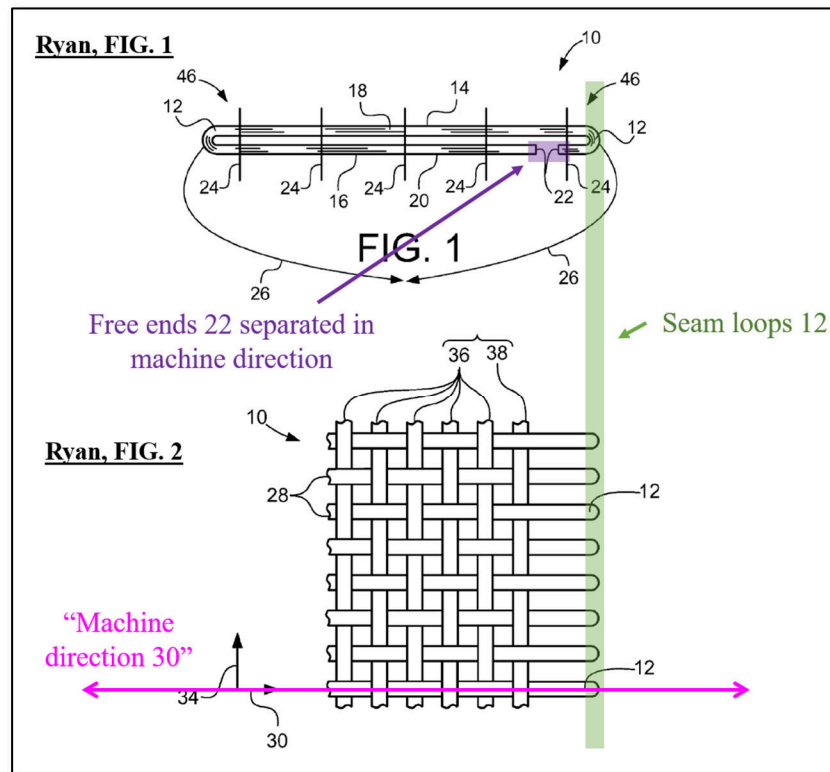
Ryan discloses the flat-woven base material (“flat-woven PMC base fabric 10”) which includes top and bottom sides (top and bottom of red “ply 18,” respectively, i.e., the pink arrows below) and two terminal ends (purple “two free ends 22”). EX1007, [0029], [0030], FIG. 1; EX1003, 78. As shown below, Ryan’s base structure matches that of the ’388 patent. EX1003, 79.



Ryan further discloses that its free ends 22 are separated from one another in a machine direction. EX1007, [0030], FIG. 2; EX1003, 80. The figure below

shows FIG. 1 (side view) and FIG. 2 (top view) aligned at the seam loops 12. *Id.*

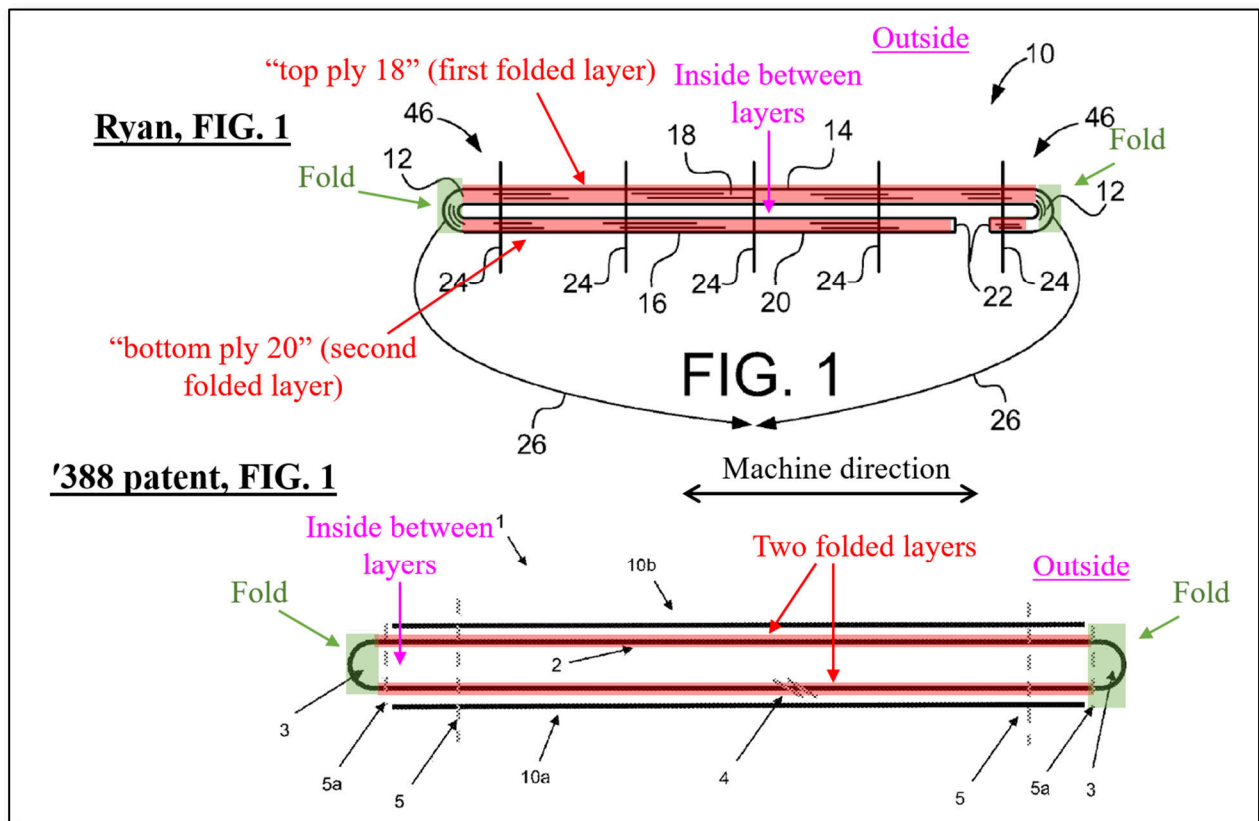
The machine direction 30 (defined by an extension direction of the MD yarns 28) extends left-right, the same direction in which the free ends 22 are separated. *Id.*



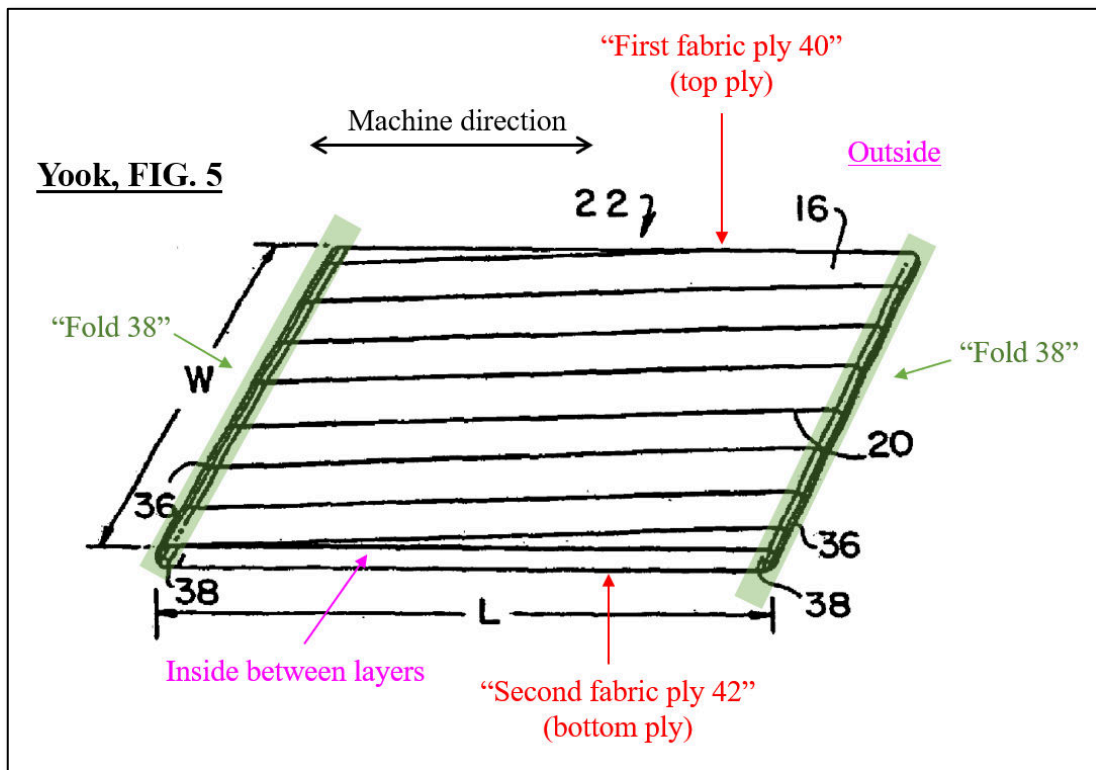
[1b]: said flat woven base material being folded in two folded layers with folds being separated from one another in the machine direction and defining an inside between the two folded layers and an outside;

Both Ryan and Yook teach the folded structure of [1b]. EX1007, [0029]-[0031], FIG. 1; EX1006, 5:61-65, 8:48-58; EX1003, 81. Shown below, Ryan's base fabric 10 "has been folded" at its "seam loops 12" to form "a top ply 18" (first red folded layer) and a "bottom ply 20" (second red folded layer). EX1007, [0029],

[0031], FIG. 1; EX1003, 81. This fold defines an inside between top ply 18 and bottom ply 20, and an outside above top ply 18 and below bottom ply 20. EX1003, 81-82. Ryan's two-layer folded base fabric 10 matches that of the '388 patent base fabric, as shown below. EX1003, 81.



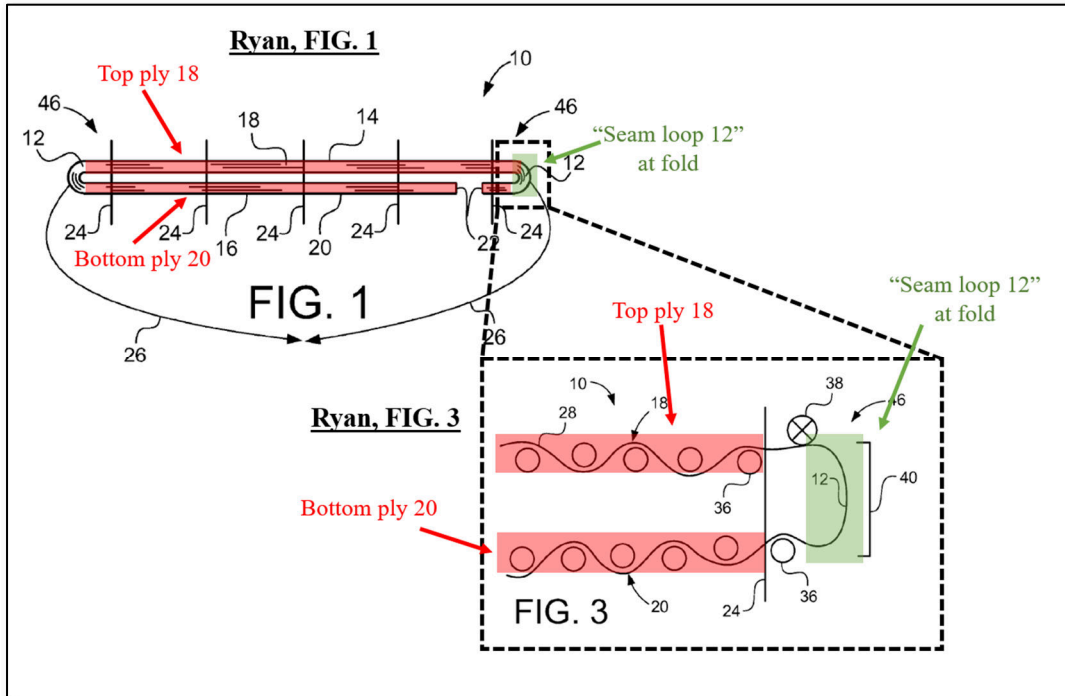
Similarly, Yook describes that a "base fabric layer is flattened to produce [a] first fabric ply and the second fabric ply having two widthwise edges. The first fabric ply and the second fabric ply are connected to one another at folds along the two widthwise edges," shown below. EX1006, 5:61-65; EX1003, 83.



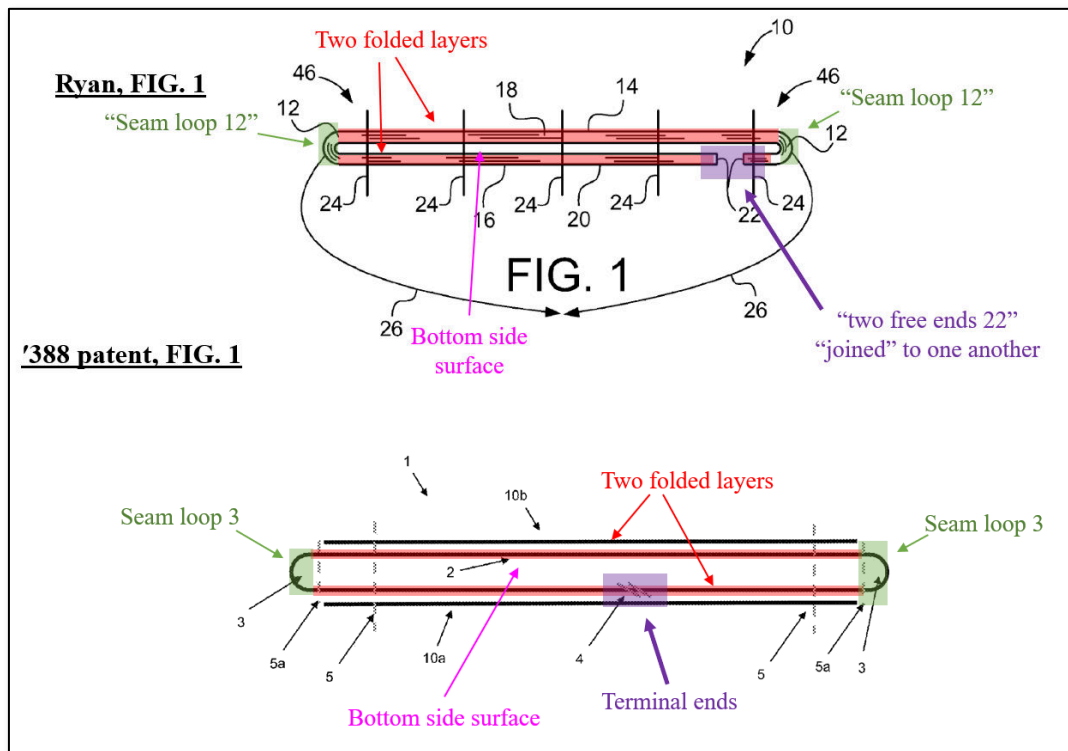
[1c]: said two terminal ends being located under the bottom side surface and said two terminal ends being adjacent one another or overlapping one another, and wherein seam loops are located at said folds; and

Ryan's base fabric 10 has the structure of [1c]. EX1007, [0007], [0012]-[0013], [0029], [0031], [0042]; EX1003, 84. Specifically, Ryan's two terminal ends ("two free ends 22") are located under the bottom side surface (bottom of top ply 18). EX1007, [0029], FIG. 1; EX1003, 84. The two free ends 22 "come together and are joined," such that they are adjacent or overlapping. EX1007, [0042]; EX1003, 84. Moreover, Ryan's base fabric 10 has "seam loops 12" at its folds, as shown below. EX1007, [0007], [0012]-[0013], [0031], FIGS. 1-8;

EX1003, 85. The seam loops are loops formed by the MD yarns where the top and bottom plies meet at a fold. EX1003, 85.



As shown below, Ryan's structure matches that of the '388 patent: each includes seam loops (green) at the folds between top and bottom layers (or plies) (red), and, in each, ends of the folded fabric (purple) are at the bottom and adjacent. EX1003, 86.



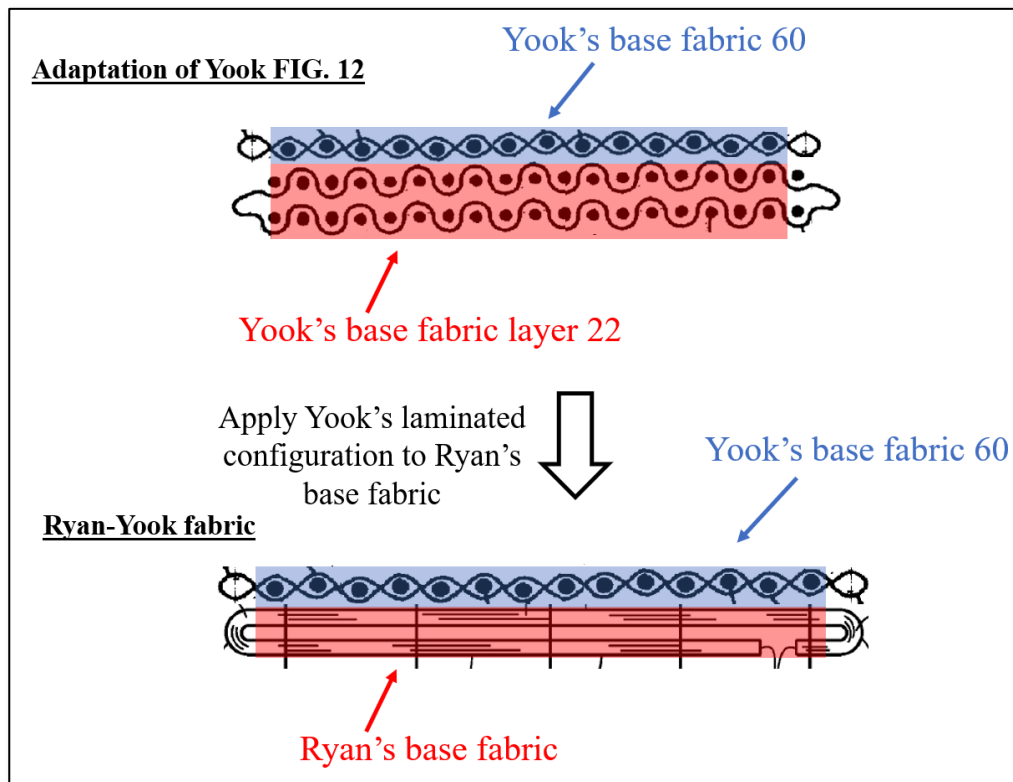
Yook, too, teaches seam loops at the folds of the base fabric. EX1006, 4:47-50; 8:47-58; FIGS. 5-6, 9-16; EX1003, 87. Yook discloses that “[a]t least one crosswise yarn in each of the turns of the fabric strip are *removed at each of the folds* at the two widthwise edges to provide unbound sections of lengthwise yarns of said fabric strip at the folds, the unbound sections being *seaming loops*.” EX1006, 5:65-6:2.

[1d], [1e]: one or more sheet plies, wherein: all of said sheet plies are disposed outside said folded layers; and

Ryan teaches the base fabric of claim 1 (Figure 1’s two-layer folded base fabric 10) but does not explicitly disclose additional sheet plies that are all

“disposed outside said folded layers.” EX1003, 88. It would have been obvious, however, to add Yook’s base fabric 60 to Ryan’s two-layer base fabric 10, to obtain a fabric in which the one or more sheet plies (Yook’s base fabric 60) are exclusively located outside the two-layer base structure. EX1003, 88.

As discussed above in §IV.A.2, the advantages of lamination were well known. It would have been obvious and conventional for a POSITA to realize these advantages by adapting Ryan’s two-layer folded base fabric 10 into a laminated fabric with Yook’s base fabric 60 using Yook’s methods, such that the base fabric 60 constitutes the “one or more sheet plies” of claim 1. EX1003, 88, 98. A combination of Ryan and Yook is illustrated below. EX1003, 98-100.



Applying Yook's laminated configuration to Ryan⁵

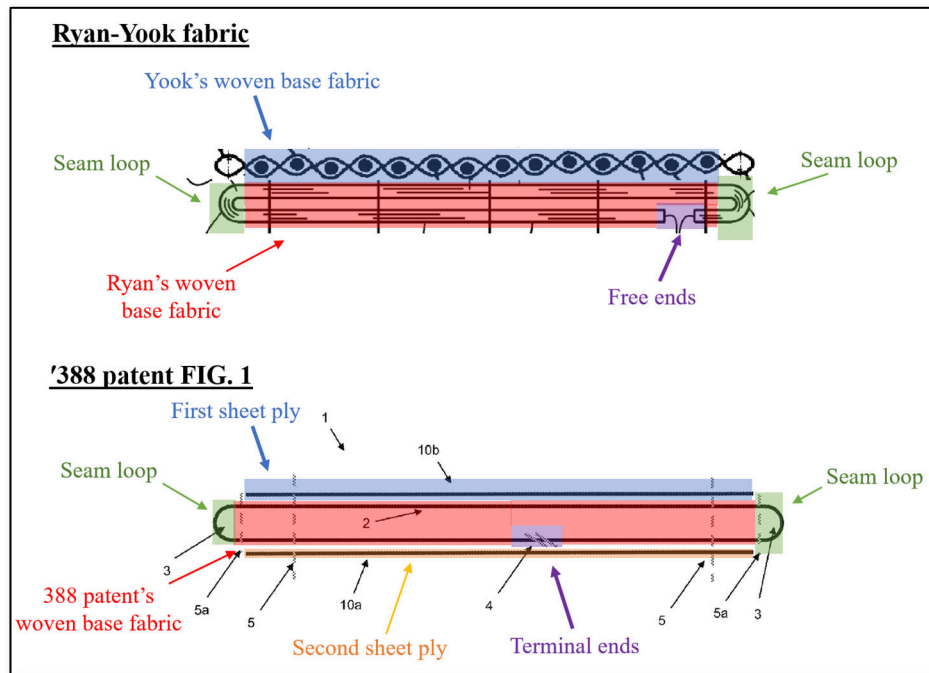
Achieving this combination would have involved simply attaching one fabric to another fabric, a process well within the skill of a POSITA in a predictable art such as fabric manufacture. EX1003, 101. For example, Yook describes that base fabric 60 is “joined” to the underlying base fabric layer 22 by

⁵ The illustrated “Ryan-Yook” fabric is a composite of Ryan FIG. 1 and Yook FIG. 12. EX1003, 99. While Yook's base fabric 60 is selected here, either base fabric 22 or 60 can be laminated to the outside. *See* claim 2; EX1006, 10:16-21; EX1003, 102.

“batt material 80 needled into and through the superimposed” base fabrics.

EX1006, 10:21-27; EX1003, 101. Thus, it would have been obvious for a POSITA to join Yook’s one-layer base fabric 60 to the outside of Ryan’s two-layer base fabric 10 by needling a batt material through both fabrics.⁶ EX1003, 101.

The resulting Ryan-Yook fabric and the matching FIG. 1 fabric of the ’388 patent are shown below.⁷ Here, Yook’s base fabric is “one or more sheet plies,” satisfying [1d] and [1e]. EX1003, 103.



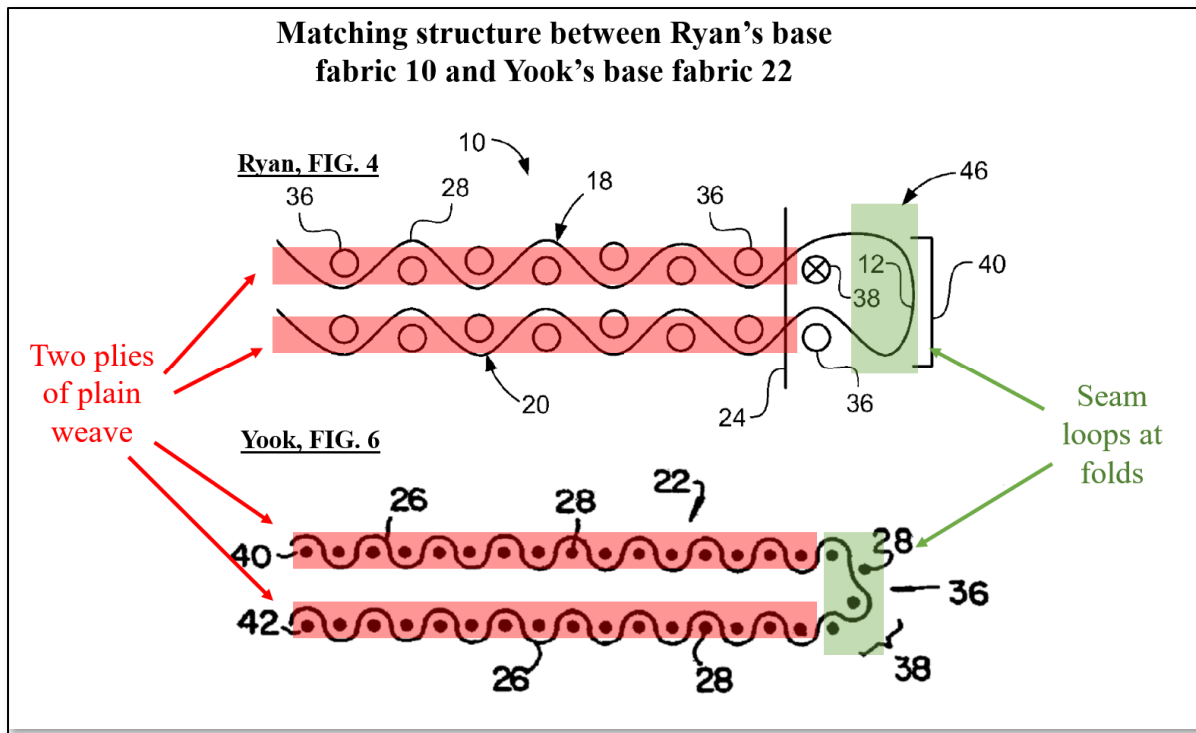
⁶ Batt is being used here to **attach** Yook’s base fabric 60 (i.e. the outer ply) to Ryan’s base fabric 22. Batt is **not** the claimed “plies...disposed outside[.]”

⁷ For clarity, the needled batt material is omitted.

Under *KSR*, the addition of Yook’s woven base fabric to Ryan’s woven base fabric would have been obvious as “the mere application of a known technique to a piece of prior art ready for the improvement.” *KSR*, 550 U.S. at 417. In this case, the “known technique” is base fabric lamination, or the joining of multiple base fabrics to one another, as taught by Yook and corroborated widely in the art. EX1003, 104. The “improvement” is the increased void volume and other advantages that the art widely recognized as being provided by laminated fabrics, discussed above in §IV.A.2. *Id.* And the “piece of prior art ready for the improvement” is Ryan’s two-layer folded base fabric, which, as a press fabric, is the very type of fabric that Yook and others teach should be laminated. *Id.*

A POSITA would have had a reasonable expectation of success in obtaining the Ryan-Yook laminated structure. *Id.*, 105. The means for joining Ryan’s and Yook’s base fabrics—needling with batt—was standard. *Id.* Indeed, batt was almost universally included in press fabrics. *Id.* For example, Adanur explains that “[p]ress fabrics, in general, consist of two components []: base fabric and batt.” EX1011, 45; EX1003, 105. Further, “[t]he process in which the batt is locked to the base fabric is called *needling*,” the same process Yook uses. EX1011, 46; EX1003, 105. Accordingly, attaching Yook’s base fabric to Ryan’s would have involved no more than a process (needling) that, practically, would have been performed on Ryan’s base fabric *anyway*. EX1003, 105.

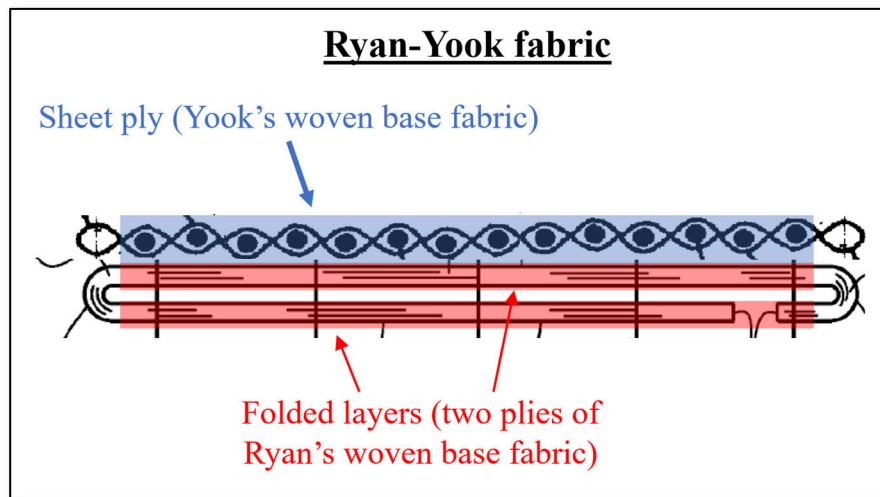
Further, Ryan's two-layer base fabric 10 is similar to Yook's two-layer base fabric layer 22, such that a POSITA would have reasonably expected that the lamination of Yook's base fabric 60 to Ryan's base fabric would have been successful. *Id.*, 106. As shown below, both Ryan's base fabric 10 and Yook's base fabric layer 22 are a folded, two-layer plain weave structure, with seam loops at their folds. *Id.*, 106-107.



The fabrics differ in that Yook's fabric is multiaxial (spiral-wound) whereas Ryan's is not; this difference, however, would not have impeded a POSITA in making the combination. EX1003, 108. Indeed, Dr. Pastore explains that lamination to Ryan's base fabric would likely have been *easier* than lamination to Yook's fabric, "because Ryan's fabric presents square edges with CD yarns

extending parallel to the fold, compared to angled CD yarns in Yook's multiaxial fabric." *Id.*, 109. Therefore, lamination of Yook's base fabric 60 to Ryan's base fabric 10 would have involved only substituting one base fabric for another, very similar base fabric, giving a POSITA a reasonable expectation of success in meeting this limitation. *Id.*, 110.

Accordingly, a POSITA would have arrived at the Ryan-Yook fabric, which has one or more sheet plies disposed outside the folded layers, satisfying [1d] and [1e]. *Id.*, 110-113.



[1f]: one, some or all of the sheet plies consist of or comprise a woven material or a non-woven component selected from the group consisting of a polymer film, a foam layer, a knitted structure and a warp-knit structure.

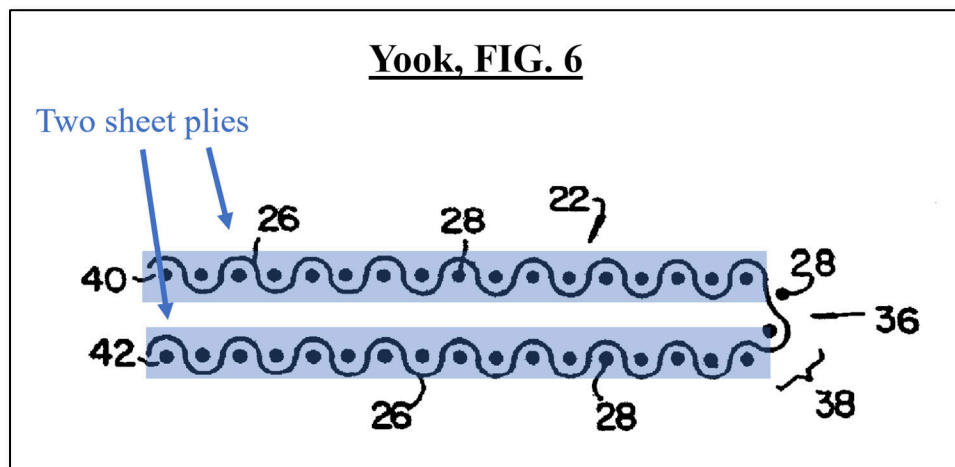
Yook's base fabric 60 (the "sheet ply" in the Ryan-Yook fabric) is a woven material (e.g., layers "may be **woven** from monofilament...or multifilament

yarns”), satisfying [1f]. EX1006, 10:9-13; EX1003, 114.

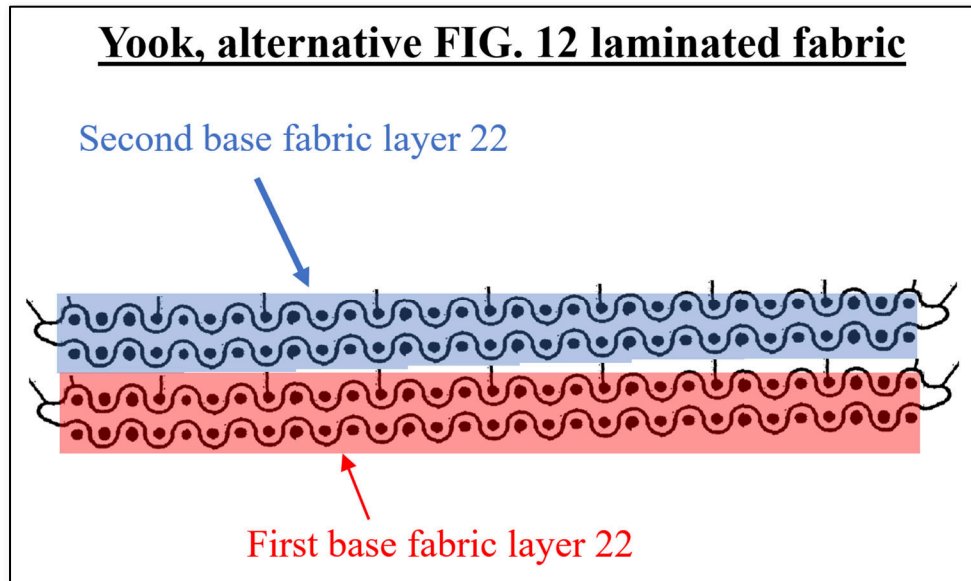
(b) Claim 2

[2]: The fabric according to claim 1, wherein said one or more sheet plies are two or more sheet plies.

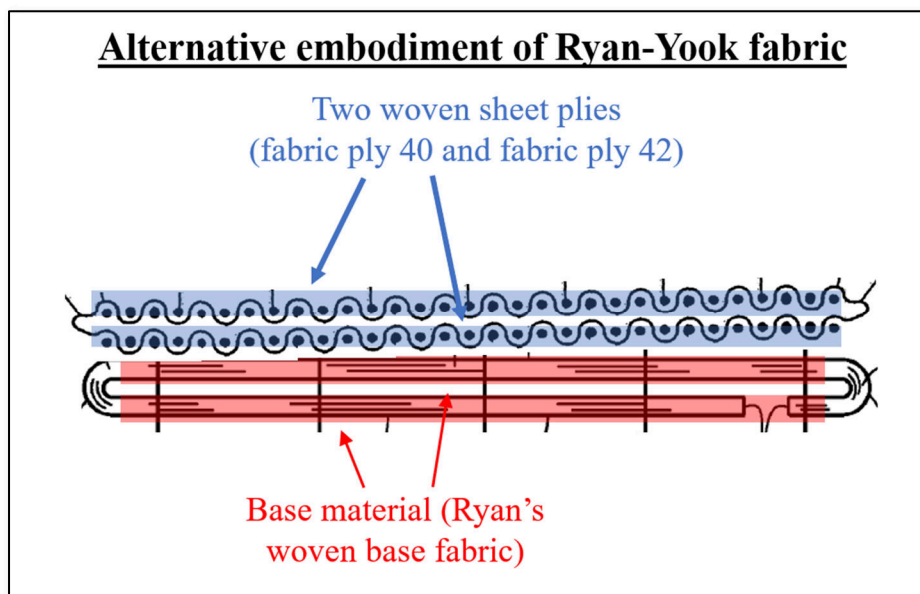
In view of Yook’s disclosure that base fabric 60 can be replaced by base fabric layer 22 in Yook’s laminated structure, it would have been obvious to use the **two-ply** fabric layer 22 in the laminated Ryan-Yook fabric, thereby providing two or more sheet plies and satisfying [2]. EX1006, 8:39-58, 10:19-21; EX1003, 115. Specifically, although the foregoing discussion with respect to claim 1 was based on the use of Yook’s base fabric 60, Yook also describes that “[a]lternatively, a second on-machine seamable base fabric layer 22 may be used instead[.]” EX1006, 10:19-21; EX1003, 116. The base fabric layer 22 is “a **two-ply fabric**.” EX1006, 8:39-40. It includes “a first fabric ply 40 and a second fabric ply 42,” shown below. EX1006, 8:56-57.



Yook's alternative laminated structure includes two base fabric layers 22 and is shown below as an adaptation of Yook FIGS. 6 and 12. EX1003, 117.



Laminating the two-ply fabric 22 to Ryan's base fabric 10, to achieve the advantages of lamination as discussed with respect to claim 1, would result in two sheet plies in the Ryan-Yook fabric, as shown below. EX1003, 118.



(c) **Claim 3**

[3]: The fabric according to claim 1, configured for producing a fiber web selected from the group consisting of a paper web, a cardboard web, a tissue web and a pulp web.

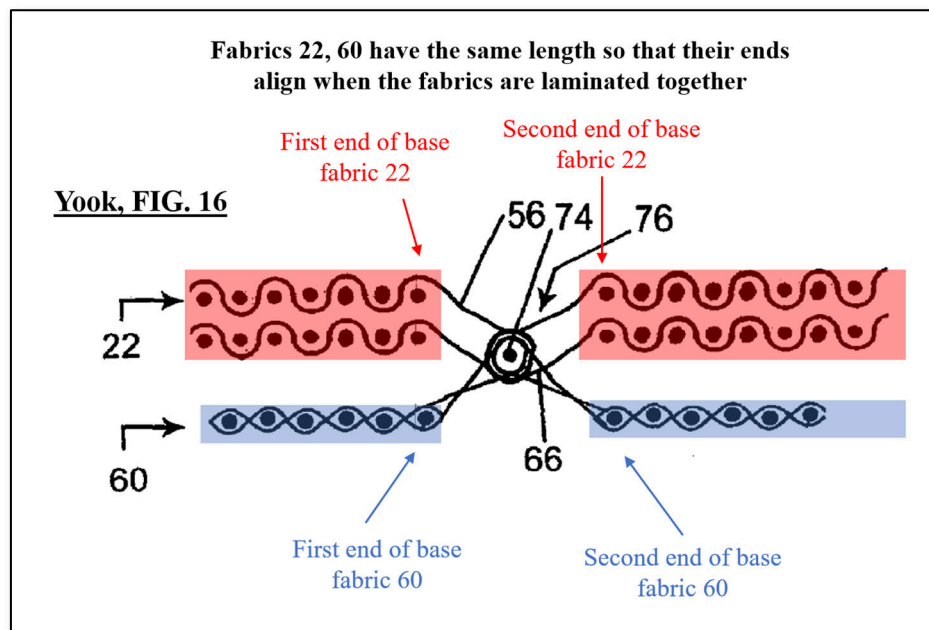
Each of Ryan and Yook discloses that their fabric is configured for producing a paper web, i.e., a fibrous web that is used to make paper. EX1006, 1:11-26; EX1007, [0006], [0029]; EX1003, 119. For example, Yook explains that forming fabrics and press fabrics are used for producing a paper web: “[d]uring the **papermaking** process, **a cellulosic fibrous web is formed** by depositing a fibrous slurry...onto a moving **forming fabric** in the forming section of a paper machine....The cellulosic fibrous web passes through the press nips **supported by a press fabric**...to **turn the cellulosic fibrous web into a paper sheet.**” EX1006, 1:11-26; EX1003, 119. Ryan similarly describes that press fabrics carry a “fibrous web” in a paper making machine. EX1007, [0006], [0029]; EX1003, 119.

(d) **Claim 4**

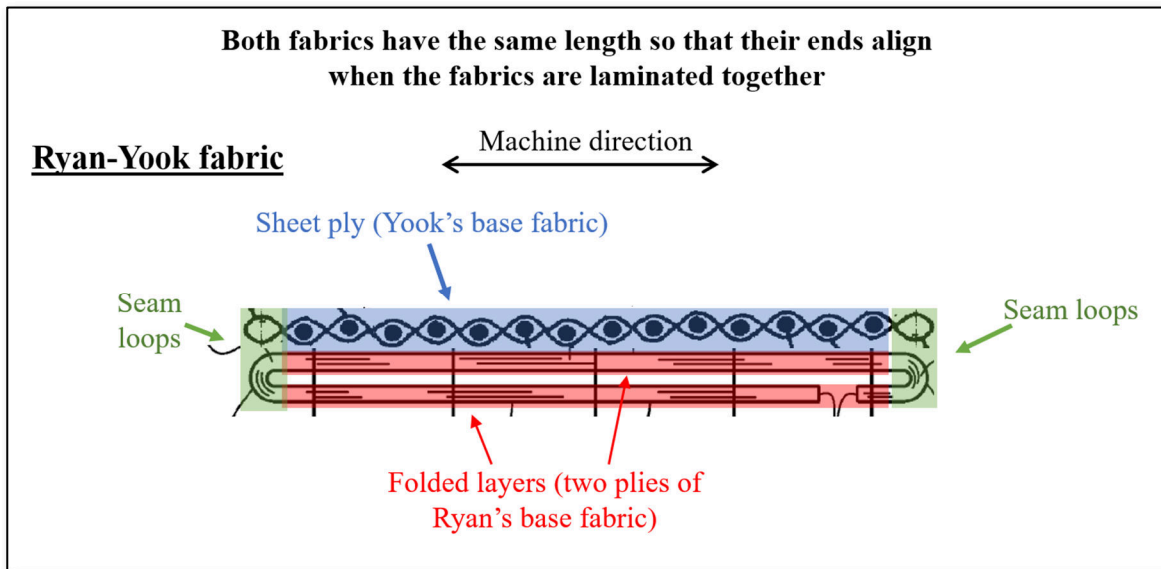
[4]: The fabric according to claim 1, wherein said sheet plies have a width substantially equal to a width in cross machine direction as the fabric and/or said sheet plies have a length substantially equal to a length in the machine direction as the fabric.

Ryan and Yook disclose or render obvious the substantially equal width and length. EX1006, 6:5-8, 2:52-57; EX1003, 120. The '388 patent defines “essentially the same width” or “essentially the same length” as being within 10% (“not less than 90% and not more than 110% of the width in cross machine direction [or length in machine direction] of the fabric”). EX1001, 2:59-3:4; EX1003, 120. Although “substantially equal” is not defined, the art cited herein satisfies or renders obvious this “essentially the same” relationship. *Id.*

With respect to the length, Yook discloses that two base fabrics (such as the laminated base fabrics of the Ryan-Yook fabric) should have “substantially the same length” in the machine direction. EX1006, 6:5-8; EX1003, 121. Dr. Pastore explains that this configuration permits pintle of the aligned base fabrics having the same length. EX1006, 10:31-11:9; FIGS. 13-16; EX1003, 122-123.



It would have been obvious for a POSITA to apply this teaching to the laminated Ryan-Yook fabric, such that the fabric's sheet ply (Yook's base fabric 60) would have a length substantially equal to that of "the fabric" (Ryan's base fabric 10), as shown below. EX1003, 123.



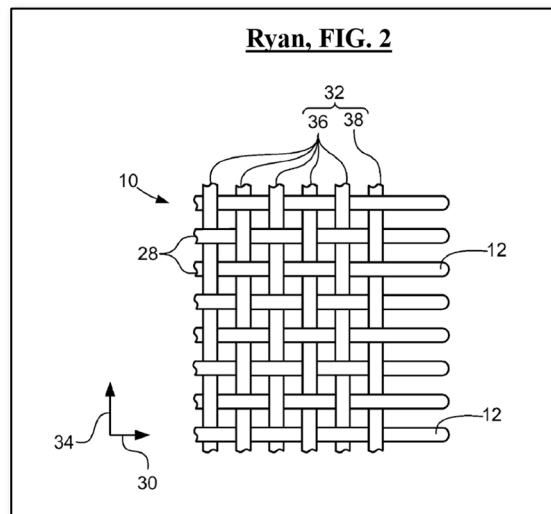
It would also have been obvious for a POSITA to provide Yook's base fabric with a cross-machine direction width substantially matching Ryan's base fabric. EX1003, 124. Yook teaches that "press fabrics are designed to have smooth surfaces...so that...a smooth, mark-free surface is imparted to the paper." EX1006, 1:52-55. A POSITA would have recognized that having the laminated-on base fabric's width match the underlying base fabric's width, so as to fully cover the underlying base fabric, would avoid forming "steps" in the fabric surface, thereby improving the surface uniformity Yook teaches is desirable. EX1003, 124-125.

(e) **Claims 5, 6**

[5]: *The fabric according to claim 1, wherein said woven base material is a one-layer weave.*

[6]: *The fabric according to claim 5, wherein said woven base material is a plain weave.*

Ryan and Yook both disclose a one-layer plain weave as the woven base material. EX1007, [0034], FIGS. 2-8; EX1006, 2:4-7, 8:9-14, FIG. 6; EX1003, 126.⁸ Ryan's "fabric 10 can be a ***single-layered fabric***." EX1007, [0034]; *see also id.*, FIGS. 2-8. EX1003, 127. Additionally, FIG. 2 (below) shows MD yarns 28 and CD yarns 32 arranged in a simple, right-angled crisscross pattern that a POSITA would have recognized as a plain weave. EX1007, FIG. 2; EX1003, 127-128.



⁸ The woven base material forms the base structure on which the sheet plies are attached. EX1001, 4:40-5:3; EX1003, 126.

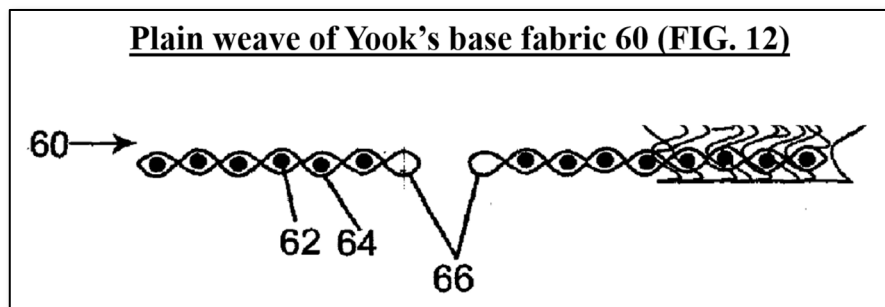
Further, Yook (i) describes that “base fabrics...may be *single-layered*” and (ii) describes a “*single-layer weave*” and “*plain weave*” for the base fabric layer 22 to which base fabric 60 is laminated. EX1006, 2:4-6, 8:9-14, FIG. 6; EX1003, 129.

(f) Claims 7, 8

[7]: The fabric according to claim 1, wherein said woven material is a one-layer weave.

[8]: The fabric according to claim 7, wherein said one-layer weave is a plain weave.

The “woven material” of the sheet ply (Yook’s base fabric 60) in the Ryan-Yook fabric is a “one-layer” “plain” weave. EX1006, 8:9-14, 9:56-61, FIGS. 11-12; EX1003, 130-131. Yook’s FIG. 12 (below) shows the base fabric 60 has one layer of crosswise yarns 62 and lengthwise yarns 64 crossing at right angles, with the lengthwise yarns 64 following an over/under/over/under pattern with respect to the crosswise yarns 62; i.e., a single-layer plain weave. EX1006, 9:56-61, 10:16-18, FIG. 12; EX1003, 130.



(g) **Claim 9**

[9]: The fabric according to claim 1, wherein said woven base material and one, some or all of said sheet plies are formed of a same woven material.

Yook's base fabric 60 is formed, or would have been obvious to have been formed, of a same woven material as Ryan's base fabric 10 (the "woven base material" of the Ryan-Yook fabric). EX1006, 2:5-9, 10:9-21; EX1007, [0030]-[0031]; EX1003, 132. As discussed for claims 5-8, both fabrics are composed of a one-layer plain weave. EX1007, [0034], FIGS. 2-8; EX1006, 8:9-14, 9:56-61, FIGS. 11-12; EX1003, 132-134.

Ryan's and Yook's fabrics also use the same yarn compositions. EX1003, 135. Ryan's yarns "may include ***any manmade material***, such as nylon, ***polyester***, or other types of poly-yarns," and can specifically include "monofilament yarns 36." EX1007, [0030]-[0031]; EX1003, 135. Likewise, Yook's yarns may be "monofilament, plied monofilament multifilament or plied multifilament yarns" and "are typically extruded from any one of several synthetic polymeric resins, such as polyamide and ***polyester*** resins." EX1006, 2:5-9, 10:9-15. Moreover, like Ryan's yarns, Yook's "yarns...are preferably monofilament yarns." *Id.*, 10:13-15; EX1003, 135.

Given these overlapping and broad descriptions of yarn composition, it would have been obvious for a POSITA to use the same yarns for both base fabrics

of the Ryan-Yook fabric, to simplify manufacture by permitting the same yarn supply and tool configurations to be used for the weaving of both base fabrics. EX1003, 136. This configuration would also advantageously result in both base fabrics having the same mechanical and hydrothermal responses, so that one would not deform significantly more or less than the other. *Id.* Indeed, Yook teaches a laminated structure that includes two identical base fabrics 22. EX1006, 10:19-21; EX1003, 137.

Accordingly, it would have been obvious to form the Ryan-Yook fabric with Ryan's fabric 10 and Yook's fabric 60 having the same yarn composition and same weave structure, i.e. having the sheet plies and base material "*formed of a same woven material.*" EX1003, 138.

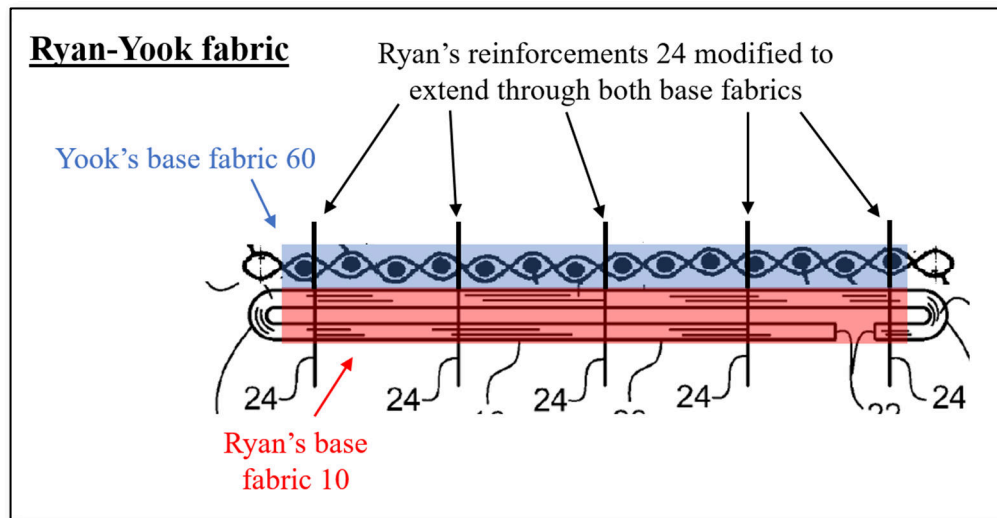
(h) Claim 10

[10]: The fabric according to claim 1, which comprises one or more stitchings for securing said sheet plies to said woven base material.

It would have been obvious to join Yook's base fabric 60 (sheet ply) to Ryan's folded base fabric 10 (woven base material) using the stitchings already present in Ryan. EX1007, [0029], [0031], [0040], [0042]; EX1003, 139.

Specifically, Ryan already discloses "reinforcements 24" ("seam stitching") that "assist[s] in securing bottom ply 20 to top ply 20[sic, 18]." EX1007, [0029], [0031]; EX1003, 139. It would have been obvious to provide the reinforcements 24

through **both** the base fabric 10 **and** the base fabric 60 in the laminated Ryan-Yook fabric to better secure the base fabrics to one another, as shown below. EX1003, 139.



Indeed, stitching together laminated base fabrics was well known in the art. EX1003, 140; EX1022, 5:36-40, 7:44-46; EX1015, [0062], [0104], FIG. 15.

In addition, a POSITA would have recognized that the reinforcements 24 would advantageously reduce drift of CD yarns adjacent to the seam loops of Yook's base fabric. *See* EX1008, FIG. 5, [0005], [0011]; EX1003, 141.

A POSITA would have had a reasonable expectation of success in making this modification. EX1003, 142. As Dr. Pastore explains, Ryan's reinforcements 24 are stitched after the base fabric is folded into the two-layer base fabric 10, as opposed to during weaving of the base fabric 10. *Id.* This method would be highly compatible with stitching of the reinforcements through **both** base fabrics 10 and

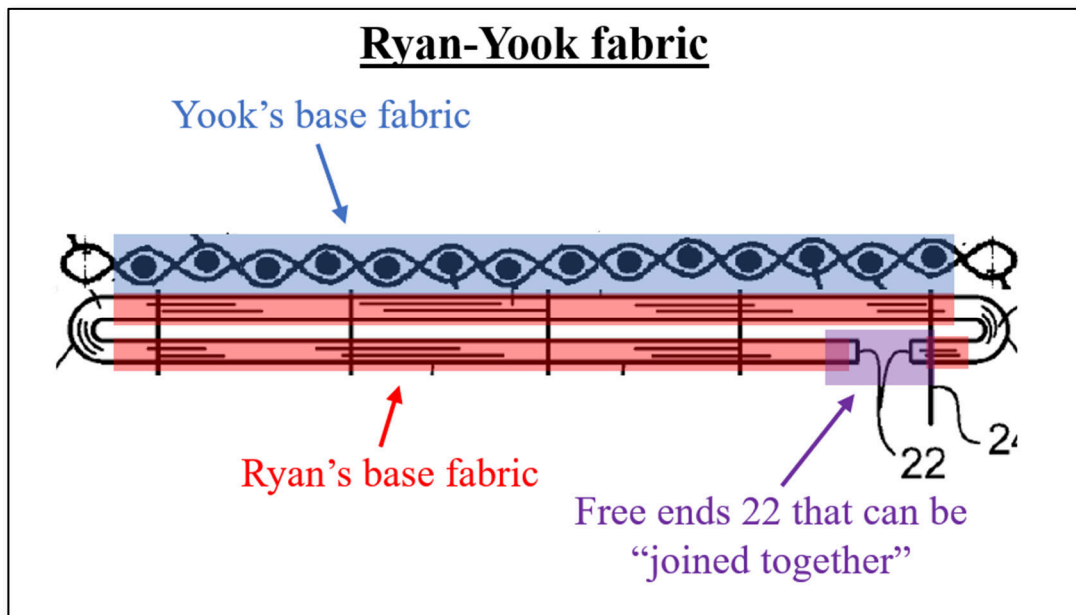
60. A POSITA would have performed the stitching after placement of the base fabrics 10 and 60 against one another, without requiring any fundamental modifications to the reinforcements 24, the base fabrics, or their manufacture. *Id.* Moreover, reinforcements 24 may include a wide variety of stitch types, stitch patterns, and yarn materials, and may be located at various locations. EX1003, 143. A POSITA would have had no trouble adapting this highly flexible system to stitch through multiple base fabrics. EX1007, [0040], [0042]; EX1003, 144.

The stitched reinforcements 24 of this modified Ryan-Yook fabric would join Yook's one-layer base fabric 60 (sheet ply) to Ryan's two-layer folded base fabric 10 (woven base material), satisfying [10]. EX1003, 145.

(i) Claim 11

[11]: The fabric according to claim 1, wherein said two terminal ends are at least temporarily connected to one another.

Ryan describes that “free ends 22 can come together and ***be joined together***,” satisfying [11]. EX1007, [0029], [0042], FIG. 1; EX1003, 146.



(i) **Claim 12**

[12]: The fabric according to claim 11, wherein said two terminal ends are connected to one another by a process selected from the group consisting of welded, stitching, and gluing.

Although Ryan does not explicitly disclose how the free ends 22 are “joined together,” it would have been obvious for a POSITA to use welding, stitching, or gluing—all well-known methods to which the ’388 patent does not ascribe any particular advantages or unexpected effects—to secure the free ends together.

EX1007, [0039]; EX1006, 2:63-3:3; EX1003, 147-148. For example, Ryan describes that “stitching,” “ultrasonic welding,” or “gluing” can be used to bond together the top and bottom ply of the fabric. EX1007, [0039]; EX1003, 149. And Yook describes that “stitching,” “welding (e.g., ultrasonic) or gluing” can be used

to bond together adjacent windings of Yook's spiral-wound base fabric. EX1006, 2:63-3:3; EX1003, 150. Bonding together adjacent windings is practically identical to bonding together the free ends 22, because both processes involve attaching adjacent fabric edges. EX1003, 150.

The use of any of these methods would have been a selection of one of a "finite number of identified, predictable solutions" to achieve the predictable result of joining the free ends 22 together. *KSR*, 550 U.S. at 421; EX1003, 151.

(k) Claim 13

[13]: The fabric according to claim 1, which further comprises at least one layer of batt fibers.

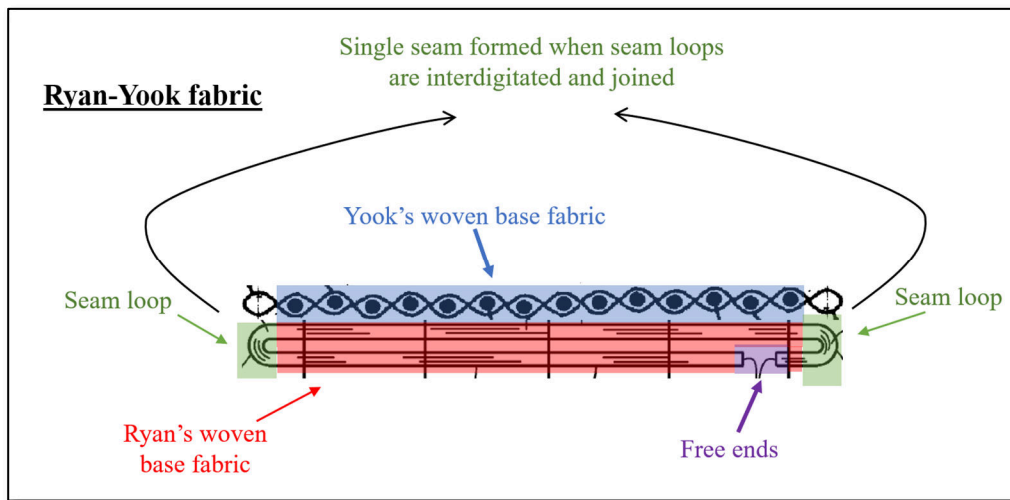
As discussed for claim 1, the Ryan-Yook fabric includes "one or more layers of staple fiber batt material 80 needled into and through" Ryan's base fabric and Yook's base fabric, to secure the base fabrics together. EX1006, 10:24-25; EX1003, 152. Yook teaches attaching the base fabrics "by one or more layers of staple fiber batt material 80 needled into and through the superimposed [base fabrics]." EX1006, 10:24-27; EX1003, 152. Additionally, inclusion of at least one layer of batt fibers was a conventional, near-universal feature of press fabrics, and would have been obvious to add to the Ryan-Yook fabric. EX1003, 153.

(l) Claim 14

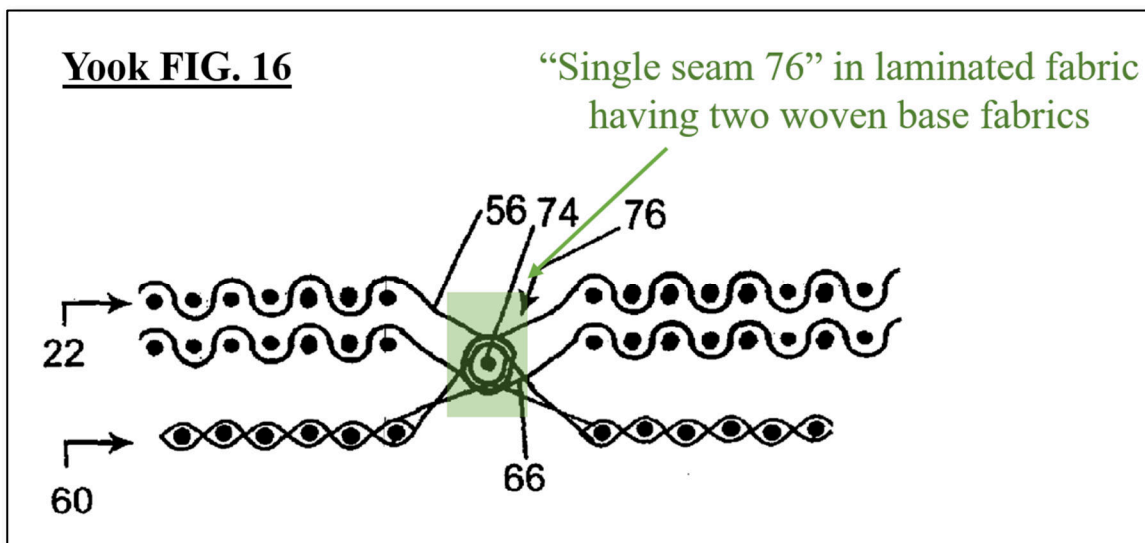
[14]: The fabric according to claim 1, wherein the fabric is configured to be on-machine seamable and comprises only one seam.

The Ryan-Yook fabric is on-machine seamable. EX1007, [0006]; EX1006, 10:16-11:9, FIGS. 12-16; EX1003, 154-158. Ryan describes that “[f]or installation in a paper machine [], the two ends are separated such that the fabric can be pulled in its direction of movement into the machine, after which the two belt longitudinal ends can then be joined together again.” EX1007, [0006]. A POSITA would have recognized this as a description of on-machine seaming. EX1003, 154. Similarly, Yook discloses that its base fabric is “on-machine seamable” and provides detailed guidance on effective on-machine seaming. EX1006, 10:16-11:9, FIGS. 12-16; EX1003, 155. *See also* EX1011, 51.

Further, the Ryan-Yook fabric includes only one seam. EX1003, 156-158. This claim limitation appears to refer to the single seam formed using the ’388 patent’s seam loops. EX1001, 2:32-34; EX1003, 156. The Ryan-Yook fabric similarly includes one seam formed by seam loops 12 when interdigitated and pintle inserted. EX1007, [0006]; EX1003, 156.



The one seam can also be a “single seam” as described for Yook FIG. 16. EX1006, 11:4-9, FIG. 16; EX1003, 156. This “single seam” is formed by seam loops in two laminated-together woven base fabrics, matching the Ryan-Yook fabric. EX1003, 156.



(m) Claim 15

[15]: A method for producing a fiber web, providing a web-producing machine with at least one fabric according to claim 1.

Both Ryan and Yook disclose this method. EX1007, [0006], [0029]; EX1006, 1:18-28, 1:46-55; 1:67-2:1; EX1003, 159. Claim 1 is met as discussed above. EX1003, 159. Ryan and Yook also describe “a method for producing a fiber web” that includes “providing a web-producing machine” with the fabric. EX1003, 159. Ryan describes “install[ing]” a press fabric (such as the Ryan-Yook fabric) “in a paper machine” with “the fabric [] pulled in its direction of movement into the machine.” EX1007, [0006]; EX1003, 159. Ryan also describes processing a “web of fibrous material (or a nascent such web)...when [the fabric] is used in a paper making machine,” for example, by performing “dewatering.” EX1007, [0006], [0029]; EX1003, 160.

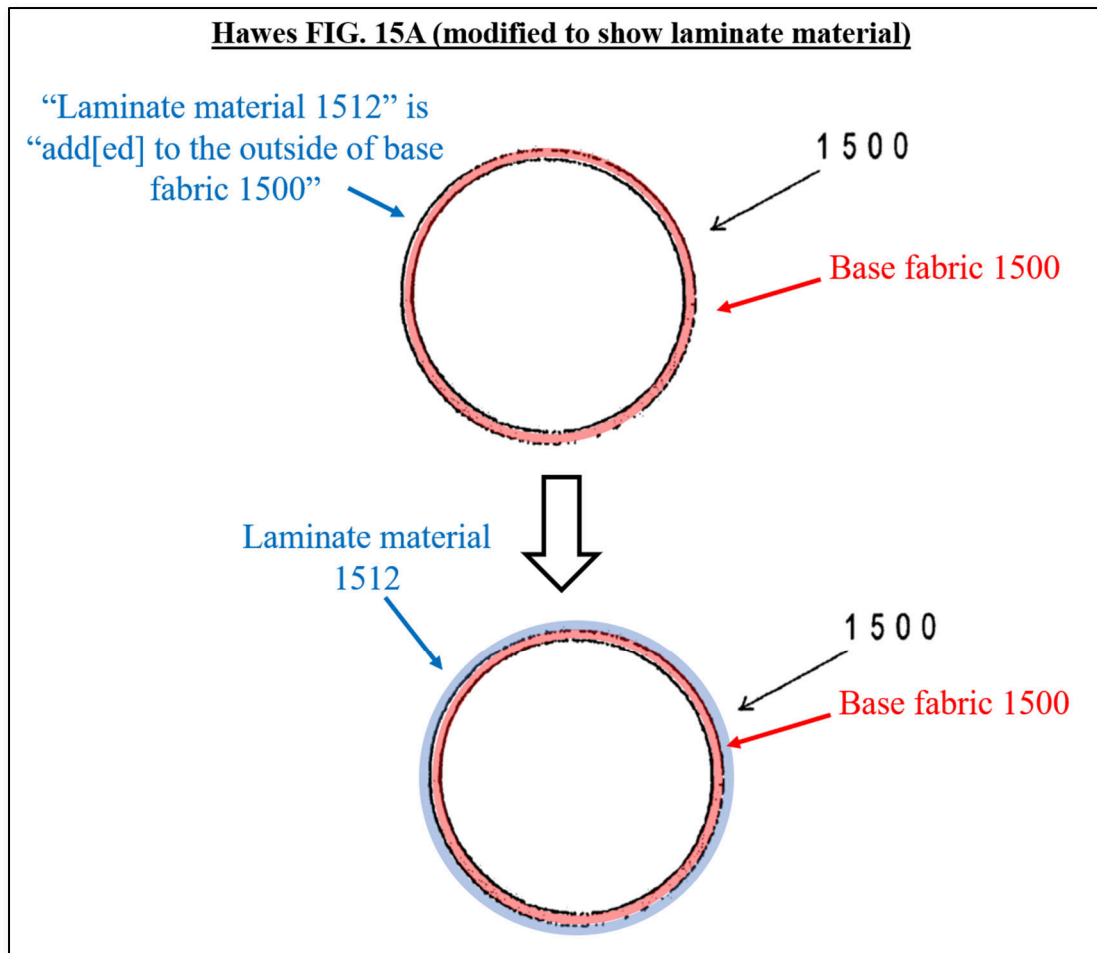
Similarly, Yook describes “install[ing]” press fabrics on “paper machines,” “support[ing]” and “carry[ing]” a “cellulosic fibrous web” on the press fabrics, and thereby “turn[ing] the cellulosic fibrous web into a paper sheet.” EX1006, 1:18-28, 1:46-55; 1:67-2:1; EX1003, 161.

B. [GROUND 2A] – Hawes-Crook Renders Claims 1-15 Unpatentable

1. Hawes

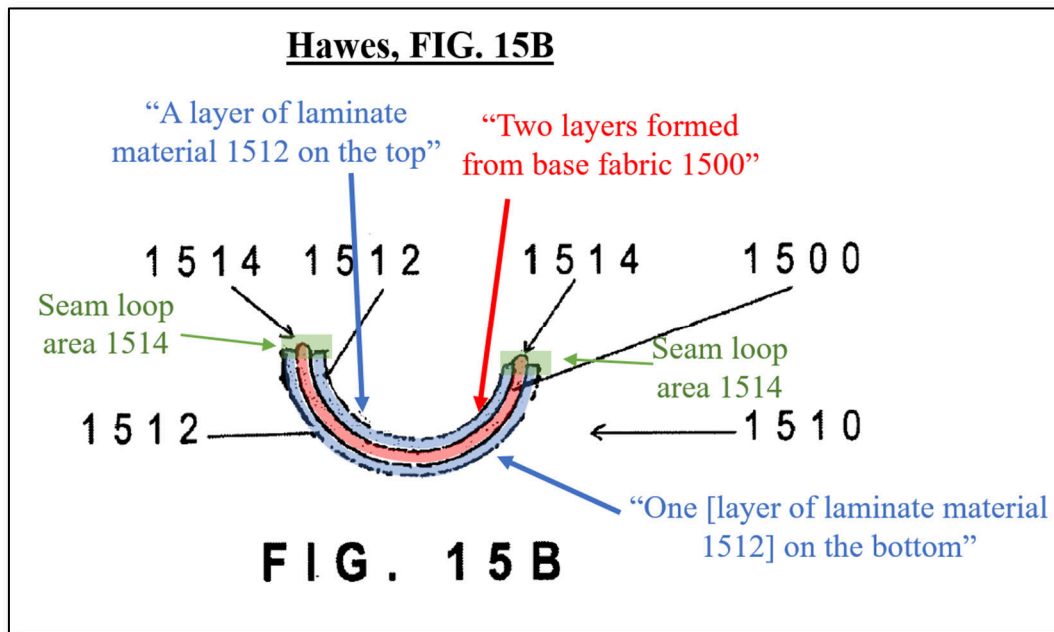
Hawes describes “multilayer” or “laminated” fabrics “for a paper machine.”

EX1004, 3:36-4:57; EX1003, 162. Hawes describes an embodiment that “involves a laminate material which becomes part of a multilayer fabric with a multiaxial base.” EX1004, 4:47-49. As shown below, a “multilayer fabric 1510” is obtained by first “adding a laminate material 1512” (blue) “to the outside of base fabric 1500” (red) “and needling the fabric with laminate to attach the same.” EX1004, 11:39-42; FIG. 15A; EX1003, 162-164.



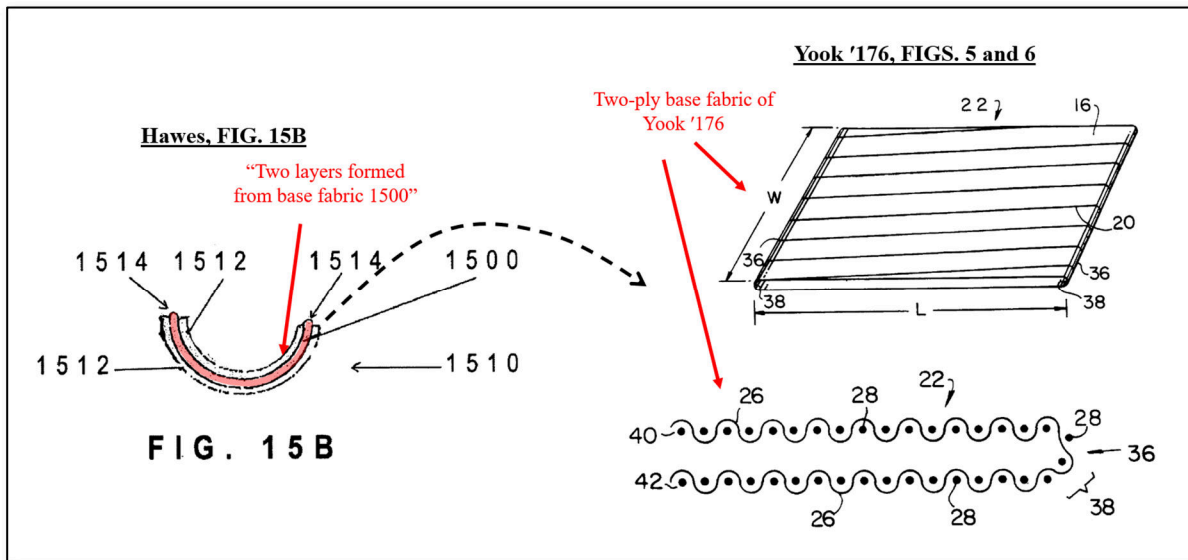
After further processing, the “multilayer fabric 1510” fabric is obtained, shown below. EX1004, 11:40-52; EX1003, 165. This fabric 1510 has “two layers

formed from base fabric 1500 and a layer of laminate material 1512 on the top and one on the bottom.” *Id.*, 11:49-52. The fabric 1510 also has seam “loop area[s] 1514”. *Id.*, 11:46-47.



The base fabric 1500 is two layers because the base fabric 1500 is an “endless single layer multiaxial base fabric” as described in “the ’176 patent,” (U.S. Pat. No. 5,939,176), referred to herein as “Yook ’176” and discussed throughout Hawes. *See, e.g.*, EX1004, 4:20-27, 6:3-44, 11:32-37; EX1003, 166. Yook ’176 describes forming an “endless base fabric layer” “by spirally winding a fabric strip in a plurality of contiguous turns, each of which abuts against and is attached to those adjacent thereto.” EX1016, Abstract; EX1003, 43-44, 167-170. Thus, Hawes’ fabric is not “endless-woven,” but is manufactured directly in endless form through spiral-winding, resulting in an endless fabric analogous to

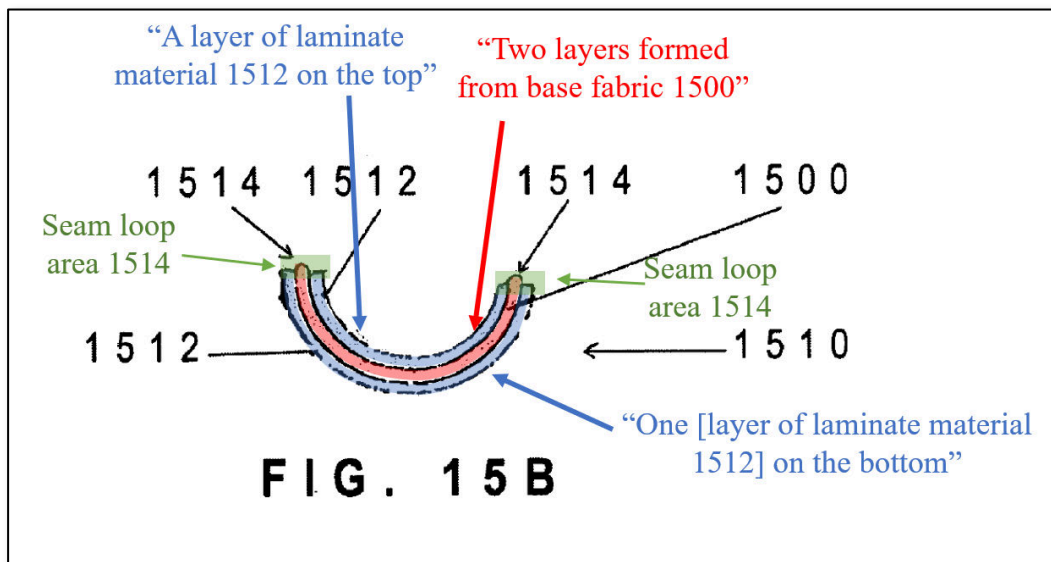
endless-woven fabrics. EX1003, 168. The result is a “two-ply” fabric, i.e. “two layers” of base fabric 1500. EX1003, 171. As shown below, this base fabric is the same as Yook’s “base fabric layer 22” discussed above. EX1016, 6:16-18; EX1003, 171; *see* §IV.A.4(a).



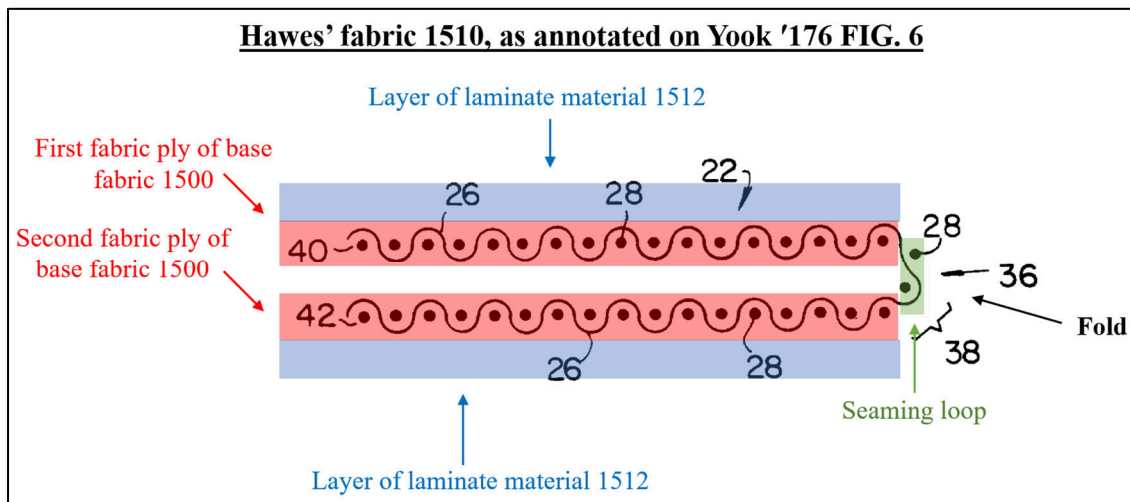
After Hawes’ laminate material 1512 is needled to the outside of base fabric 1500, “the laminate material [is] cut away in the loop area 1514,” “[t]he fabric 1510 is folded on itself as shown and then seamed in a manner as taught in the ’176 patent.” EX1004, 11:46-49; EX1003, 172. As Dr. Pastore explains, the ’176 patent teaches forming seam loops at the folds of the fabric 1500, the same as in Ryan, Yook, and the ’388 patent. EX1003, 173-176.

As shown in FIG. 15B, “[t]he resulting fabric 1510 would have two layers formed from base fabric 1500 and a layer of laminate material 1512 on the top and one on the bottom.” EX1004, 11:49-52. Seam loops are located at “loop areas

1514” where the fabric 1510 is folded. EX1003, 177. As Dr. Pastore notes, “this is exactly the structure of claim 1 of the ’388 Patent, except that the base fabric 1500 is spiral-wound into endless form instead of having terminal ends separated in the machine direction.” EX1003, 177-178.



For clarity, one edge of Hawes’ fabric 1510 is depicted below as an adaptation of Yook ’176’s base fabric layer 22, showing the folding and seaming described in Yook ’176. EX1003, 179. An opposite edge would have the same structure. *Id.*



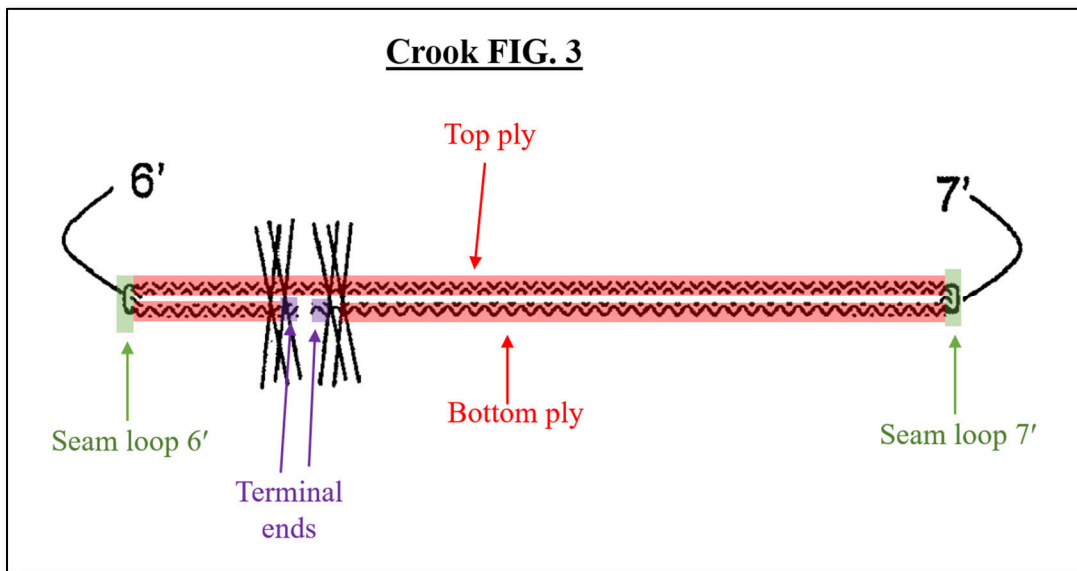
2. Crook

Instead of being spiral-wound in endless form like Hawes' base fabric, Crook's fabric (like the '388 patent's fabric) has two terminal ends that are brought together by folding the fabric. EX1003, 180. Crook describes a belt using nearly identical language to the '388 patent:

[A] flat woven material having a top side surface and a bottom side surface and two terminal ends separated in a machine direction. Folds formed in the flat woven material are separated in the machine direction, so that the two terminal ends are located under the bottom side surface. Seam loops are located at the folds. The two terminal ends [] are arranged adjacent each other and overlap each other[.]

EX1005, 2:10-18; EX1003, 180. Crook's belt (i.e., PMC) is shown below.⁹

⁹ A different embodiment of Crook is shown in FIG. 6, where the base fabric has a sheet ply ("insert 21") *inside* the folded layers, as opposed to *outside* as claimed in



Accordingly, Crook's PMC has "essentially the same configuration as claim 1 of the '388 patent, except that it is missing that "all of said sheet plies are disposed *outside* said folded layers[.]" EX1003, 182. But this too would have been obvious in view of Hawes and the known benefits of lamination. *Id.*

Crook also describes laminates and multi-component PMCs based on that flat-woven structure. EX1003, 183. For example, Crook discloses that "the folded fabric belt or belt base...can be coupled to, e.g., laminated with, another belt, such as a single ply fabric belt or belt base." EX1005, 6:58-62; EX1003, 183. Crook

the '388 patent. EX1005, FIG. 6, 6:15-44; EX1003, 181. This embodiment was overcome during prosecution expressly by the requirement that all sheet plies must be on the outside of the base fabric. *See* EX1002, 38; EX1003, 181.

further describes placing an insert 21 “between the folds of the folded fabric,” or on “the bottom side of the flat woven seam base” and states “other fabric laminates may be used without departing from the spirit and scope of the invention[.]” EX1005, 2:32-34, 6:15-57; EX1003, 183. Thus, a broad range of layers and fabrics can be attached on and/or in Crook’s base fabric. EX1003, 183.

3. Hawes-Crook combination

Hawes discloses all elements of claim 1, except that Hawes’ fabric lacks terminal ends separated in the machine direction. EX1003, 184-85. As discussed below, it would have been obvious to substitute Crook’s flat-woven fabric, with terminal ends, for Hawes’ base fabric, thereby arriving at the fabric of claim 1. *Id.* This modification would have represented a predictable, simple substitution. *Id.*

4. Analysis of Claims

(a) Claim 1

[Ipre]: A fabric for a machine for producing a fiber web, comprising:

To the extent the preamble is limiting, Hawes and Crook each disclose it. EX1004, 1:9-19, 1:44-49; EX1005, 1:7-20; EX1003, 186. Hawes describes that fabrics are used for producing a fiber web, stating “a cellulosic ***fibrous web is formed*** by depositing a fibrous slurry...***onto a moving forming fabric*** in the forming section of a paper machine.” EX1004, 1:9-12. Hawes explains that “[t]he present invention relates primarily to...***press fabrics***, but “may also find

application” in “forming and dryer” fabrics. EX1004, 1:44-49; EX1003, 186.

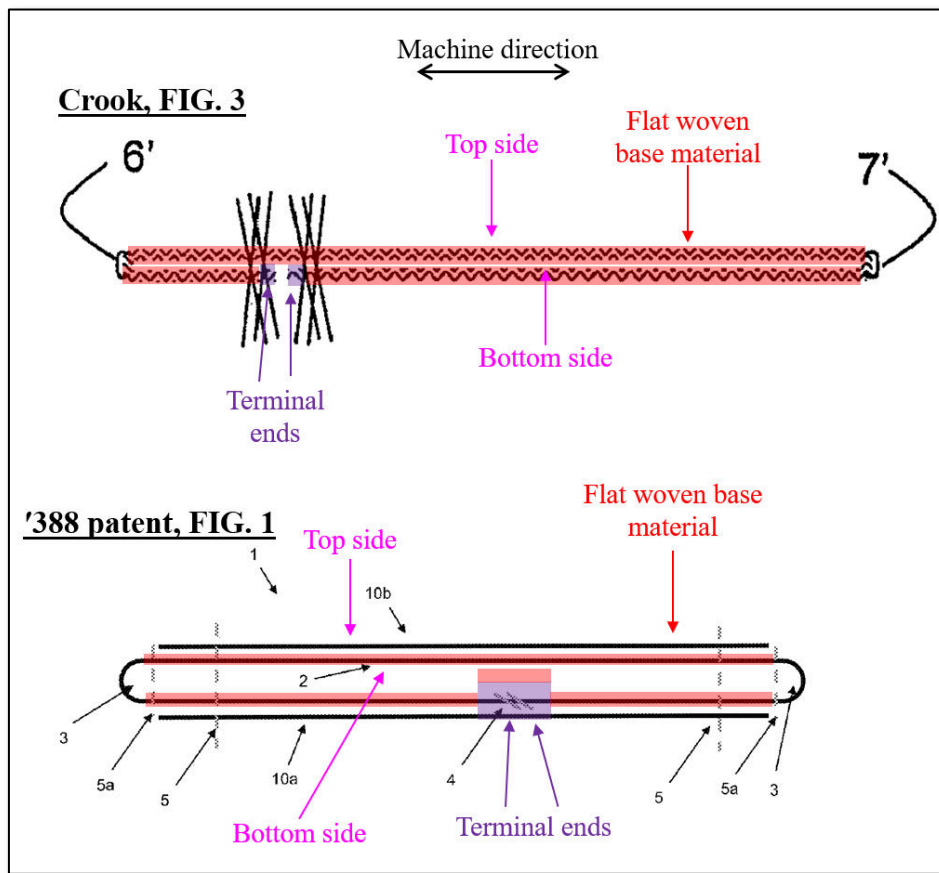
Crook similarly describes “a seamable belt base for a paper making machine” and that “[t]he base can be needled and finished in any conventional matter [sic] in order to form a normal press seam fabric.” EX1005, 1:7-20; EX1003, 187.

[1a]: a flat woven base material having a top side and a bottom side, two terminal ends separated from one another in a machine direction;

As noted above, Hawes’ base fabric is spiral-wound in endless form and therefore lacks “terminal ends separated from one another in a machine direction[.]” EX1003, 188. But Hawes describes—and a POSITA would have understood—that the “flat-woven with terminal ends” (Crook) and “endless” (Hawes) approaches were common alternatives. EX1003, 188. For example, Hawes teaches that “[w]oven fabrics...may be woven endless, ***or flat woven and subsequently rendered into endless form with a seam.***” EX1004, 2:13-15; EX1003, 188. Because endless and non-endless fabrics were widely recognized substitutes, it would have been obvious to replace Hawes’ endless base fabric with Crook’s fabric having terminal ends. EX1003, 189.

Crook discloses “a flat woven material having a top side surface and a bottom side surface and two terminal ends separated in a machine direction,” mirroring the claim language. EX1005, 2:10-13; EX1003, 190. The machine

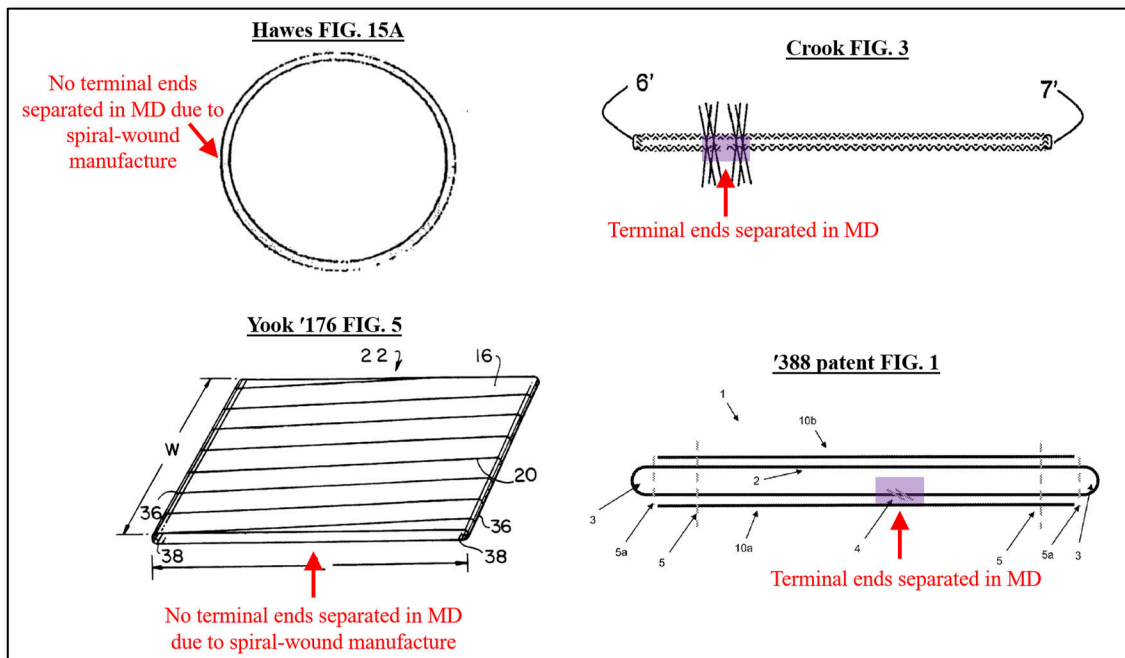
direction (MD) is labeled explicitly in FIG. 1, and the terminal ends 2, 3 are labeled explicitly in FIG. 2 (not shown here). EX1005, 3:61-65; EX1003, 190. As shown below, this structure matches that of the '388 patent and satisfies [1a]. EX1003, 191.



A POSITA would have understood Crook's base structure as a valid alternative to Hawes'. EX1003, 192. Specifically, Hawes' and Crook's base fabrics represented two well-known and similar alternatives for papermaking fabrics. *Id.* Substituting Crook's fabric for Hawes' would have involved nothing more than the simple substitution of one known element for another to obtain a predictable result.

Id.; *KSR*, 550 U.S. at 417.

The difference between Hawes' (and Yook '176's) base fabric and Crook's base fabric is shown below. EX1004, FIG. 15A; EX1016, FIG. 5; EX1005, FIG. 3; EX1003, 193. Hawes' fabric forms an endless closed loop, **without** terminal ends,¹⁰ because of its spiral-wound manufacture, discussed in §IV.B.1. *Id.* Because Crook's base fabric results from folding ends of a flat-woven fabric, Crook's fabric, like the '388 patent's, **has** terminal ends, which can be joined to one another to form a closed loop. *Id.* The structures are otherwise identical to one another with respect to key fabric characteristics. EX1003, 193-194.



¹⁰ Hawes' fabric has terminal ends in the cross-machine direction, rather than "separated in the machine direction." EX1003, 193.

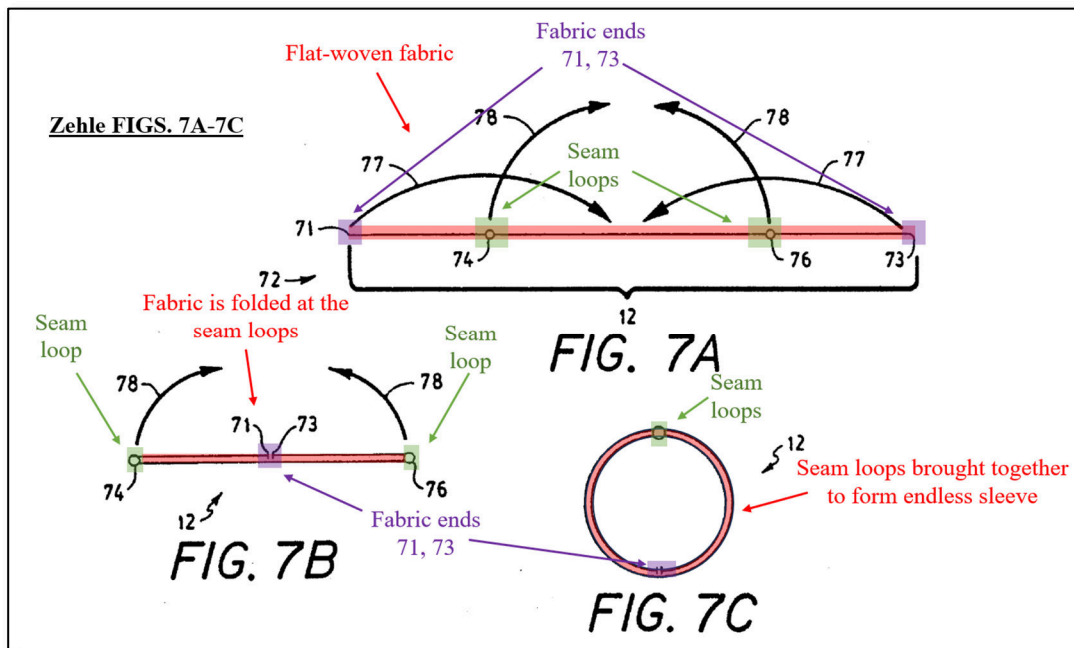
A POSITA understood that endless, without terminal ends, and flat-woven with terminal ends were common alternatives, as Hawes itself notes. EX1004, 2:13-15; EX1003, 195. Hawes also discusses the “spiral winding technique” as a “recent” development “[i]n response to [a] need to produce press fabrics in a variety of lengths and widths more quickly.” EX1004, 2:51-56; EX1003, 195. A POSITA would thus have been well aware of Crook’s technique as a valid alternative. EX1003, 195.

Dr. Pastore explains that “the base fabric structure of Crook’s and the ’388 patent was typical.” EX1003, 196. Indeed, the ’388 patent admits that it “is known...to use a simple, flat woven material and to fold it in order to produce a two ply base structure with seam loops for a seamable fabric,” particularly in view of Crook and the ’388 patent’s common ownership. EX1001, 1:41-45.

That folded configuration, however, was in no way limited to Crook. EX1003, 197. For example, Sudre discusses two alternatives: “[t]here are two basic methods whereby papermakers’ fabrics are produced, either the fabric is woven ‘flat’, and the free ends joined, or the fabric is woven ‘endless.’” EX1014, 1:6-9. The former method would result in terminal ends (as in Crook) and the latter, like Hawes’s method, would not provide terminal ends. EX1003, 197. *See also id.*, FIG. 4 (Sudre’s structure identical to Crook and the ’388 patent). Further, similar or identical configurations were also disclosed, for example, in Hawes

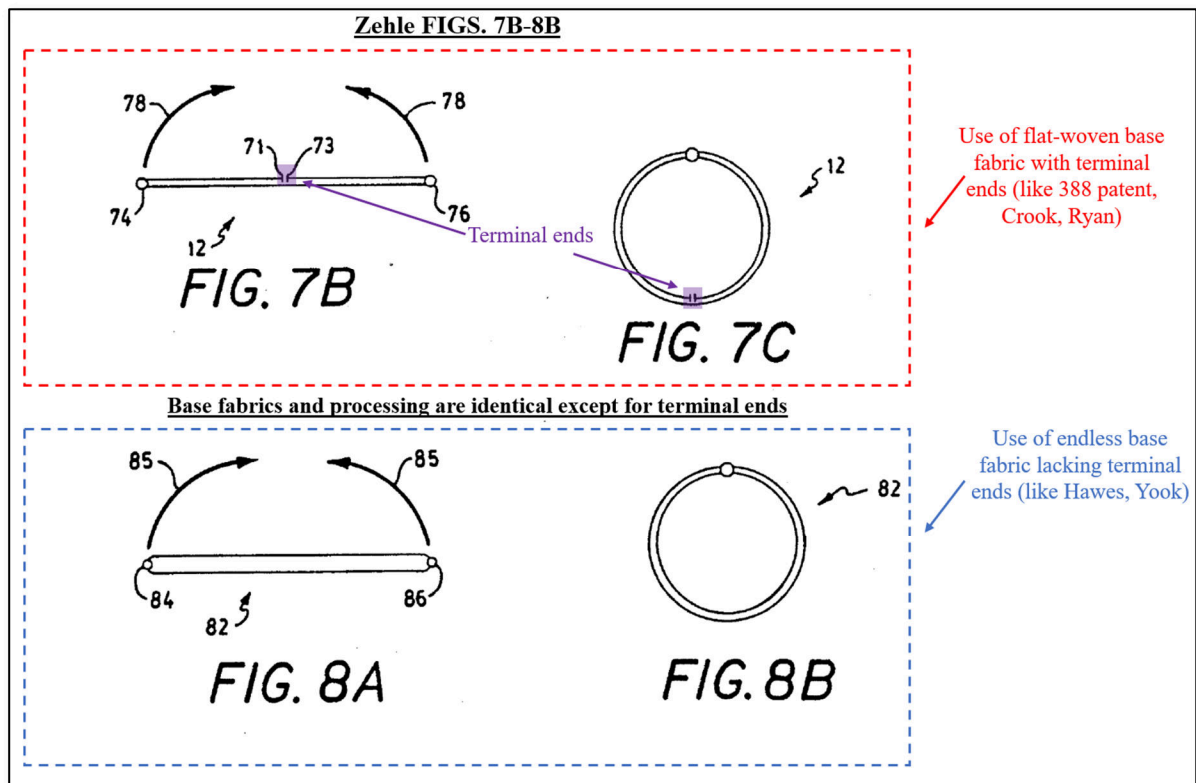
'402, Ryan (*see* Ground 1), Sarrazin, McGill, and Zehle. EX1007, [0029], FIG. 1; EX1018, 5:38-65, 7:36-41; EX1019, 4:1-6, 6:1-11; EX1020, 6:7-29, FIGS. 7A-7C; EX1013, [0025]-[0027], FIG. 3; EX1003, 197-198.

Zehle's description demonstrates the interchangeability of Hawes' and Crook's base fabrics. EX1003, 199. Discussed further in Ground 3A (§IV.D), Zehle teaches a flat-woven, folded base fabric with terminal ends in the machine direction, similar to Ryan, Crook, the '388 patent, and others. EX1003, 199. For example, Zehle's FIGS. 7A-7C illustrate folding a "flat base fabric 72" with terminal ends 71 and 73 (purple). EX1020, 6:10-21; EX1003, 199.



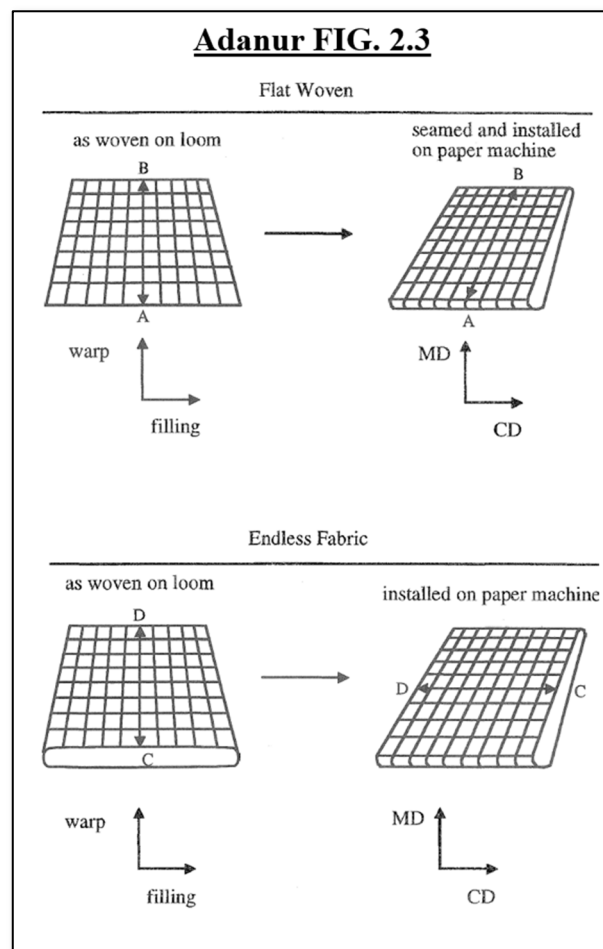
Immediately after describing the above flat-woven fabric, Zehle explains “[a]lternatively, the base fabric assembly may be formed from, as shown in FIGS. 8A-8B, an endless base fabric.” EX1020, 6:30-32; EX1003, 200. Zehle then shows

and describes how the first base fabric (which has terminal ends, like Crook's) and the second base fabric (which is endless, similar to Hawes') can be used to obtain essentially the same structure, differing only in the presence of terminal ends in the machine direction, as shown below. EX1020, 6:30-40, FIGS. 7B-8B; EX1003, 200.



Thus, these two base fabric types—i.e., Hawes' and Crook's—were being used in the same way, by the same POSITA, to obtain nearly identical end products. EX1003, 201. It would have been obvious to substitute one for the other.
Id.

Similarly, explaining the “Manufacturing of Press Fabrics,” Adanur describes that “[b]ase fabrics...can be *woven as a flat or endless belt*,” indicating these two approaches were known substitutes. EX1011, 51; EX1003, 202. Adanur’s FIG. 2.3 illustrates the terminal end-including and endless configurations as straightforward alternatives. EX1011, 17; EX1003, 202.



Indeed, in another patent, Hawes describes a “flat woven piece of fabric” that is “folded upon itself...to form an endless loop” and to “form seaming loops,” after which the “two free ends” can be “temporarily or permanently attached,” the

same configuration as the '388 patent and Crook. *See* EX1018, 5:38-65, 7:36-47; EX1003, 203. POSITAs in this field, therefore, were aware of both base fabric types and able to apply either as desired. EX1003, 203.

The substitution of Crook's well-known base fabric with terminal ends for Hawes' endless base fabric, then, would have amounted to a "simple substitution of one known" structure for another. *KSR*, 550 U.S. at 417. The manufacture of Hawes' FIG. 15B fabric begins with "an endless single layer multiaxial base fabric 1500 [that] can be created *in any manner* heretofore discussed." EX1004, 11:32-35; EX1003, 204. It would have been obvious to a POSITA to instead start with a closed loop formed by Crook's flat-woven fabric, e.g., with the terminal ends joined to one another. EX1005, 5:6-15; EX1003, 204.

The modification proposed here—substituting a fabric that is looped by joining its opposite terminal ends, for a fabric that is manufactured already in a loop form—falls squarely within *KSR*'s "simple substitution" category. EX1003, 205. A POSITA knew there were multiple ways to form a fabric, including Crook's end-joining approach and Hawes' spiral-wound approach. EX1003, 205. The resulting fabrics, however, look and operate fundamentally the same, and a POSITA would have had no technical difficulties in substituting one for another. EX1003, 205.

This substitution would have been achievable by a POSITA with a reasonable expectation of success. A POSITA would simply have used “needling” to attach Hawes’ laminate material 1512 to Crook’s base fabric instead of to Hawes’ base fabric. Specifically, Hawes describes that the “laminate material 1512” is “needl[ed]” to the “outside of base fabric 1500” on a “needle loom.” EX1004, 11:40-47. “Needling” refers to a needle-punching process in which many barbed needles would be pushed through the laminate material and the base fabric to attach them together. EX1011, 46-52, 169 (FIG. 3.21); EX1003, 206. The needling attachment process is the same regardless of underlying weave structure. EX1003, 206. Indeed, needling was conventionally used for attachment of layers, as both Hawes and Crook describe. *Compare* EX1004, 2:4-6, 2:35-38, 3:36-43, 6:31-34, *with* EX1005, 2:42-44, 6:31-33; *see also* EX1011, 46-52; EX1003, 206.

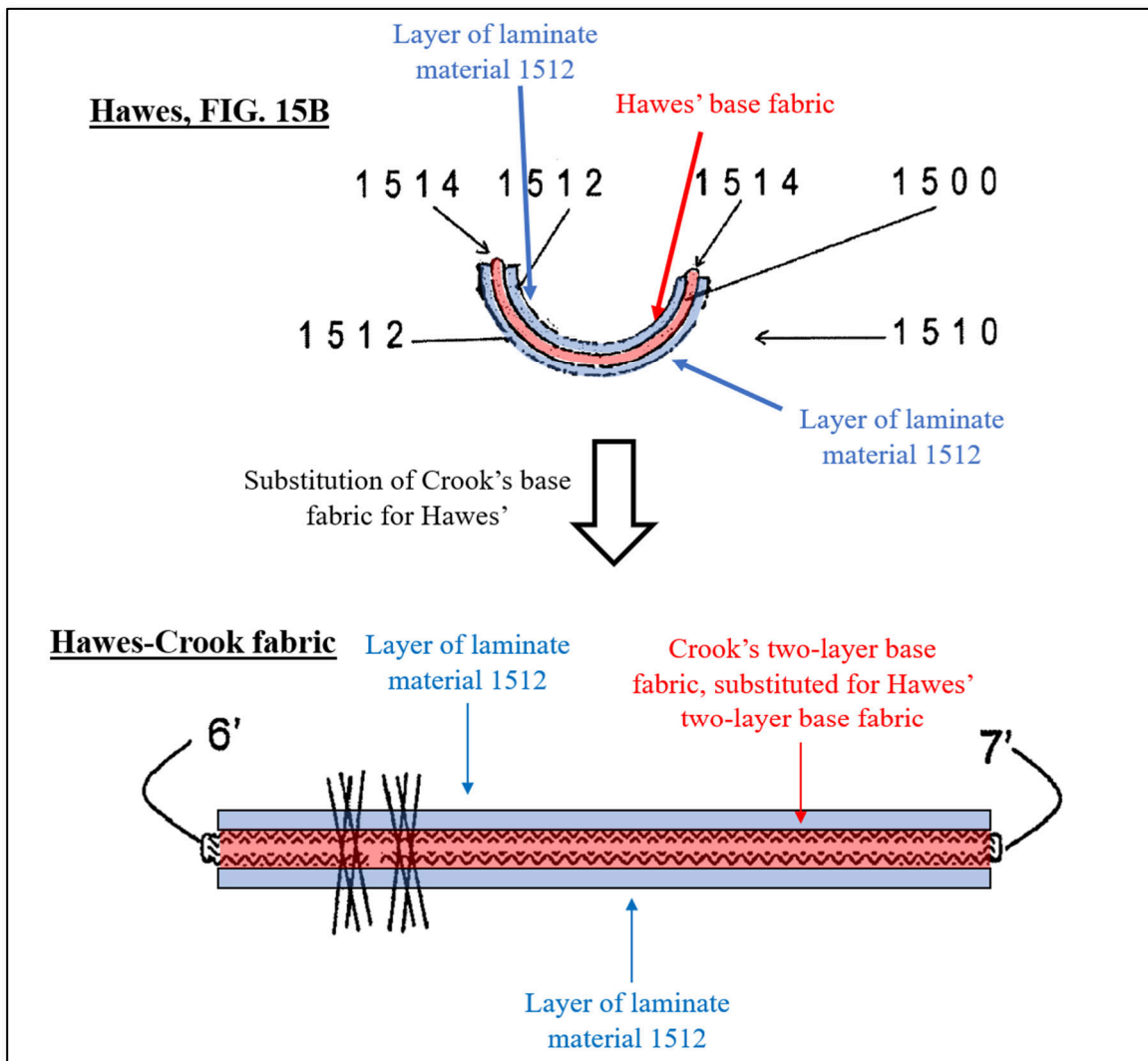
Because both Crook and Hawes *already* describe using needling to attach material to their base fabrics, the addition of the laminate 1512 to Crook’s fabric by needling would not have been substantively different from Hawes’ process. EX1003, 207.

Moreover, the art recognized advantages provided by Crook’s approach. EX1014, 6:11-17; EX1001, 1:45-49; EX1003, 208. Sudre describes that Crook’s configuration is “simple” because “requisite lengths of base fabric woven in any desired weave patern[sic] may be cut from a stock supply[.]” EX1014, 6:11-17.

Similarly, the '388 patent acknowledges that “[t]he use of a flat woven material is advantageous, since it can easily be produced on a comparably simple and cheap loom and the production time is much faster[.]” EX1001, 1:45-49; EX1003, 208.

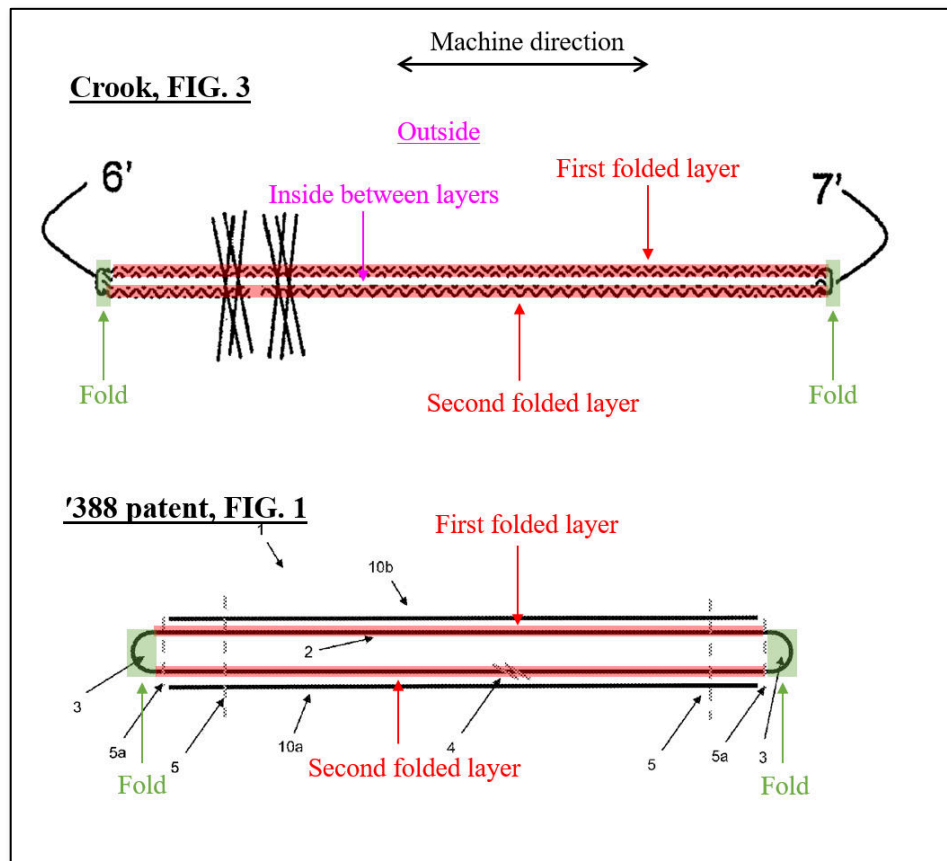
To achieve these advantages, and as a matter of simple substitution of two known alternatives, it would have been obvious for a POSITA to use Crook’s base fabric, having terminal ends, instead of Hawes’ endless fabric. EX1003, 209. The resulting fabric includes Crook’s base material, which, according to Crook, is “a flat woven material having a top side surface and a bottom side surface and two terminal ends separated in a machine direction,” satisfying [1a]. EX1005, 2:10-13; EX1003, 209.

The proposed Hawes-Crook fabric shown below shows Crook’s base fabric (red) with Hawes’ two layers of laminate material 1512 (blue) attached on top and bottom. EX1003, 210.



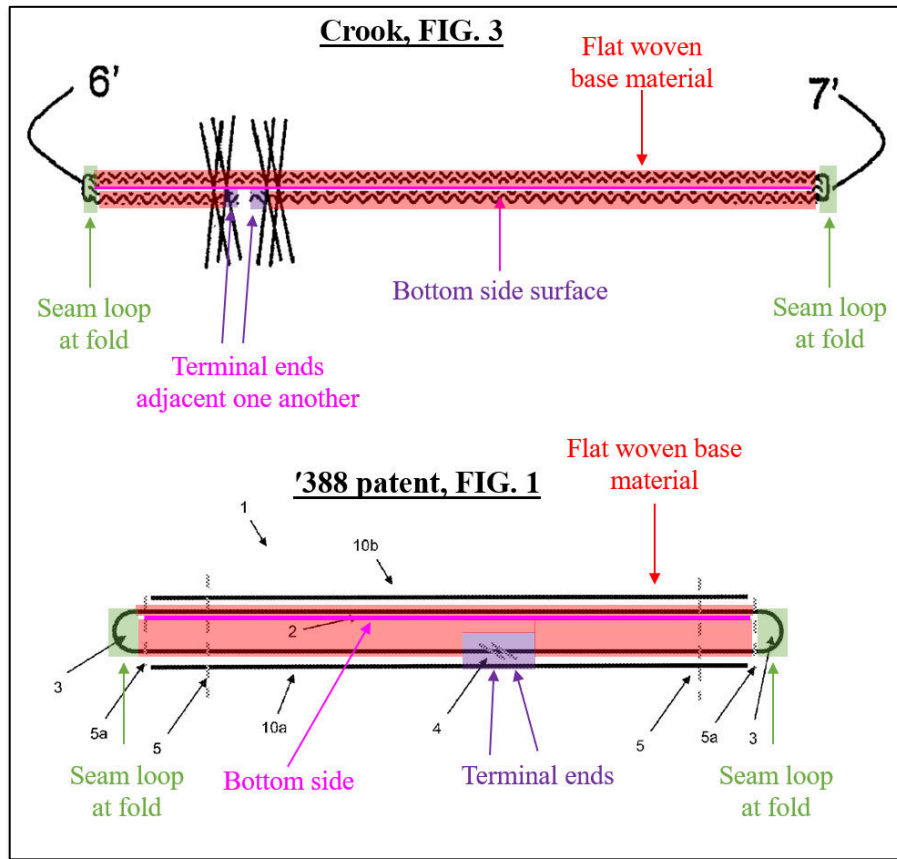
[1b]: said flat woven base material being folded in two folded layers with folds being separated from one another in the machine direction and defining an inside between the two folded layers and an outside;

Crook's base structure in the Hawes-Crook fabric is "folded over onto itself" to form two folded layers. EX1005, 4:38-39; EX1003, 211. "[F]old lines 6 and 7" are separated from one another in the machine direction and define an inside and an outside. EX1005, 4:38-48, FIGS. 2-3; EX1003, 211.



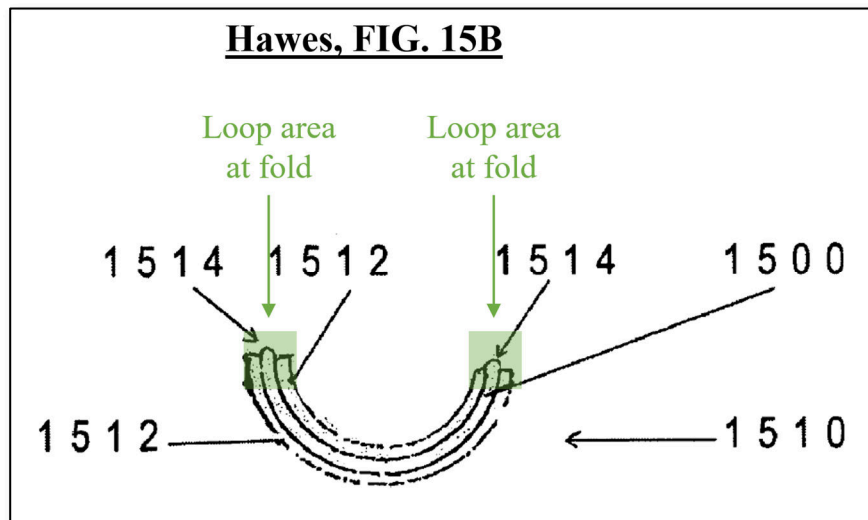
[1c]: said two terminal ends being located under the bottom side surface and said two terminal ends being adjacent one another or overlapping one another, and wherein seam loops are located at said folds; and

Crook's base structure in the Hawes-Crook fabric includes "terminal ends 2 and 3" that are "positioned under the bottom side surface and one of adjacent each other and overlapping each other," mirroring the language of [1c]. EX1005, 3:61-65, 8:19-21 (cl. 13), FIG. 3; EX1003, 212. And Crook's "seam loop ends 6' and 7'" (green) are "in the folds." EX1005, 4:45-52; 8:25-26, FIG. 3; EX1003, 212.



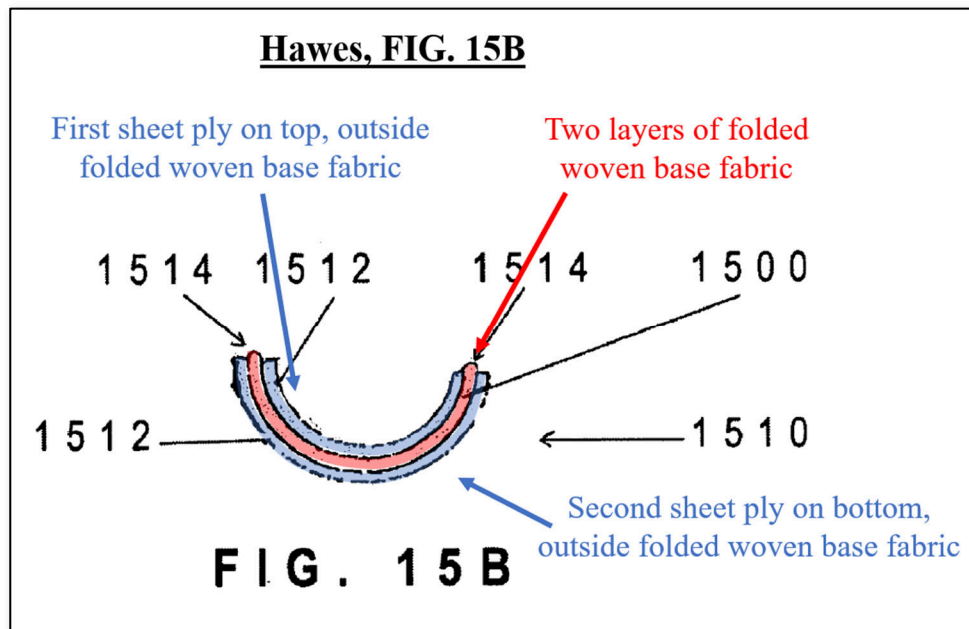
Hawes' fabric also has seam loops at its folds, shown below (green).

EX1004, 11:46-49; EX1003, 213.

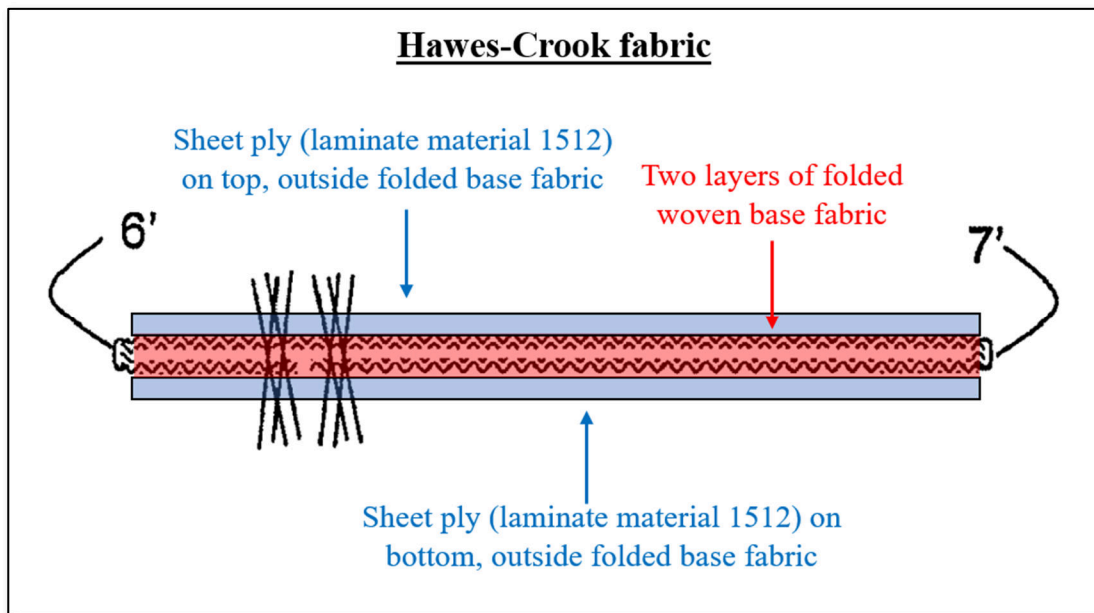


[1d], [1e]: one or more sheet plies, wherein: all of said sheet plies are disposed outside said folded layers; and

Hawes discloses one or more sheet plies, where all of the sheet plies are disposed outside the folded layers. EX1004, 11:49-52, FIG. 15B; EX1003, 214. Specifically, Hawes discloses a “fabric 1510 [having] two layers formed from base fabric 1500 and *a layer of laminate material 1512 on the top and one on the bottom.*” EX1004, 11:49-52; EX1003, 214. The layers of laminate material 1512 (blue) on the top and bottom of the “two layers formed from base fabric 1500” are “outside” the two-layer structure, as shown below. EX1003, 214.



When the base structure of Crook is used in place of Hawes’, the resulting structure also has one or more sheet plies (blue), where all of the sheet plies are disposed outside the folded layers (red), shown below. EX1003, 215.



As discussed above for [1a], it would have been obvious for a POSITA to substitute Crook's fabric for Hawes' fabric, and the POSITA would have had a reasonable expectation of success in doing so because the fabrics are well-known alternatives. EX1003, 216; *see* §IV.B.4(a).

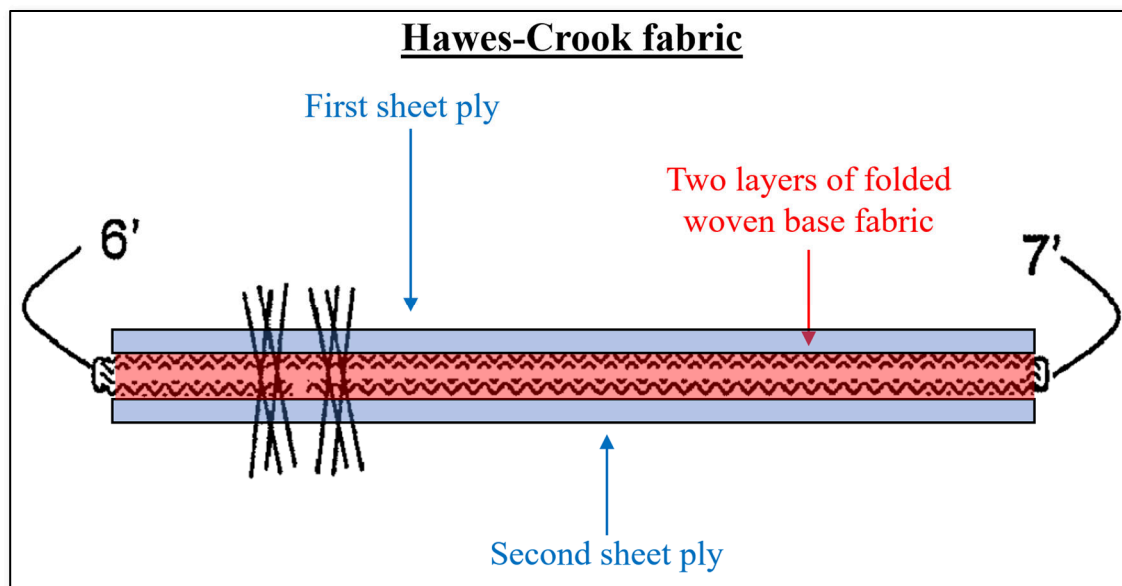
[1f]: one, some or all of the sheet plies consist of or comprise a woven material or a non-woven component selected from the group consisting of a polymer film, a foam layer, a knitted structure and a warp-knit structure.

The laminate material 1512 of Hawes (the "sheet plies") can be a polymer film or a knitted structure, thereby satisfying [1f]. EX1004, 9:34-50, 11:42-44; EX1003, 217. Specifically, Hawes describes that "the laminate may be any material suitable for the purpose," for example, a "nonwoven layer may include materials such as **knitted, extruded mesh**" or "a **sheet** or web structure...made of

any suitable material, such as *polyamide and polyester resins*[.]” EX1004, 9:34-50, 11:42-44; EX1003, 217. “Polyamide” and “polyester” refer to polymer films. EX1003, 217.

(b) **Claim 2**

Hawes’ fabric 1510 includes two sheet plies: “a layer of laminate material 1512 on the top and one on the bottom.” EX1004, 11:49-52; EX1003, 218. Thus, the Hawes-Crook fabric includes two sheet plies with this configuration. EX1003, 218-219.



(c) **Claim 3**

Hawes and Crook both disclose that their fabric is configured for producing a paper web. EX1004, 1:9-24; EX1005, 3:61-65, 6:3-6; EX1003, 220. For example, Hawes describes that “*a cellulosic fibrous web* is formed by depositing a fibrous slurry...onto a moving forming fabric in the forming section of a paper

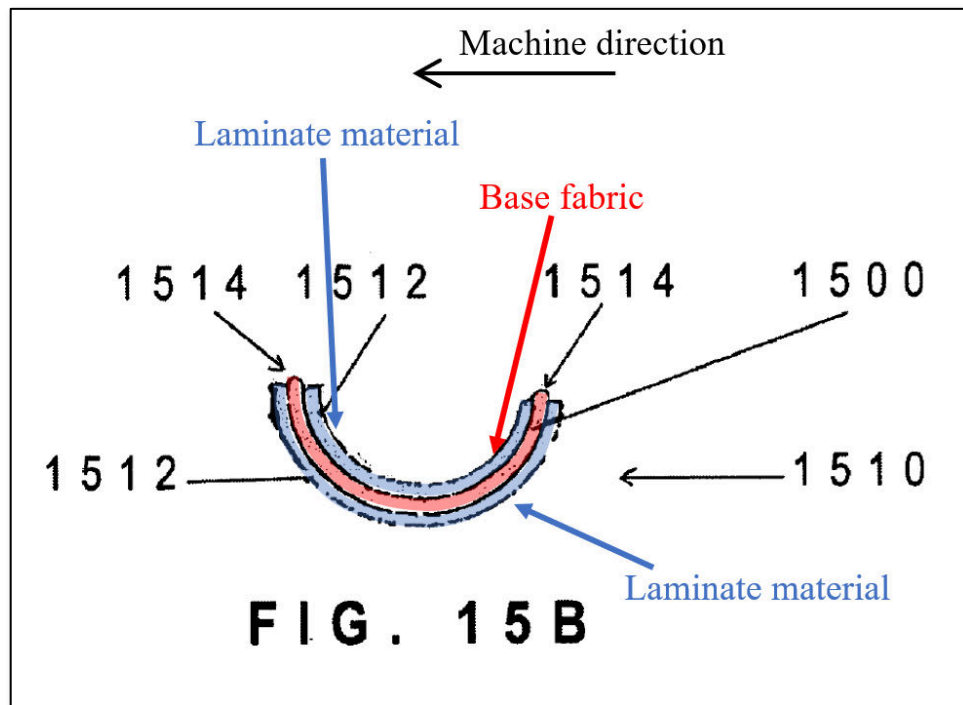
machine” and in the pressing section, “subject[ing] the web to compressive forces...*to turn the cellulosic fibrous web into a paper sheet.*” EX1004, 1:9-24; EX1003, 220-221.

Crook similarly describes a “a base structure for a belt of a paper making machine” and refers to producing a “web.” EX1005, 3:61-65, 6:3-6; EX1003, 222.

(d) Claim 4

Hawes discloses or renders obvious both the substantially equal width and the length limitations. EX1003, 223. First, as noted above for Ground 1 in §IV.A.4(d), the ’388 patent defines “substantially equal” (more specifically, “essentially the same”) broadly. EX1003, 224.

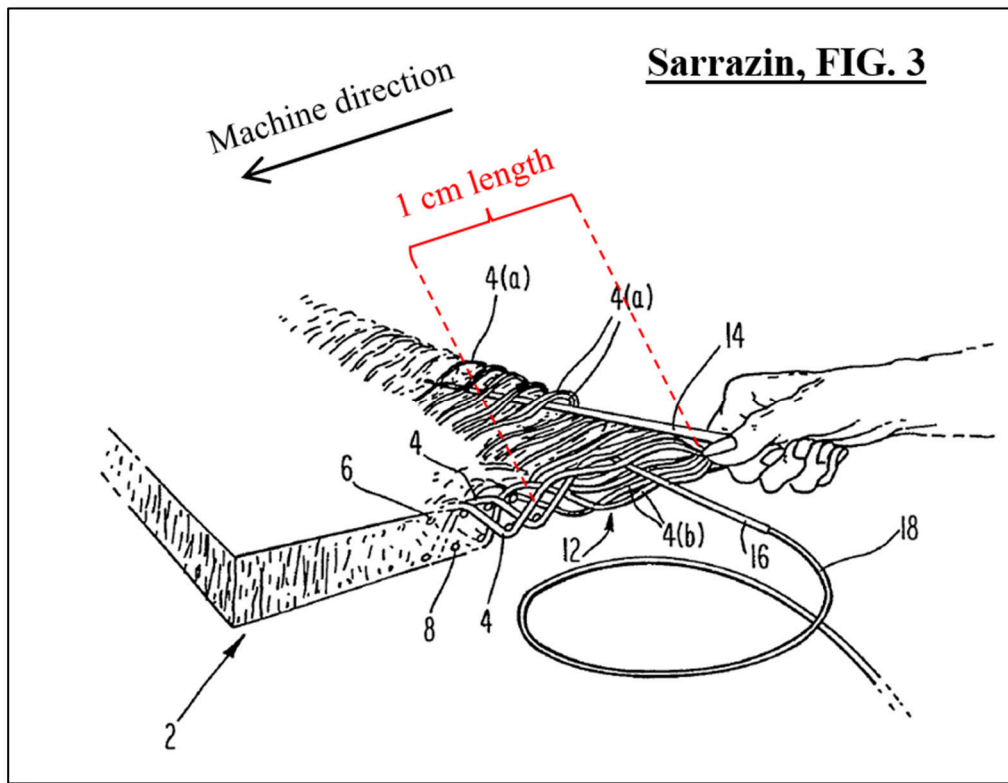
Regarding length, FIG. 15B of Hawes illustrates that the laminate material 1512 (sheet plies, blue) has substantially the same machine-direction length as the base fabric 1500 (red). EX1004, FIG. 15B; EX1003, 225.



The laminate material entirely overlaps the base fabric except for a small portion of laminate material 1512 that is “cut away in the loop area 1514” to permit forming seam loops, as shown above. EX1004, 11:46-47; EX1003, 226. Although Hawes does not provide a relative length of this “cut away” section, a POSITA would have understood that it would constitute much less than 10% of the entire machine-direction length of the base fabric. EX1003, 226.

A typical papermaking fabric would be tens of meters long in the machine direction. EX1011, 37; EX1003, 227. In contrast, seam loops are centimeter scale structures. EX1003, 227. For example, Sarrazin describes that, to form seam loops, cross-machine direction yarns are removed over a length of about 1 cm in a fold area of a fabric. EX1019, 6:12-25, FIGS. 2-3; EX1003, 227-228. Accordingly, a

POSITA would have understood that the machine-direction length difference between Hawes' laminate material (sheet plies) and base fabric would be *less than 0.1%*, well within the 10% limits specified by the '388 patent. EX1003, 229.



It would also have been obvious for a POSITA to provide the laminate material 1512 with a cross-machine direction width substantially matching that of the base fabric 1500. EX1003, 230. Hawes emphasizes having a “smooth” and “uniform” fabric surface in order to form a smooth, uniform paper surface. EX1004, 1:54-58; 3:44-61; EX1003, 230. A POSITA would have recognized that having the width of the laminate material and the underlying base fabric match, so

as to fully cover the base fabric, would avoid forming “steps” in the fabric surface, thereby achieving the desired surface uniformity. EX1003, 230.

(e) Claims 5, 6

Hawes and Crook both disclose a one-layer plain weave as the woven base material. EX1004, 2:6-9; EX1016, 6:41-48, FIGS. 3, 6; EX1005, 4:8-11, 4:21-24; EX1003, 231. First, Hawes describes that “[t]he base fabrics may be **woven**” and “may be **single-layered**[.]” EX1004, 2:6-9; EX1003, 231. Moreover, Yook ’176 (source of Hawes’ base fabric 1500, *see* §IV.B.1) describes that the base fabric 1500’s fabric strip is “interwoven in a **single-layer weave**.” EX1016, 6:41-45; EX1003, 231. Similarly, Crook describes that its “exemplary embodiment is identified as a **single layer woven structure**.” EX1005, 4:8-11; EX1003, 231.

Second, both Hawes and Crook disclose that the woven base material is a plain weave. EX1003, 232. The Yook ’176 fabric (Hawes’ base fabric 1500) has “a **plain weave**[.]” EX1016, 6:45-48, FIGS. 3, 6; EX1003, 232. And, for the Hawes-Crook base fabric, Crook describes that “the fabric can be formed...**using a single layer plain weave**.” EX1005, 4:21-24; EX1003, 233.

(f) Claims 7, 8

Claims 7 and 8 further narrow the composition of the “one or more sheet plies” in the case where the sheet plies “consist of or comprise a woven material.” These claims, however, do not require that the sheet plies necessarily include the

woven material. That is, sheet plies that “consist of or comprise...a *non-woven* component” from a group of options are also within the scope of claims 7 and 8. Claims 7 and 8 are accordingly rendered obvious by Hawes-Crook for the reasons discussed for claim 1. EX1003, 234-235; *see* §IV.B.4(a).

Nevertheless, even if a “woven material” is required, claims 7 and 8 would have also been obvious over Hawes-Crook because it would have been obvious to a POSITA to use a one-layer, plain-woven material as the “laminate material 1512,” which Hawes describes can be “any material suitable for the purpose[.]” EX1004, 11:40-44; EX1003, 236. Crook describes that a “folded fabric belt or belt base...can be coupled to...another belt, such as a *single ply fabric belt*[.]” EX1005, 6:57-7:3; EX1003, 237.

Moreover, Hawes’ laminate material 1512 is joined to the underlying base fabric by needling, the same method that the art widely described as being used for laminating multiple woven base fabrics to one another, as discussed for Ground 1 at §IV.A.4(a). EX1004, 11:40-42; EX1003, 238. With this method, a POSITA would have had a reasonable expectation of success in using a woven base fabric as the laminate material 1512. EX1003, 238.

In doing so, it would have been obvious to select Crook’s “single ply fabric belt.” EX1005, 6:57-62; EX1003, 239. For example, it would have been obvious to use the “single layer plain weave” that Crook describes as suitable for a belt.

EX1005, 4:21-24; EX1003, 239. Accordingly, a laminated structure in which the laminate material 1512 is Crook's single layer plain weave fabric belt would have been obvious and satisfies claims 7 and 8. EX1003, 240.

(g) Claim 9

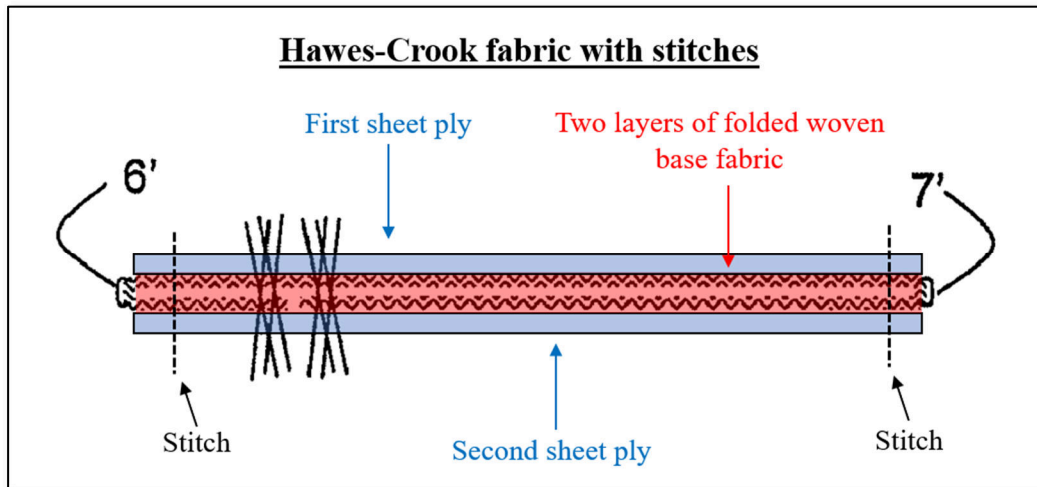
As discussed for claims 7-8, it would have been obvious to use Crook's "single ply fabric belt or belt base" as the laminate material 1512 in the Hawes-Crook fabric. EX1003, 241. In this fabric, the woven base material and the sheet plies would have been obvious to form of the same woven material, that is, the "single layer plain weave" with "nylon 6" yarns that Crook describes using for belt fabric. EX1005, 4:15-24; EX1003, 241. Using the same woven material was advantageous, as discussed above in §IV.A.4(g). EX1003, 241.

(h) Claim 10

It would have been obvious to sew Crook's "stitch[es]"—which attach two folded base fabric layers near seam loops 6' and 7'—also through the laminate material 1512 of the Hawes-Crook fabric, satisfying claim 10. EX1005, 5:1-5; EX1003, 242.

First, Crook explains stitches are "sewn" "once the MD thread loops are formed," which in Hawes' process happens *after* the laminate material 1512 has been applied. EX1004, 11:46-49; EX1005, 5:1-5; EX1003, 243. Accordingly, simply following these teachings to manufacture the Hawes-Crook fabric would

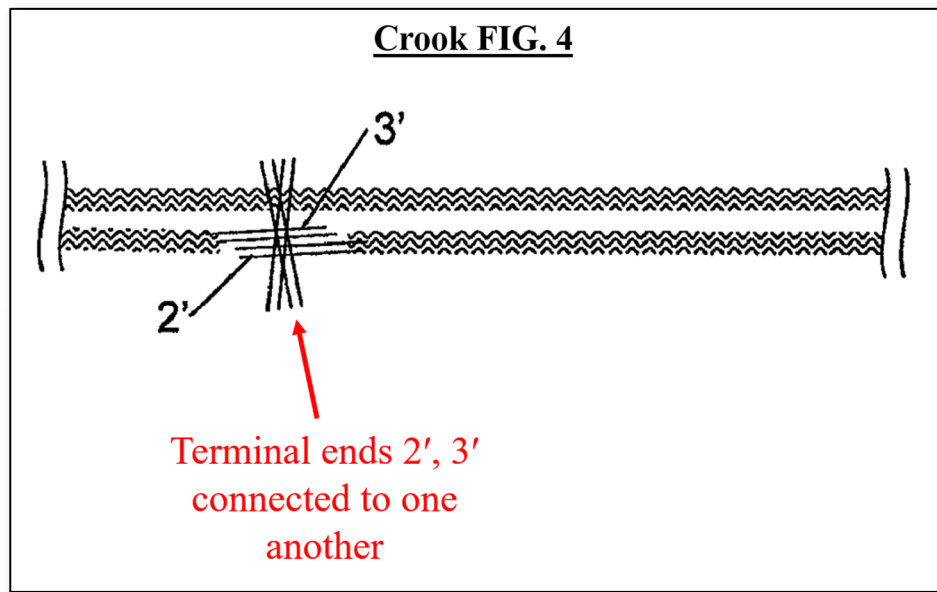
result in the stitches naturally extending through the laminate material 1512, as shown below. EX1003, 243.



Moreover, a POSITA would have recognized that stitches would help secure the laminate material 1512 to the base fabric, as discussed for claim 10 above at §IV.A.4(h). See EX1022, 5:36-40, 7:44-46; EX1015, [0062], [0104], FIG. 15; EX1003, 244. These stitches would secure the sheet plies (laminate material 1512) to the base fabric, satisfying claim 10. EX1003, 245.

(i) Claim 11

Crook describes that terminal ends 2 and 3 can be stitched together. EX1005, 5:8-10; EX1003, 246. Crook's FIG. 4 (below) shows the terminal ends connected to one another. EX1005, 5:29-39, FIG. 4; EX1003, 246.



Further, Crook describes that “terminal ends 2’ and 3’” can be “overlapped, and stitched down” or “intermeshed and stitched,” i.e., “connected to one another,” satisfying [11]. EX1005, 5:29-39; EX1003, 247.

(j) Claim 12

As discussed for [11], Crook discloses that the terminal ends can be “overlapped, and *stitched down*” or “intermeshed and *stitched*,” satisfying [12]. EX1005, 5:31-39; EX1003, 248.

(k) Claim 13

While Hawes’ FIG. 15B embodiment does not show a batt layer, a POSITA would have found the inclusion that layer obvious, as Hawes explains that batt layers were conventional and could be added. EX1004, 4:54-57 (“*in a press fabric one or more layers of batt fiber would be added*”), 9:24-26 (“additional layers can

be added *such as fiber batt* attached by needling.”); EX1003, 249.

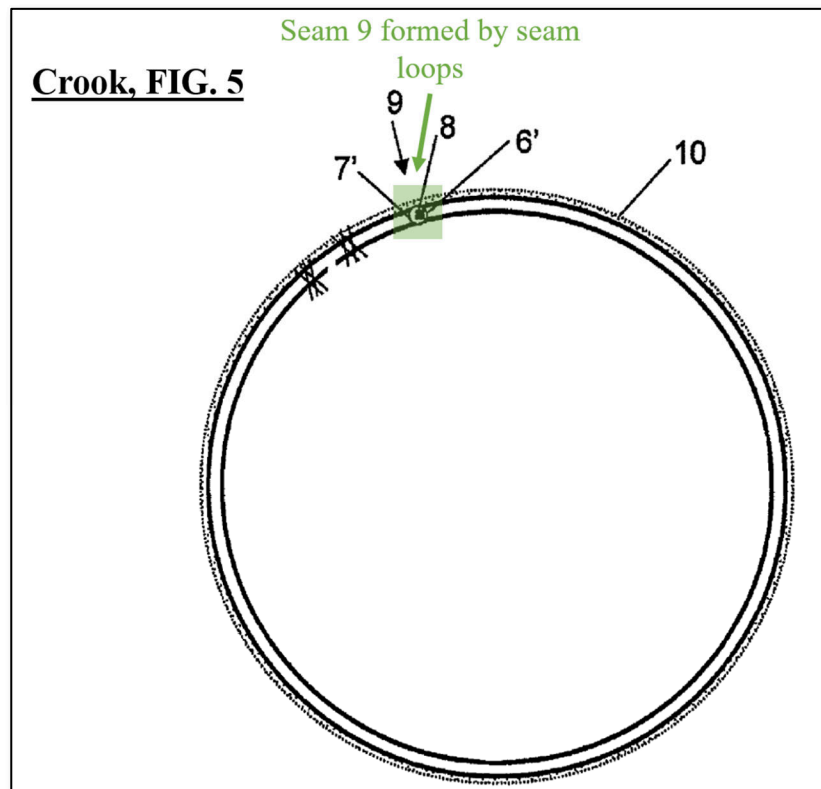
Similarly, Crook describes “[a] batt layer 10 can be needled onto the seamed base structure[.]” EX1005, 6:3-6; EX1003, 250.

(l) Claim 14

The Hawes-Crook fabric is on-machine seamable and includes only one seam. EX1004, 11:48-49; EX1016, Abstract, 4:38-40; 7:17-27; EX1005, 5:46-51; EX1003, 251.

A POSITA would have understood that Hawes’ FIG. 15B fabric’s seam loops were specifically designed to make the fabric on-machine seamable. EX1003, 252. For example, Hawes uses Yook ’176’s fabric, which is expressly “on-machine-seamable.” EX1004, 11:48-49; EX1016, Abstract, 4:38-40; 7:17-27; EX1003, 252. The Hawes-Crook fabric, having Crook’s “loops 6’ and 7’” that “form an opening to receive a pintle 8,” is likewise on-machine seamable, as the “pintle” would be inserted during installation on a paper machine. EX1005, 5:46-51; EX1003, 252.

Further, the Hawes-Crook fabric (below) includes only a single “seam 9,” formed by the seam loop ends 6’, 7’ when the seam loops are “aligned and connected with a pintle.” EX1005, 1:16-18, 5:49-51; EX1003, 253-254.



(m) Claim 15

Hawes and Crook both disclose this method. EX1004, 1:16-26, 2:1-4, 2:22-25; EX1005, 1:11-20; 2:39-41, 6:4-6; EX1003, 255-257. Claim 1 is met as discussed above. EX1003, 255. Further, Hawes describes “install[ing]” “press fabrics” on “paper machines” and “plac[ing]” base fabrics “into endless form during installation on a paper machine.” EX1004, 2:1-4, 2:22-25; EX1003, 255. After installation, Hawes describes “support[ing]” a “cellulosic fibrous web” using the press fabric and “subject[ing]” the web “to compressive forces which squeeze water therefrom...to turn the cellulosic fibrous web into a paper sheet.” EX1004, 1:16-26; EX1003, 255.

Additionally, Crook describes “insert[ing]” “a pintle...through the seam loops,” which is done during installation on a paper machine. EX1005, 1:11-20; 2:39-41; EX1003, 256. The installed fabric is then used to produce a “web.” EX1005, 6:4-6; EX1003, 256.

C. [GROUND 2B] – Hawes-Crook-Yook Renders Claims 7-9 Unpatentable

1. Analysis of claims

(a) Claim 7

Hawes describes that the “laminate material 1512” “may be any material suitable for the purpose.” EX1004, 11:40-44. Based on Yook, it would have been obvious to use a woven base fabric, such as Yook’s base fabric 60, as the laminate material. EX1003, 258.

As discussed above (§IV.A.4(a)), a POSITA would have known the advantages of laminated press fabrics having multiple layers of woven material. EX1008, [0012] (“a laminated structure” has “relatively large water retention capacity,” “good resistance against compression,” and “greater flexibility compared with a single-base structure”); EX1011, 40 (“multilayer or laminated fabrics” provide “[h]igh void volume”); *id.*, 49 (“[l]aminated fabrics” having “two or more base fabric structures” “allow a wider range of base fabric pressure uniformity and low batt-to-base ratio...critical for open and clean operation.”); *see also* EX1022, 3:15-24; EX1003, 259.

Thus, it would have been obvious for a POSITA to look to Yook to modify the Hawes-Crook fabric to incorporate a woven laminate material, such as Yook's base fabric 60. EX1003, 260. Yook's base fabric 60 is a one-layer weave, as shown in FIG. 12 and discussed above (§IV.A.4(f)). EX1006, FIG. 12, 12:62-64; EX1003, 260.

Yook discloses that, to form a laminate fabric having multiple base fabrics, the base fabrics can be "joined to one another by one or more layers of staple fiber batt material 80 needled into and through the superimposed base fabric layer 22 and base fabric 60[.]" EX1006, 10:21-28; EX1003, 261. Because Hawes already describes that the laminate material 1512 is "needl[ed]" to the base fabric 1500, the use of a woven material (like Yook's base fabric 60) as the laminate material 1512 would have required a method substantially unchanged from Hawes' method. EX1004, 11:40-42; EX1003, 261. A POSITA would have had the skill to accomplish this with a reasonable expectation of success. EX1003, 261.

Indeed, both Hawes and Crook suggest the efficacy of multiple laminated fabric layers. EX1003, 262. Hawes describes that a "laminated" structure includes "two separate base fabrics, on top of the other" and "joined together" by "the needling of batt therethrough," (EX1004, 3:36-43), i.e., the same method of joining as in Yook. EX1003, 262. Hawes teaches this arrangement advantageously allows for "each layer [to] be designed for a different functionality." EX1004, 3:36-39;

EX1003, 262.

Similarly, Crook describes that “the folded fabric belt or belt base...can be coupled to...a *single ply* fabric belt or belt base[.]” EX1005, 6:57-64; EX1003, 263.

Accordingly, in applying Yook’s teachings, a POSITA would have merely been following the suggestions already provided by both Hawes and Crook, supporting the obviousness of the Hawes-Crook-Yook combination and the reasonable expectation of success in making the combination. EX1003, 264.

Because Yook’s base fabric 60 is a one-layer weave, the Hawes-Crook fabric, modified with Yook’s base fabric 60 as the laminate material 1512, satisfies [7]. EX1003, 265; EX1006, FIG. 12, 12:62-64.

(b) Claim 8

As shown in FIG. 12 and discussed for claims 7-8 in §IV.A.4(f), Yook’s base fabric 60 is a plain weave. EX1003, 266. Accordingly, the Hawes-Crook fabric, modified with Yook’s base fabric 60 as the laminate material 1512 (*see* [7]), satisfies [8]. EX1003, 266.

(c) Claim 9

As discussed for claim 7, it would have been obvious to use Yook’s base fabric 60 as Hawes’ laminate material 1512 in the Hawes-Crook fabric. EX1003, 267. In this fabric, the woven base material (Crook’s base fabric) and the sheet

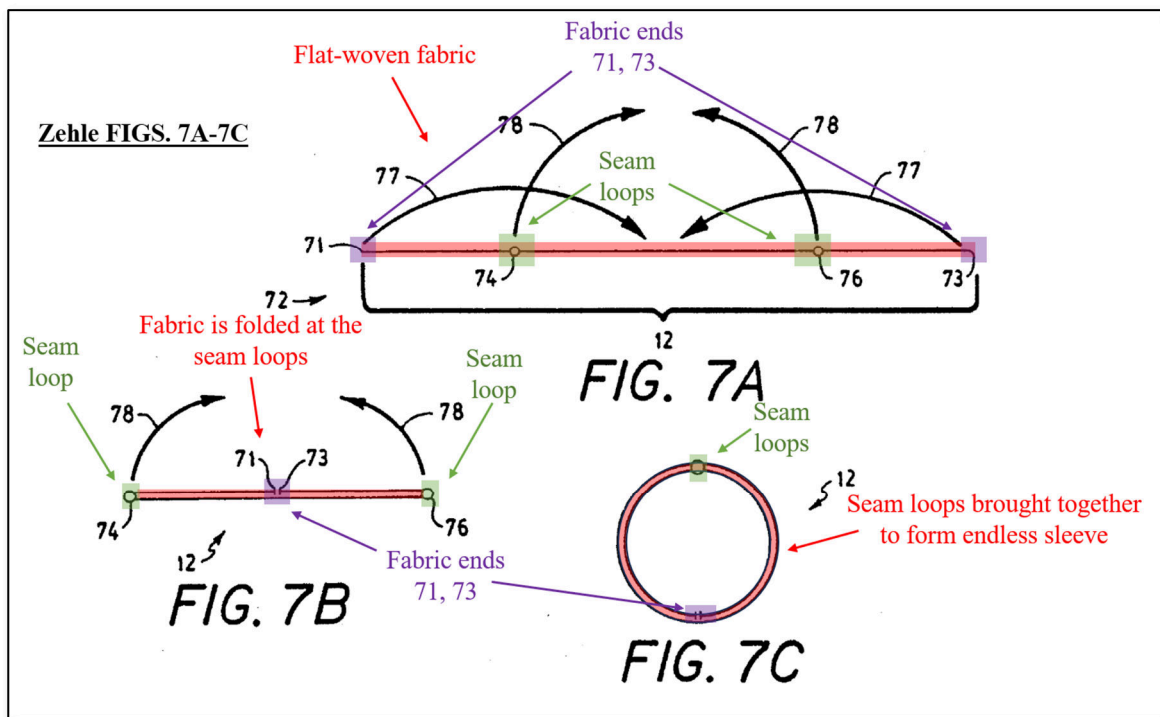
plies (Yook's base fabric 60) are formed of a same woven material. EX1003, 267. Specifically, Crook's base fabric is a single-layer plain weave (*see* claims 5 and 6). EX1005, 4:8-11, 4:21-24; EX1003, 268. Moreover, the yarns are "nylon 6" yarns, i.e., polyamide yarns. EX1005, 4:21-24; EX1023, 7-8; EX1024; EX1003, 268. Similarly, Yook's base fabric 60 is a single-layer plain weave (*see* claims 5-6 of Ground 1 at §IV.A.4(e)) with "polyamide" yarns. EX1006, 2:4-10, 7:59-63, 8:9-16, FIG. 6; EX1003, 269. Accordingly, both the woven base material and sheet plies of the Hawes-Crook-Yook fabric are single-layer plain weaves with polyamide yarns, thereby being "formed of a same woven material." EX1003, 270.

D. [GROUND 3A] – Hawes-Zehle Renders Claims 1-8 and 11-15 Unpatentable

While Crook discloses a flat-woven fabric with terminal ends, that fabric was not discovered or invented by Crook. Rather, it long existed in the art. For example, Zehle discloses that very fabric. Indeed, Zehle discloses many of the same teachings as Crook while further demonstrating the interchangeability of flat-woven, folded base fabrics with terminal ends and endless base fabrics. EX1003, 271-272. Thus, not only are the claims unpatentable for obviousness over Hawes and Crook, as detailed in Ground 2A, §IV.B, the claims are equally unpatentable for obviousness over Hawes and Zehle. *Id.*

1. Zehle

Zehle teaches a flat-woven, folded base fabric with terminal ends separated in the machine direction, like Ryan, Crook, the '388 patent, and others. EX1003, 273. For example, Zehle's FIGS. 7A-7C (below) illustrate folding a "flat base fabric 72" having CD yarns removed at its folds "to be used as a [seam] loop." EX1020, 6:12-29; EX1003, 273.



2. Analysis of claims

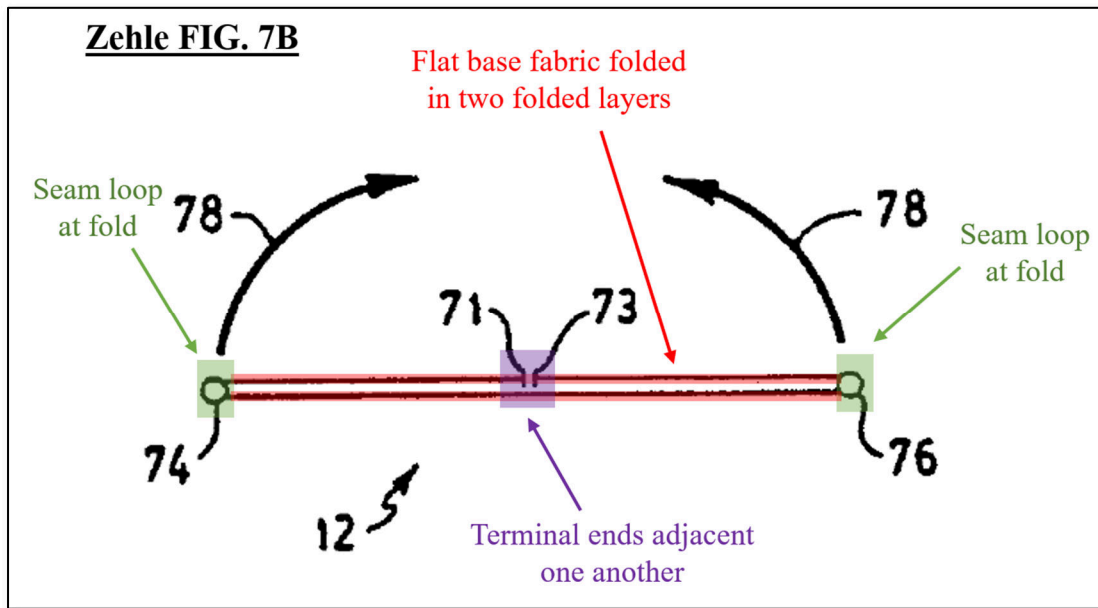
(a) Claim 1

The reasoning provided for claim 1 of Ground 2A (§IV.B.4(a)) applies equally here. Zehle's fabric of FIG. 7B is a flat-woven base material having two terminal ends and folded into two layers, with two terminal ends adjacent one

another and with seam loops located at its folds. EX1020, 6:7-29; EX1003, 274.

Zehle's terminal ends (purple) are shown in FIG. 7B (below) on the top as opposed to the bottom. EX1003, 275. Showing the terminal ends on top, however, is merely an illustrative choice; a POSITA would have understood that the same structure could equivalently be illustrated with the opposite orientation, so as to have "two terminal ends being located under the bottom side surface," as claimed.

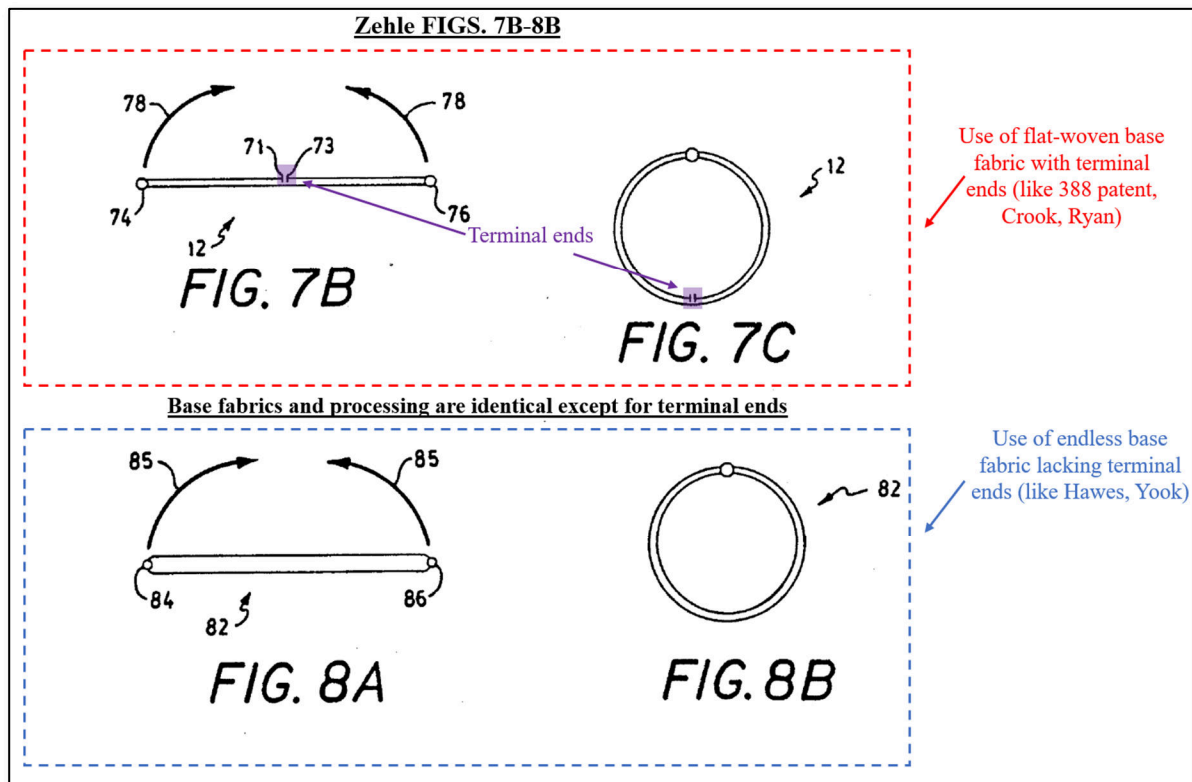
Id.



As discussed for the Hawes-Crook combination, it would have been obvious to substitute Zehle's fabric 72 for Hawes' base fabric 1500 in Hawes' FIG. 15B embodiment, satisfying claim 1. EX1003, 276. Like Hawes' and Crook's fabrics, Zehle's is "needled," such that a POSITA would have a reasonable expectation of success in making the substitution by attaching Hawes' laminate material 1512 to

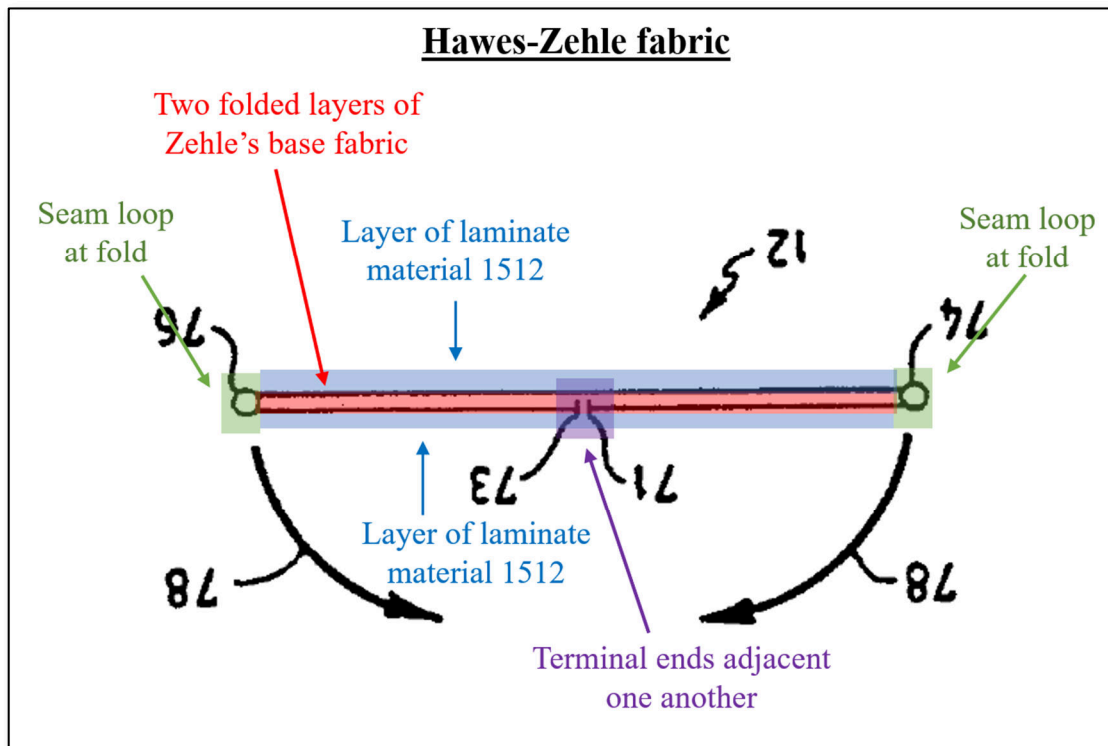
Zehle's fabric 72 by Hawes' method of "needling." EX1020, 6:27-29; EX1004, 11:40-42; EX1003, 276.

Zehle reinforces that (i) flat-woven fabrics with terminal ends (like Zehle's FIG. 7B fabric) and (ii) fabrics manufactured in endless form (like Hawes' base fabric 1500) were substitutable alternatives. EX1003, 277. After describing the FIG. 7B fabric with terminal ends shown above, Zehle explains "[a]lternatively, the base fabric assembly may be formed from, as shown in FIGS. 8A-8B, an endless base fabric." EX1020, 6:30-32; EX1003, 277. Zehle then shows and describes how the base fabrics with and without terminal ends can be used to obtain essentially the same structure, differing only in that one includes terminal ends separated in the machine direction and one lacks them. EX1020, 6:30-40, FIGS. 7B-8B; EX1003, 277.



Zehle discusses these two approaches together, describing that “[t]he advantage to a base fabric prepared according to the embodiments...*shown in FIGS. 7A-7C and 8A-8B* is that in the area of the seaming of the base fabric, the thickness of the base fabric is not increased from the pintle cable joining because a yarn has been removed from that area already.” EX1020, 6:41-46; EX1003, 278. Thus, Zehle describes the two types of base fabrics in succession, illustrates them near-identically, and describes their shared advantage. EX1003, 278. It would have been obvious to substitute one base fabric (Zehle’s base fabric with separated terminal ends) for the other (Hawes’ endless base fabric) as described in Ground 2A. EX1003, 278.

The discussion for claim 1 at §IV.B.4(a) applies equally with Zehle's base fabric substituted for Crook's for a Hawes-Zehle fabric. EX1003, 279. The Hawes-Zehle fabric satisfies claim 1.



(b) Claim 2

See claim 2 at §IV.B.4(b). The Hawes-Zehle fabric includes two sheet plies: "a layer of laminate material 1512 on the top and one on the bottom." EX1004, 11:50-52; EX1003, 280.

(c) Claim 3

See claim 3 at §IV.B.4(c). Like Hawes' fabric, Zehle's fabric is configured for producing a paper web. EX1020, 1:10-35, 2:40-44; EX1003, 281.

(d) Claim 4

See claim 4 at §IV.B.4(d), citing Hawes to demonstrate that the Hawes-Crook—and, correspondingly, the Hawes-Zehle—fabric satisfies claim 4. EX1003, 282.

(e) Claims 5, 6

See claims 5, 6 at §IV.B.4(e), showing that Hawes’ base fabric 1500 has a one-layer plain weave. EX1003, 283. Zehle, too, describes the use of “a single layer plain weave monofilament fabric[.]” EX1020, 5:48-49; EX1003, 283. It would have been obvious to use Zehle’s “single layer plain weave monofilament fabric” as the fabric in the Hawes-Zehle fabric, as Zehle discloses its suitability for this purpose. EX1003, 283.

(f) Claims 7, 8

See claims 7, 8 at §IV.B.4(f). The Hawes-Zehle fabric satisfies these claims even without including a woven material as a sheet ply, because these claims do not require the presence of a woven material as the sheet ply. EX1003, 284.

Nevertheless, Hawes-Zehle also renders obvious the use of a one-layer, plain-woven material as Hawes’ laminate material 1512. EX1003, 285. As in Crook (§IV.B.4(f)), Zehle makes clear that base fabrics can be attached to one another (as a “dual base fabric”), which is advantageous because “two base fabrics with different characteristics can be used,” explaining “[a] coarse base fabric with

high void volume and a high degree of compaction resistance is desirable for the inside or wear surface of the press felt” and “[a] finer fabric for the side of the press felt which faces the paper sheet will provide uniform pressure and prevent marking...which reduces the quality of the paper sheet.” EX1020, 3:2, 5:14-23; EX1003, 285. It would have been obvious for a POSITA to realize these advantages by using a woven material as the laminate material 1512, to obtain a fabric having multiple base fabrics laminated to one another. EX1003, 286. Zehle also discloses the use of a “single layer plain weave monofilament fabric” in the laminated structures of FIGS. 4 and 5. EX1020, 5:48-50; EX1003, 286. It would have been obvious to use such a “fine” fabric as the laminate material 1512 to achieve the advantages of achieving “uniform pressure” and marking prevention. EX1020, 5:19-23, 5:48-50; EX1003, 286.

(g) Claims 11, 12

The Hawes-Zehle fabric includes free ends (terminal ends) 71, 73, which “ar[e] ***stitched together*** loosely with brittle yarns which are subsequently destroyed in the needling operation.” EX1020, 6:21-23; EX1003, 287. Accordingly, the free ends are “at least temporarily [stitched]” to one another, satisfying claims 11 and 12. EX1003, 288.

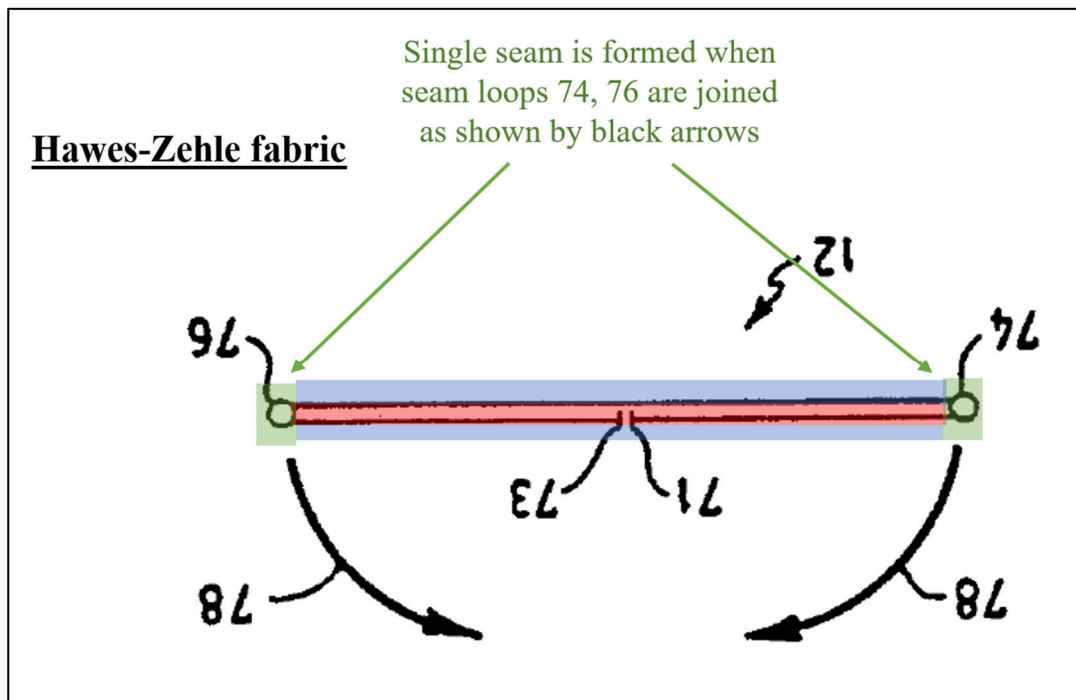
(h) Claim 13

See claim 13 at §IV.B.4(k). Zehle discloses the inclusion of a layer of batt, as indicated by the description that the base fabric is “needled” (i.e., needled with a layer of batt), and discloses that batt needling is used to attach two base fabrics to one another in a laminated fabric, like Hawes. EX1020, 1:6-9, 4:61-64, 5:5-8, 5:36-41, 6:27-29; EX1003, 289-290.

(i) Claim 14

See claim 14 at §IV.B.4(l). Hawes’ fabric is on-machine seamable. EX1004, 11:48-49; EX1016, Abstract, 4:38-40, 7:17-27; EX1003, 291. Zehle’s fabric is likewise compatible with on-machine seaming because it includes seam loops 74, 76 that are “intermeshed” and through which “a pintle cable is inserted to join the fabric into an endless base fabric,” as is typical in on-machine seaming. EX1020, 6:25-29; EX1011, 51; EX1003, 291.

Further, the Hawes-Zehle fabric (below) includes only a single seam, formed when seam loops 74, 76 are intermeshed. EX1003, 292-293.



(j) *Claim 15*

See claim 15 at §IV.B.4(m). Like Hawes, Zehle describes a “method for producing a fiber web” that includes “providing a web-producing machine” with the fabric. EX1003, 294. For example, Zehle describes that “the conventional papermaking process” includes “fe[e]d[ing]” “a water slurry or suspension of cellulose fibers...onto the top of the upper run of a traveling endless forming belt” and “[t]he forming belt...operates as a filter...to form a wet paper web.” EX1020, 1:11-16. Further, the “web is transferred to the press section in the machine” where more water is removed. EX1020, 1:23-28.

E. [GROUND 3B] – Hawes-Zehle-Yook Renders Claims 7-10 Unpatentable

1. Analysis of claims

(a) Claims 7, 8

See claims 7 and 8 at §IV.C.1(a)-(b). As discussed above, in view of Yook’s description of a “laminated fabric” including two attached base fabrics, it would have been obvious to use Yook’s base fabric 60 as the laminate material 1512 of the Hawes-Zehle fabric. EX1006, 10:16-31; EX1003, 295. This substitution would comport with Zehle’s disclosure of the advantages of fabrics that include “two base fabrics” attached to one another. EX1020, 3:2, 5:16-23; EX1003, 295. Further, each of Yook, Hawes, and Zehle describe that multiple laminated base fabrics can be attached to one another by needling. EX1006, 10:23-26; EX1004, 2:35-38, 11:40-42; EX1020, 5:5-8; EX1003, 295.

Yook’s base fabric 60 is a one-layer plain weave, satisfying claims 7 and 8. EX1006, FIG. 12, 12:62-64; EX1003, 296.

(b) Claim 9

See claim 9 at §IV.C.1(a). Yook teaches use of two of the *same* base fabric layer 22 in a laminated, two-base-fabric structure that, as discussed for claims 7 and 8, would have been obvious based on Hawes, Zehle, and Yook. EX1006, 10:19-21; EX1003, 297. Thus, it would have been obvious to select, as the laminate material 1512 of the Hawes-Zehle fabric, a fabric formed of the same

woven material as Zehle's fabric 72 to which the laminate material 1512 is attached. EX1003, 298.

(c) Claim 10

Yook teaches using "[s]titches 54" to "connect first fabric ply 40 to second fabric ply 42" within the same base fabric. EX1006, 9:49-52; EX1003, 299. As discussed above for the analogous "seam stitching" of Ryan and "stitch[es]" of Crook in §§IV.A.4(h) and IV.B.4(h), it would have been obvious for these stitches to also go through the attached laminate material 1512 of the Hawes-Zehle fabric, better securing the laminate material to the underlying fabric 72 of Zehle. EX1005, 5:1-5; EX1007, [0029], [0031]; EX1003, 300.

V. PAYMENT OF FEES – 37 C.F.R. § 42.103

Petitioner authorizes the Patent and Trademark Office to charge any fees to Deposit Account No. 06-1050.

VI. CONCLUSION

The Challenged Claims should be found unpatentable.

VII. MANDATORY NOTICES UNDER 37 C.F.R § 42.8(a)(1)

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

Albany International Corp. is the petitioner and the real party-in-interest.

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

Petitioner is not aware of any disclaimers, reexamination certificates, or petitions for inter partes review for the '388 Patent.

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

Petitioner provides the following designation of counsel.

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VIII. Service Information

Please address all correspondence and service to the address listed above.

Petitioner consents to electronic service by email at IPR59054-0016IP1@fr.com.

Respectfully submitted,

Dated: July 30, 2025

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CERTIFICATION UNDER 37 CFR § 42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 13,999 words, which is less than the 14,000 allowed under 37 CFR § 42.24.

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on July 30, 2025, a complete and entire copy of this Petition for *Inter partes* Review, Power of Attorney, and all supporting exhibits were provided via USPS Priority Express Mail, to the Patent Owner by serving the correspondence address of record as follows:

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