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(54) Title: CLOTHING ARTICLES ESPECIALLY USEFUL FOR AQUATIC ACTIVITIES

(57) Abstract: Clothing articles (e.g., aquatic "board" shorts) are generally comprised of at least one unitary woven fabric panel having multiple seamlessly adjacent different fabric weave sections. These seamlessly adjacent different fabric weave sections may be selected from plain fabric weaves, twill fabric weaves and/or Dobby fabric weaves. Aquatic activity shorts are provided which include a one piece rear fabric panel providing a seamless back rise.

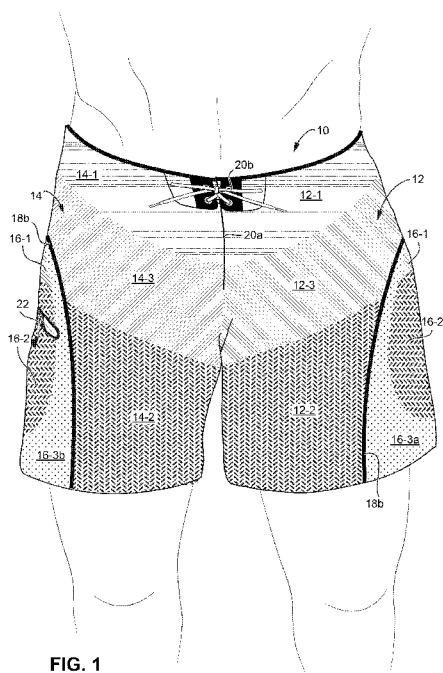


FIG. 1



Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

CLOTHING ARTICLES ESPECIALLY USEFUL FOR AQUATIC ACTIVITIES

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application is based on and claims priority benefits from U.S. Provisional Application Serial No. 62/169,797 filed on June 2, 2015, the entire content of which is expressly incorporated hereinto by reference.

FIELD

[0002] The present invention is related generally to clothing articles that may be employed usefully in aquatic activities, e.g., water sport shorts, swimming attire and the like. In preferred forms, the clothing articles are provided with unitary woven fabric panels with multiple seamlessly adjacent different fabric weave sections.

BACKGROUND AND SUMMARY

[0003] Various aquatic sports activities (e.g., surfing, water boarding, water skiing, scuba diving and the like) require clothing articles that are lightweight when saturated with water and exhibit flexibility to enable the individual participant full freedom of movement. Aquatic shorts (colloquially known as “board shorts”) that are breathable (fast drying), possess extreme light weight and supportive yet highly flexible are especially desired by water sports enthusiasts. It is towards providing such clothing, especially water shorts, that the embodiments disclosed herein are directed.

[0004] The embodiments of the present invention as described herein including clothing articles (e.g., aquatic “board” shorts) are generally comprised of at least one unitary woven fabric panel having multiple differing seamlessly adjacent fabric weave sections. These

seamlessly adjacent different fabric weave sections may be selected from plain fabric weaves, twill fabric weaves and/or Dobby fabric weaves.

[0005] At least one unitary woven fabric panel of the clothing article may comprise a twill weave section and a Dobby weave section seamlessly joined to one another along a respective interface boundary therebetween. Alternatively or additionally, the at least one unitary woven fabric panel may comprise a plain weave section and a twill weave section seamlessly joined to one another along a respective interface boundary therebetween. According to some embodiments, the at least one unitary woven fabric panel may comprise an upper plain weave section, a lower Dobby weave section and an intermediate twill weave section seamlessly joined to the upper plain and lower Dobby weave sections along respective interface boundaries therebetween.

[0006] Some embodiments of the invention are directed toward aquatic activity shorts comprised of a one piece rear fabric panel providing a seamless back rise. Preferably, the one piece rear fabric panel comprises seamlessly adjacent different woven fabric sections that may be selected from plain fabric weaves, twill fabric weaves and/or Dobby fabric weaves.

[0007] Certain other embodiments of the aquatic activity shorts may comprise one piece left and right front woven fabric panels, each of which may be comprised of seamlessly adjacent different woven fabric sections. By way of example, the seamlessly adjacent different woven fabric sections of the left and right front woven front fabric panels may be selected from plain fabric weaves, twill fabric weaves and/or Dobby fabric weaves.

[0008] If present, the one-piece left and right front woven fabric panels may be joined to the one-piece rear fabric panel along a seam that has opposed ends located generally above a knee region of a user at a

lower edge of the shorts and extends upwardly and rearwardly around a buttocks region of the user with an apex centrally located adjacent a rear waist region of the user.

[0009] According to some embodiments, the left and right front woven fabric panels include seamlessly adjacent left and right rear waist sections. Each of the left and right rear waist sections may comprise upper and lower seamlessly adjacent woven fabric sections.

[0010] Some embodiments of the aquatic activity shorts according to the invention may comprise left and right front woven fabric panels and a rear woven fabric panel, wherein each of the left, right and rear fabric panels is formed of a one piece woven fabric having seamlessly adjacent different woven fabric sections. The one piece rear fabric panel may therefore provide a seamless back rise.

[0011] The rear woven fabric panel of some embodiments may comprise an upper twill weave section and a lower Dobby weave section seamlessly joined to one another along a respective interface boundary therebetween. The rear woven fabric panel may further comprise lateral arcuate woven fabric sections seamlessly joined to the upper twill and lower Dobby weave sections along respective arcuate interface boundaries therebetween.

[0012] These and other aspects and advantages of the present invention will become more clear after careful consideration is given to the following detailed description of the preferred exemplary embodiments thereof.

BRIEF DESCRIPTION OF ACCOMPANYING DRAWINGS

[0013] The disclosed embodiments of the present invention will be better and more completely understood by referring to the following

detailed description of exemplary non-limiting illustrative embodiments in conjunction with the drawings of which:

[0014] FIG. 1 is a front elevational view of water sports clothing in the form of water shorts in accordance with an embodiment of the present invention shown as being worn to cover a person's pelvic and upper thigh regions;

[0015] FIG. 2 is an isolated front elevational view of the water shorts depicted in FIG. 1;

[0016] FIG. 3 is a rear elevational view of the water shorts depicted in FIG. 2;

[0017] FIGS. 4 and 5 are left and right side elevational views of the water shorts depicted in FIG. 2;

[0018] FIG. 6 is a plan view of the left side fabric panel employed in the water shorts of FIG. 2, the right side fabric panel being substantially a mirror image thereof; and

[0019] FIG. 7 is a plan view of the rear fabric panel employed in the water shorts of FIG. 2.

DETAILED DESCRIPTION

A. Definitions

[0020] As used herein and in the accompanying claims, the terms below are intended to have the following definitions:

[0021] "Filament" means a fibrous strand of extreme or indefinite length.

[0022] "Fiber" means a fibrous strand of definite or short length, such as a staple fiber.

[0023] "Yarn" means a collection of numerous filaments or fibers which may or may not be textured, spun, twisted or laid together.

[0024] "Spinning" means the formation of a yarn by a combination of drafting and twisting or prepared strands of staple fibers, such as rovings.

[0025] "Woven fabric" means a fabric composed of two sets of yarns, warp and filling, and formed by interlacing (weaving) two or more warp yarns and filling yarns in a particular weave pattern (e.g., plain weave, twill weave, satin weave Dobby weave and the like). Thus, during weaving the warp and fill yarns will be interlaced so as to cross each other at right angles to produce the woven fabric having the desired weave pattern.

[0026] "Plain weave" means a woven fabric wherein weft yarns alternately cross over and under immediately adjacent warp yarns with an adjacent weft yarn alternately passing under and over such immediately adjacent warp yarns, respectively.

[0027] "Twill weave" means a woven fabric with a pattern of diagonal parallel ribs formed by the repeated passing of weft yarns over one or more warp yarns and then under two or more warp yarns.

[0028] "Dobby weave" means a woven fabric having repeated geometric patterns and texture.

[0029] An "elastic filament" or "elastic yarn" means a filament/yarn that can be stretched to a length of at least about 1.5 times, typically at least about 2.0 times, and greater, of its unstretched length and has at least about 90% elastic recovery, typically at least about 92% elastic recovery, up to 100% elastic recovery after one hour relaxation following stretching.

[0030] An “inelastic filament” or “inelastic yarn” means a filament/yarn that is not capable of being stretched beyond its maximum tensioned length without some permanent deformation.

B. Exemplary Embodiments

[0031] The water shorts 10 according to an embodiment of the invention are shown in FIG. 1 as being worn about the pelvic and upper thigh regions of a user. The water shorts 10 are comprised of multiple distinct one piece woven textile panels including left and right front panels 12, 14 having left and right rear waist sections 12a, 14a, and a rear panel 16. The panels may be welded to one another along seam lines 18a-18c, respectively. The water shorts may have a front fly 20a that is closed by means of any conventional fastening system (e.g., VELCRO® loop and pile fastener, zipper, buttons or the like) and laces 20b to close the waist band. The rear panel 16 may include a water-resistant zippered opening 22 to access a pocket formed by a fabric section (not shown) welded along its periphery to an interior region thereof. An elastomeric (rubberized) waistband 24 is thermally welded to the interior waist region of the shorts 10 to provide flexion as the user's hips and waist move. The waistband 24 also provides size stability through the waist and minimizes slippage from the user's waist region.

[0032] Important to the embodiments disclosed herein, each of the panels 12, 14 and 16 are unitary (one-piece) woven textile constructions having multiple differing fabric weave sections seamlessly adjacent one another. In the embodiment depicted in FIGS. 1-6, the left and right front panels 12, 14 will include an upper plain weave textile fabric section 12-1, 14-1, and a lower Dobby weave textile fabric section 12-2, 14-2 separated from one another by an intermediate twill weave textile fabric section 12-3, 14-3, respectively. Each of the fabric sections 12-1, 12-2 and 12-3 of the left front panel 12 and each of the fabric sections 14-1, 14-2 and 14-3 of the right front panel 14 form respective seamless interface boundaries

therebetween due to the fabric panels 12 and 14 being a one-piece woven fabric construction.

[0033] The left and right rear waist sections 12a, 14a of the panels 12, 14 include an upper plain weave fabric section 12a1, 14a1 and a lower Dobby weave textile fabric section 12a2, 14a2, respectively. The opposed ends of the left and right rear waist sections 12a, 14a are thermally welded to one another along vertical rear waist seam 18a.

[0034] Like the left and right front panels 12, 14, the rear panel 16 is a unitary (one-piece) woven textile construction having multiple differing fabric weave sections seamlessly adjacent one another. The rear panel 16 is thermally welded to the panels 12, 14 along continuous seam 18b. As shown, the seam 18b has opposed ends located generally above the user's knee at the lower edge of the shorts 10 and extends upwardly and rearwardly around the user's buttock region with an apex being centrally located adjacent the user's rear waist. The rear panel 16 bounded by the seam 18b is constructed of multiple differing fabric weave sections seamlessly adjacent one another which thereby provide a seamless back rise in the shorts 10. In the depicted embodiment, the rear panel 16 includes an upper twill weave fabric section 16-1 and a lower Dobby weave fabric section 16-2. Lateral fabric sections 16-3a and 16-3b are formed of a Dobby weave textile fabric section that has a different (smaller) Dobby weave characteristic as compared to the (larger) Dobby weave of fabric section 16-2. The lateral arcuate woven fabric sections 16-3a, 16-3b are seamlessly joined to the upper twill weave section 16-1 and lower Dobby weave section 16-2 along respective arcuate interface boundaries therebetween.

[0035] Each of the fabric sections forming the panels 12, 14 and 16 of the shorts are engineered to impart optimal comfort to the user by providing differential stretch characteristics and stretch axes. By way of example, the plain weave fabric sections 12-1, 12a1, 14-1 and 14a-1 are

designed to provide compact (minimal) 4-way stretch along the vertical and horizontal axes so as to hold shape and to support the user's waist and seat region. Each of the plain weave fabric sections 12-1, 12a1, 14-1 and 14a-1 may have the same or different maximum stretch characteristics. A specific plain weave fabric that may be employed for fabric sections 12-1, 12a1, 14-1 and 14a-1 is a plain fabric construction of about 140 gm/m² woven 164 x 156 / 50 denier polyester + elastomeric filament x 50 denier polyester yarns + elastomeric filament.

[0036] The twill weave sections 12-3, 14-3 and 16-1 provide a durable and angular weave that is capable of stretching along the horizontal and vertical axes of the shorts 10. Preferably the twill weave sections 12-3, 14-3 and 16-1 exhibit greater maximum stretch along the horizontal and vertical axes of the shorts as compared to the respective plain weave fabric sections 12-1, 12a1, 14-1 and 14a-1 seamlessly adjacent thereto. A specific twill weave fabric that may be employed for fabric sections 12-1, 12a1, 14-1 and 14a-1 a twill fabric construction of about 146 gm/m² woven 164 x 156 / 50 denier polyester + elastomeric filament x 50 denier polyester yarns + elastomeric filament.

[0037] The Dobby weave sections 12a2, 12-2, 14a2, 14-2 and 16-2 are lower and loftier weave constructions possessing stretch characteristics along the vertical, horizontal and diagonal (45° bias) axes of the shorts 10. The relatively open weave of the Dobby weave sections 12a2, 12-2, 14a2, 14-2 and 16-2 create repetitive perforations that eliminate cling to the user's body with the fabric is wet, reduces weight and promotes breathability. Preferred embodiments of the Dobby weave sections 12a2, 12-2, 14a2, 14-2 and 16-2 will possess ordered rows of spaced-apart perforations with perforations in adjacent rows being off-set relative to one another. The nominal perforation size and inter-perforation spacing of the upper Dobby weave sections 12a2, 14a2 are preferably relatively smaller (e.g., at least about 10% smaller or least about 20%

smaller) as compared to the perforation size and inter-perforation spacing of the lower Dobby weave sections 12-2, 14-2 and 16-2. A particular fabric for the upper (smaller) Dobby weave sections 12a2, 14a2 may be Dobby fabric construction of about 152 gm/m² woven 164 x 166 / 50 denier polyester + elastomeric filament x 50 denier polyester yarns + elastomeric filament, while a particular fabric for the lower (larger) Dobby weave sections 12-2, 14-2 and 16-2 is a Dobby fabric construction of about 134 gm/m² woven 164 x 160 / 50 denier polyester + elastomeric filament x 50 denier polyester yarns + elastomeric filament.

[0038] The various panels 12, 14 and 16 may be woven from virtually any natural or synthetic filament or yarn. Preferably synthetic yarns are employed and can be formed from any desirable fiber-forming polymer such as polyamides (e.g., nylon 6, nylon 6,6, nylon 6,12 and the like), polyesters, polyolefins (e.g., polypropylene, polyethylene) and the like, as well as mixtures and copolymers of the same.

[0039] Similarly, any desirable elastomeric filament may be employed in order to impart the desired stretch characteristics to the woven panels 12, 14 and 16. Preferred elastic filaments are spandex filaments formed of a long chain synthetic elastomer comprised of at least 85% by weight of a segmented polyurethane typically interspersed with relatively soft segments of polyethers, polyester, polycarbonates and the like. A particularly preferred spandex filament is commercially available under the trade name LYCRA® having deniers of about 40 to about 70, typically a denier of about 50. Combinations of elastomeric and non-elastomeric filaments and yarns may also be employed. For example, one or more elastomeric filament(s) may be co-spun, wrapped or covered with a non-elastic fiber or filament, e.g. polyester.

[0040] The woven panels 12, 14 and/or 16 exhibit both stretch and elastic recovery following stretching as measured according to ASTM

D3107-2007(2011) (incorporated fully by reference herein) as shown by the data below:

<u>Stretch Properties of Woven Fabric Panels (ASTM D3107-2007(2011))</u>		
	<u>Lengthwise (Warp)</u>	<u>Widthwise (Weft)</u>
<u>Fabric stretch after 4 lbs. tensioning for 30 min.</u>		
(%)	30.0	38.8
<u>Fabric growth after 4 lbs. tensioning for 30 min.</u>		
(%)	4.0	7.2
<u>Fabric growth after stretching to:</u>	<u>31.4 cm</u>	<u>33.3 cm</u>
After 30 sec. relaxation (%)	2.4	4.0
After 30 min. relaxation (%)	1.2	2.8
After 1 hour relaxation (%)	1.2	2.4
<u>Fabric recovery after stretching to:</u>	<u>31.4 cm</u>	<u>33.3 cm</u>
After 30 sec. relaxation (%)	90.6	87.9
After 30 min. relaxation (%)	95.3	91.5
After 1 hour relaxation (%)	95.3	92.7

[0041] The invention herein is not to be limited to the disclosed embodiments, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

WHAT IS CLAIMED IS:

1. A clothing article comprising at least one unitary woven fabric panel having multiple differing seamlessly adjacent fabric weave sections
2. The clothing article of claim 1, wherein the adjacent fabric weave sections are selected from the group consisting of plain fabric weaves, twill fabric weaves and Dobby fabric weaves.
3. The clothing article of claim 1, wherein the at least one unitary woven fabric panel comprises a twill weave section and a Dobby weave section seamlessly joined to one another along a respective interface boundary therebetween.
4. The clothing article of claim 1, wherein the at least one unitary woven fabric panel comprises a plain weave section and a twill weave section seamlessly joined to one another along a respective interface boundary therebetween.
5. The clothing article of claim 1, wherein the at least one unitary woven fabric panel comprises an upper plain weave section, a lower Dobby weave section and an intermediate twill weave section seamlessly joined to the upper plain and lower Dobby weave sections along respective interface boundaries therebetween.
6. Aquatic activity shorts comprising a one piece rear fabric panel providing a seamless back rise.
7. The shorts of claim 6, wherein the one piece rear fabric panel comprises seamlessly adjacent different woven fabric sections.

8. The shorts of claim 7, wherein the seamless adjacent different woven fabric sections are selected from the group consisting of plain fabric weaves, twill fabric weaves and Dobby fabric weaves.
9. The shorts of claim 6, further comprising one piece left and right front woven fabric panels.
10. The shorts of claim 9, wherein each of the left and right front woven front fabric panels is comprised of seamlessly adjacent different woven fabric sections.
11. The shorts of claim 10, wherein the seamlessly adjacent different woven fabric sections of the left and right front woven front fabric panels are selected from the group consisting of plain fabric weaves, twill fabric weaves and Dobby fabric weaves.
12. The shorts of claim 10 wherein the left and right front woven fabric panels are joined to the rear fabric panel along a seam that has opposed ends located generally above a knee region of a user at a lower edge of the shorts and extends upwardly and rearwardly around a buttocks region of the user with an apex centrally located adjacent a rear waist region of the user.
13. The shorts of claim 12, wherein the left and right front woven fabric panels include seamlessly adjacent left and right rear waist sections.
14. The water shorts of claim 13, wherein each of the left and right rear waist sections comprise upper and lower seamlessly adjacent woven fabric sections.

15. Aquatic activity shorts comprising left and right front woven fabric panels and a rear woven fabric panel, wherein each of the left, right and rear fabric panels is formed of a one piece woven fabric having seamlessly adjacent different woven fabric sections.
16. The shorts of claim 15, wherein the one piece rear fabric panel provides a seamless back rise.
17. The shorts of claim 16 wherein the left and right front woven fabric panels are joined to the rear fabric panel along a seam that has opposed ends located generally above a knee region of a user at a lower edge of the shorts and extends upwardly and rearwardly around a buttocks region of the user with an apex centrally located adjacent a rear waist region of the user.
18. The shorts of claim 15, wherein the seamlessly adjacent different woven fabric sections of the left front, right front and rear woven fabric panels are selected from the group consisting of plain fabric weaves, twill fabric weaves and Dobby fabric weaves.
19. The shorts of claim 15, wherein the rear woven fabric panel comprises an upper twill weave section and a lower Dobby weave section seamlessly joined to one another along a respective interface boundary therebetween.
20. The shorts of claim 19, wherein the rear woven fabric panel further comprises lateral arcuate woven fabric sections seamlessly joined to the upper twill and lower Dobby weave sections along respective arcuate interface boundaries therebetween.
21. The shorts of claim 20, wherein the lateral arcuate woven fabric sections are formed of a Dobby weave construction which has

smaller perforations as compared to perforations of the lower
Dobby weave fabric section of the rear fabric panel.

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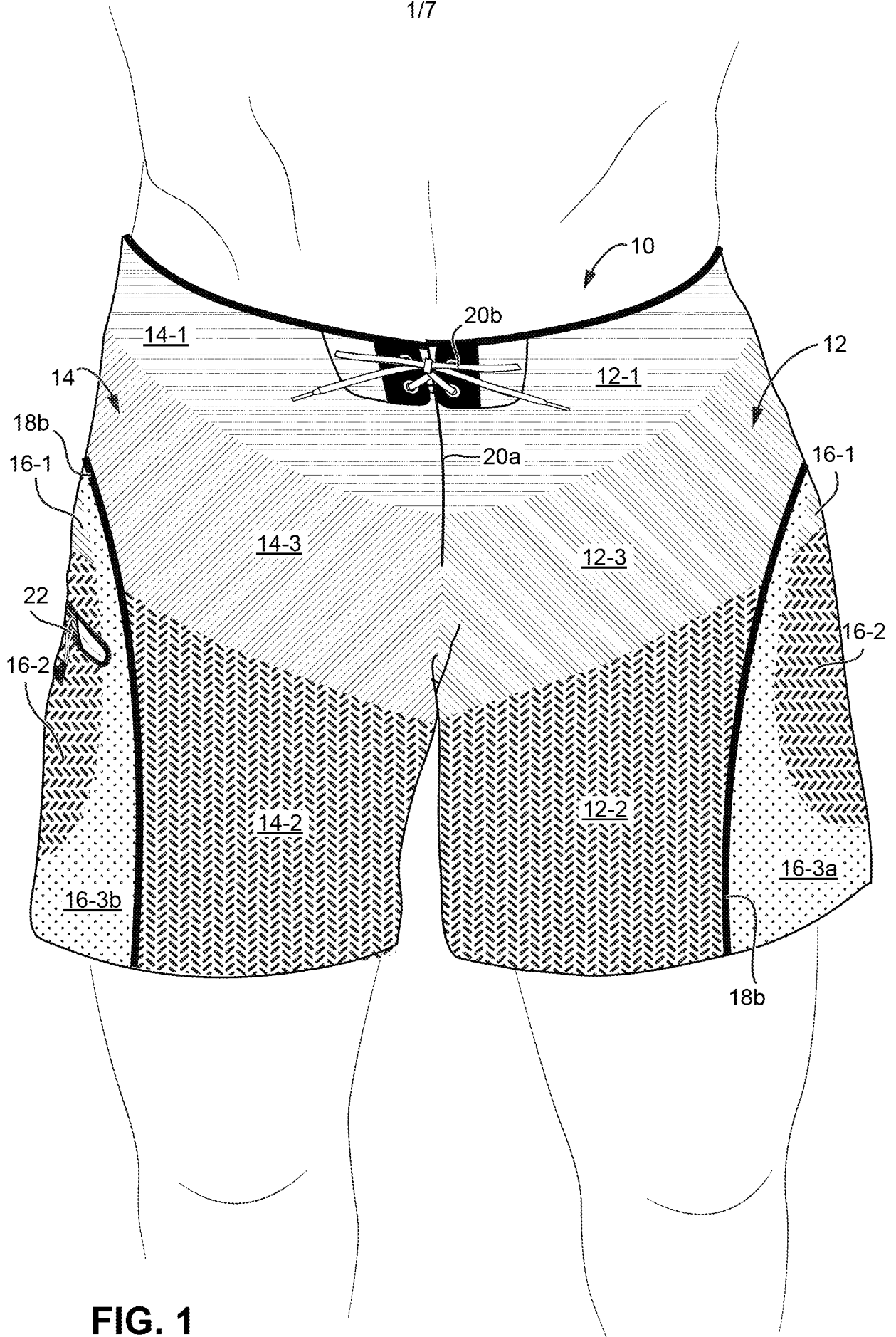
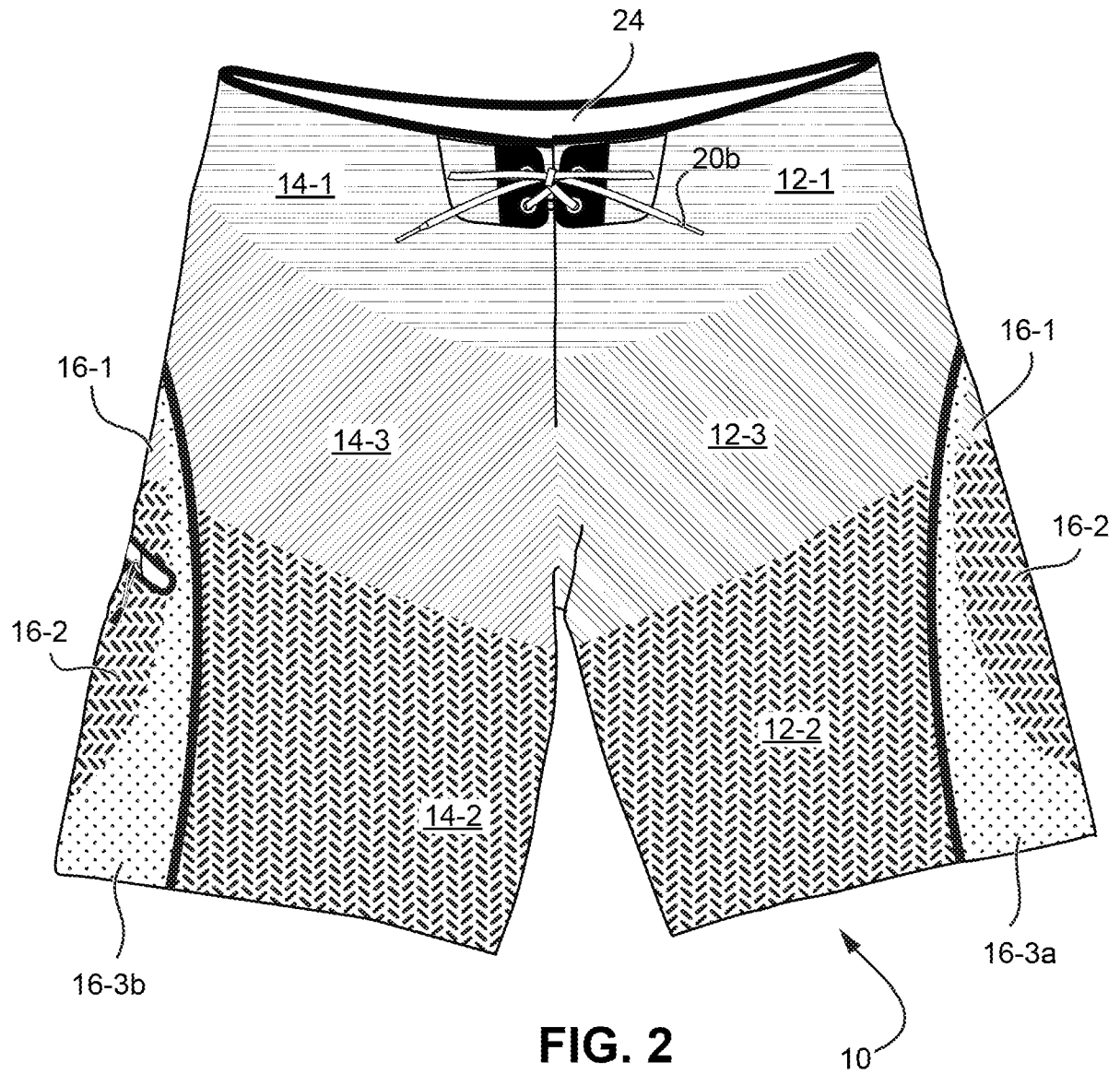
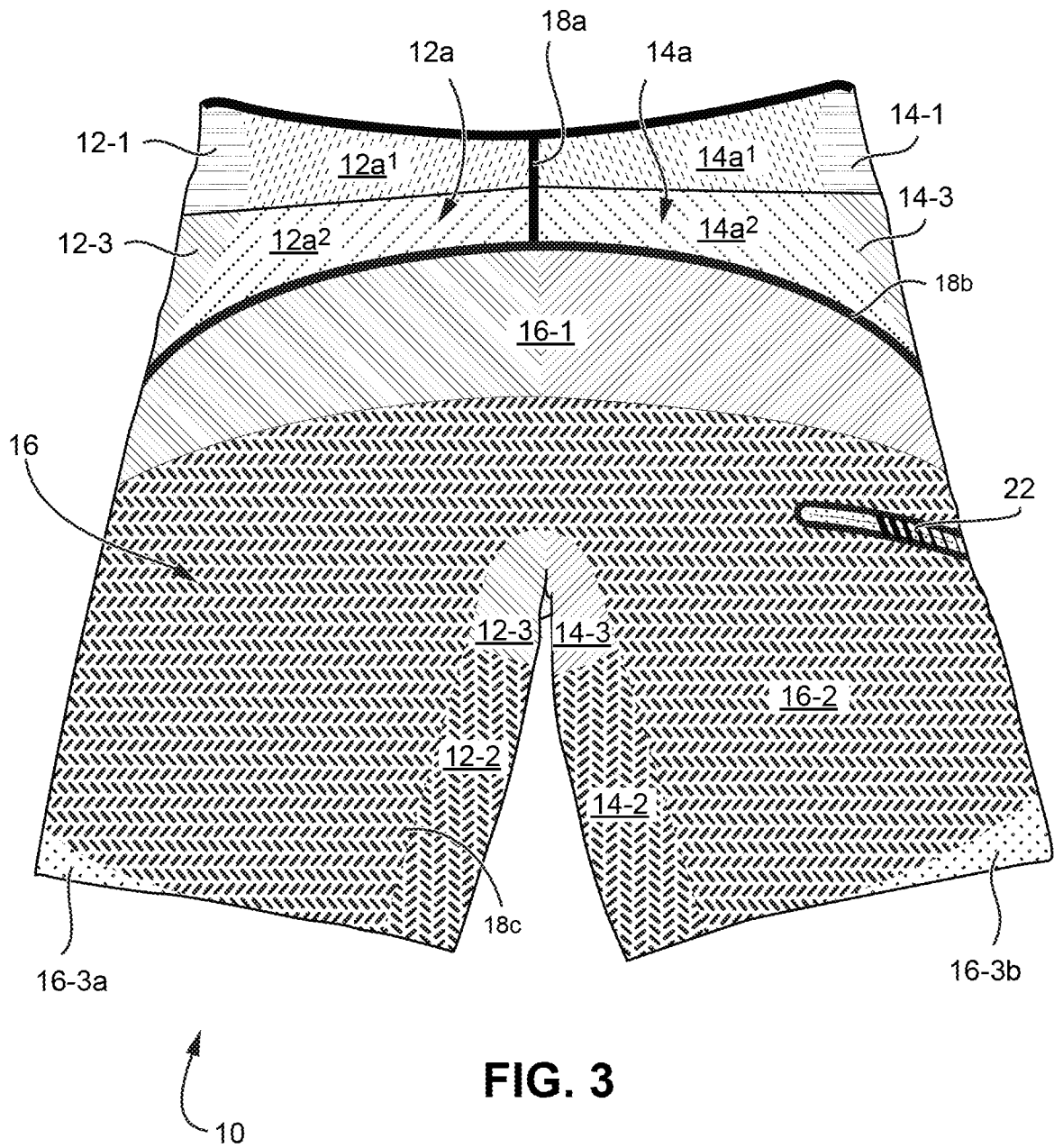


FIG. 1

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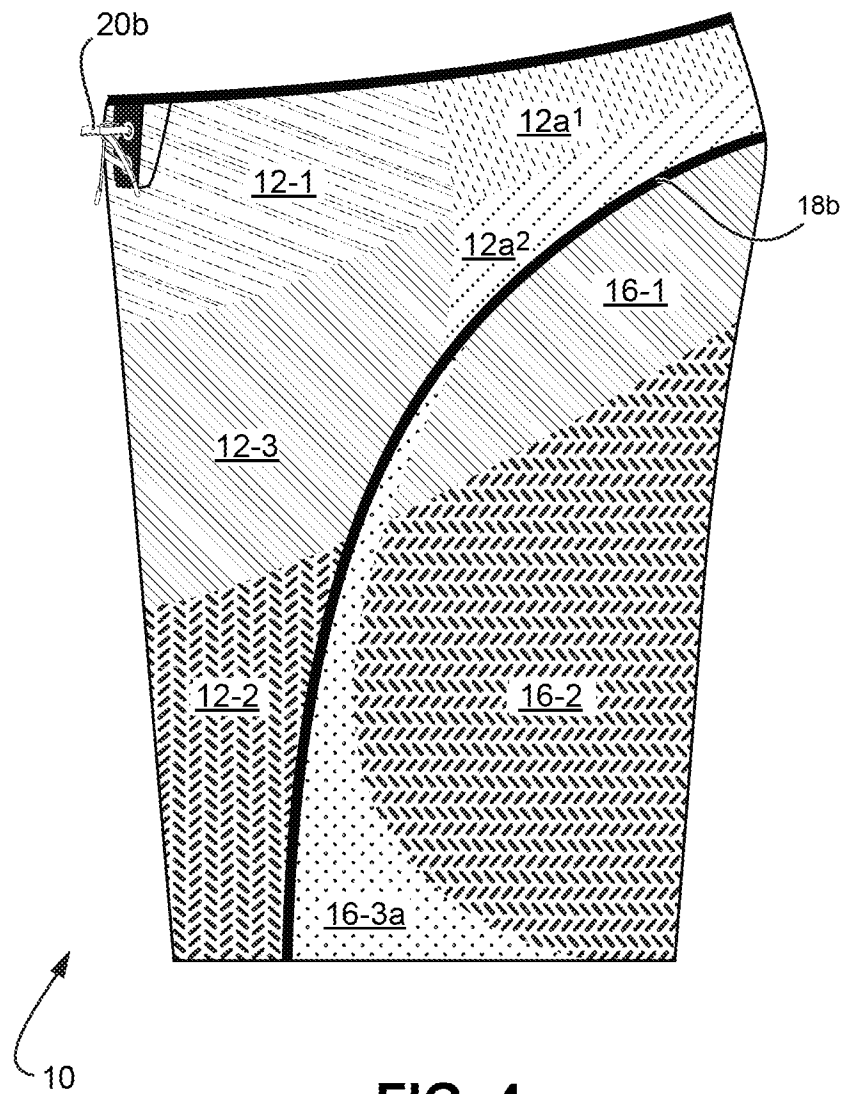


FIG. 4

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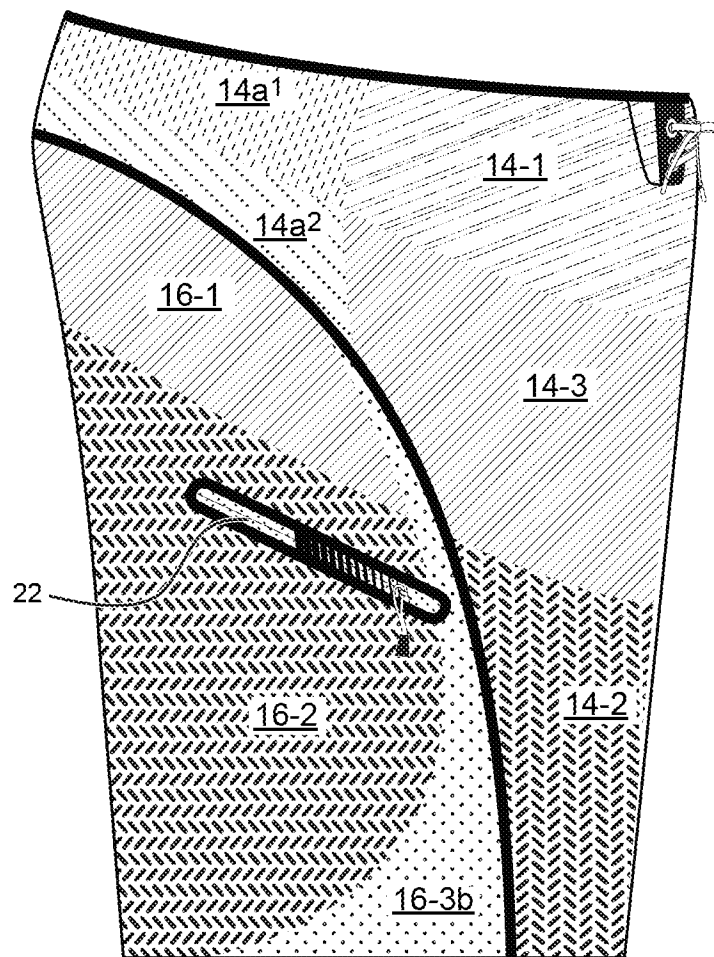
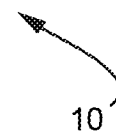
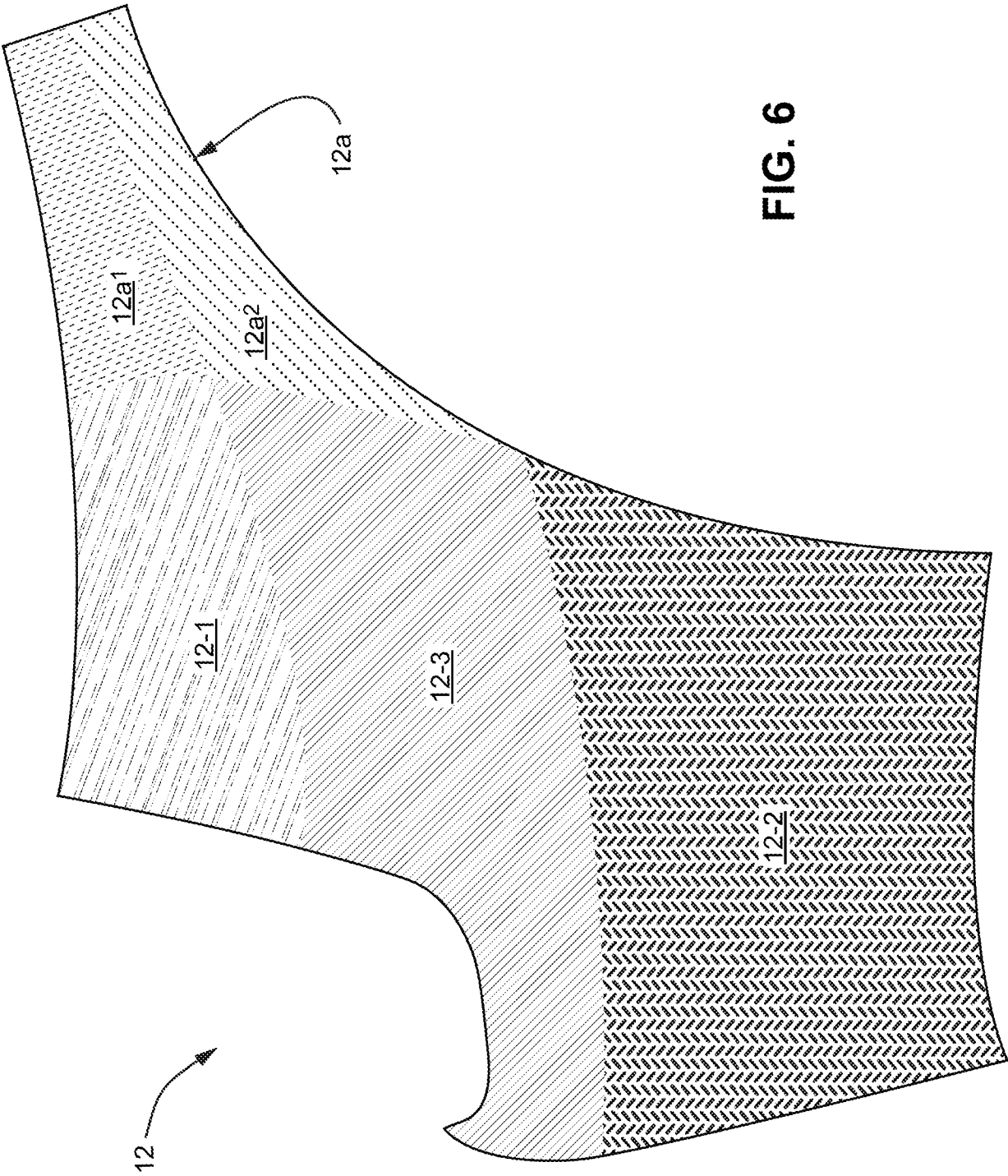


FIG. 5





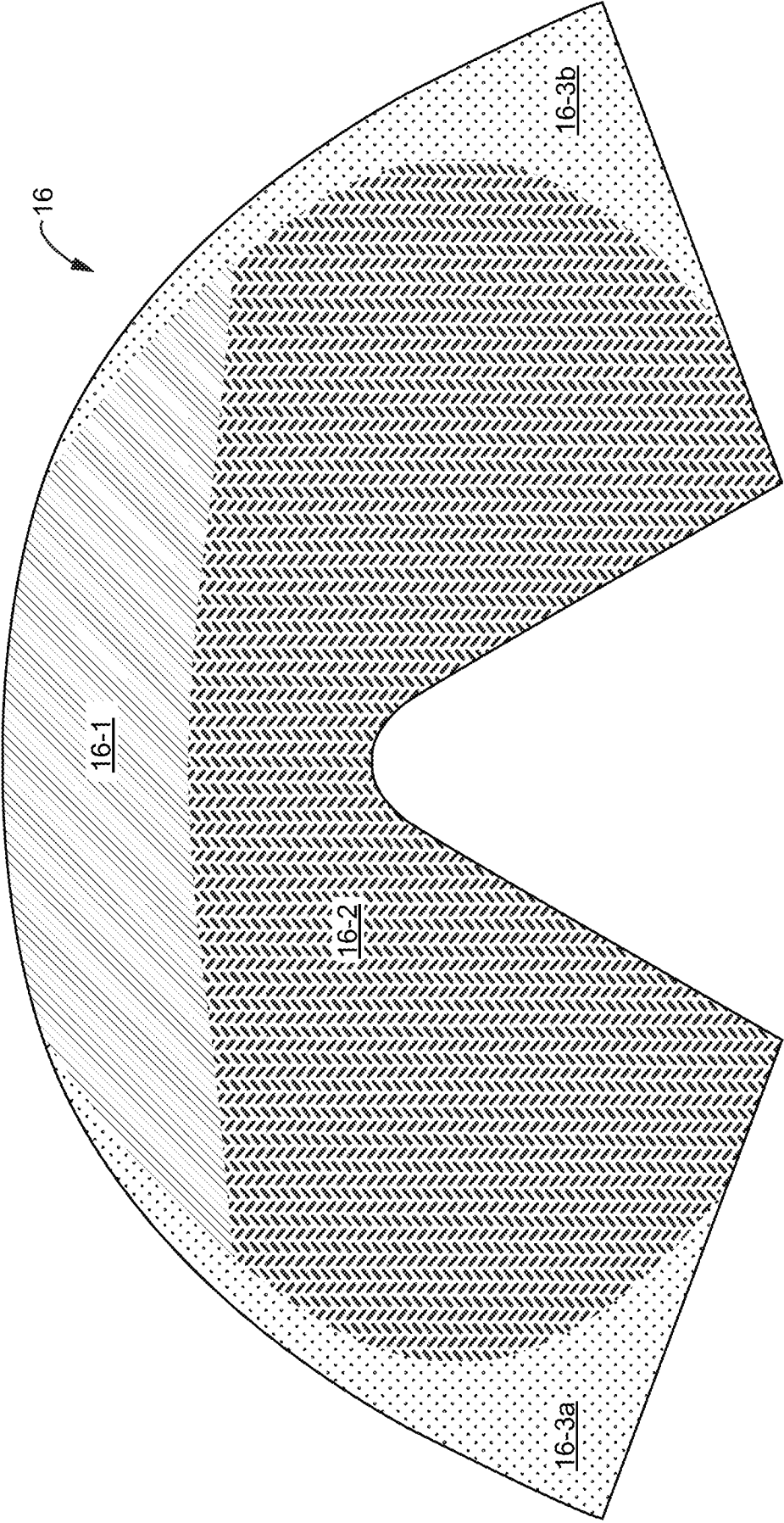


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 16/32974

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A41D 7/00 (2016.01)

CPC - A41D7/005 A41D2400/38 A41D13/0015 A41D13/012 A41D27/245

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

CPC: A41D7/005 A41D2400/38 A41D13/0015 A41D13/012 A41D27/245

IPC(8): A41D 7/00 (2016.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

CPC: A41D7/005 A41D2400/38 A41D13/0015 A41D13/012 A41D27/245; IPC(8): A41D 7/00 (2016.01); USPC: 2/67 2/228 2/238 2/275; keyword limited; terms below

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase; Google (Web, Patent, Scholar); terms used: board shorts surfing pants plain twill dobby weave woven pattern differing various dissimilar distinct seamless adjacent unitary panel section portion segment knit stretch elastic omnidirectional modulus

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X - Y - A	US 2014/0148741 A1 (MORAN) 29 May 2014 (29.05.2014), entire document, especially FIG. 2, 4; para [0062]-[0063], [0065]-[0067], [0077]	1, 6-7 ----- 2-5, 8-20 ----- 21
X - Y - A	US 2003/0208829 A1 (RAGOT et al.) 13 November 2003 (13.11.2003), entire document, especially FIG. 1-3; para [0014], [0024]-[0025]	6 ----- 9-20 ----- 21
Y - A	"Types of Fabric Weaves" (TE ONLINE) 13 October 2008 (13.10.2008) [article] accessed 31.07.2016 at <http://www.teonline.com/articles/2008/1	2-5, 8, 11, 18-20 ----- 21
A	US 2014/0366585 A1 (SHEN et al.) 18 December 2014 (18.12.2014), entire document	1-21
A	US 2012/0246793 A1 (MOORE et al.) 4 October 2012 (04.10.2012), entire document	1-21
A	WO 2014/016643 A1 (ARENA DISTRIBUTION S.A.) 30 January 2014 (30.01.2014), entire document	1-21

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

27 July 2016 (27.07.2016)

Date of mailing of the international search report

16 AUG 2016

Name and mailing address of the ISA/US

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