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(71) Applicant: THE MARENA GROUP, LLC [US/US];

1045 Progress Circle, Lawrenceville, Georgia 30043 (US).

(72) Inventors: BURHANCE, Linda Marie; 6 West Street,

Newtown, Connecticut 06470 (US). STEPHENS, Jeffrey

Dan; 475 Oakdale Road, NE, Apt. #8B, Atlanta, Georgia 30307 (US). BERNSTEIN, Jason Asher; 195 Shadow

Creek Chase, Alpharetta, Georgia 30022 (US).

(74) Agent: BERNSTEIN, Jason A.; BARNES & THORN-

BURG LLP, 11 South Meridian Street, Indianapolis, Indiana 46204-3535 (US).

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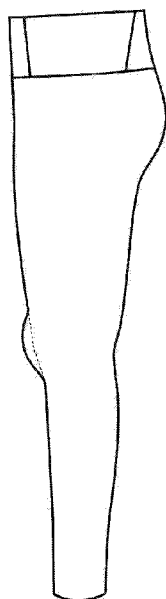
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(54) Title: GARMENT WITH MOLDED EXPANDED JOINT AREA

Fig. 5



(57) Abstract: A garment having a molded expanded area, such as proximate to an articulable area such as a knee, elbow, shoulder, heel, or other joint area, comprising at least one panel of a woven fabric having elasticity in both the warp and weft directions, and an expanded area in the fabric material formed by heating a portion of the fabric material in a mold such that the fabric is stretched and maintained after removal from the mold in the stretched state. The garment may also comprise at least one opening in a panel proximate to the expanded area for permitting access to the wearer's skin while wearing the garment. The at least one opening may be formed by a first and second flap, with a portion of the first flap overlapping the second flap.



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**PATENT COOPERATION TREATY**  
**APPLICATION FOR PATENT**

GARMENT WITH MOLDED EXPANDED JOINT AREA

INVENTORS:

LINDA MARIE BURHANCE

JEFFREY DAN STEPHENS

JASON ASHER BERNSTEIN

PRIORITY CLAIM

[001] This application claims priority to co-pending U.S. Provisional Patent Application No. 62/677,859, filed May 30, 2018, the disclosure of which is incorporated herein by reference in its entirety.

FIELD

[002] The present disclosure relates, in exemplary embodiments, to garments having an expanded area proximate to an articulable area, such as a knee, elbow, shoulder, heel, or other joint area. More particularly, the present disclosure relates to garments constructed from elastic fabric material and having an expanded area being formed in a molded manner.

SUMMARY

[003] The following presents a simplified summary in order to provide a basic understanding of some aspects of various invention embodiments. The summary is not an extensive overview of the

invention. It is neither intended to identify key or critical elements of the invention nor to delineate the scope of the invention. The following summary merely presents some concepts of the invention in a simplified form as a prelude to the more detailed description below.

[004] Generally described, the present disclosure provides in a first exemplary embodiment a garment having a molded expanded area, such as proximate to an articulable area such as a knee, elbow, shoulder, heel, or other joint area, comprising at least one panel of a woven fabric having elasticity in both the warp and weft directions, and an expanded area in the fabric material formed by heating a portion of the fabric material in a mold such that the fabric is stretched and maintained after removal from the mold in the stretched state. The garment may also comprise at least one opening in a panel proximate to the expanded area for permitting access to the wearer's skin while wearing the garment. The at least one opening may be formed by a first and second flap, with a portion of the first flap overlapping the second flap.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[005] The drawings disclose exemplary embodiments in which like reference characters designate the same or similar parts throughout the figures of which:

[006] Fig. 1 is a front elevational view of one exemplary embodiment of the present disclosure showing a legging garment.

[007] Fig. 2 is a back elevational view of the embodiment of Fig. 1.

[008] Fig. 3 is a left side elevational view of the embodiment of Fig. 1.

[009] Fig. 4 is a right side elevational view of the embodiment of Fig. 1.

[0010] Fig. 5 is a larger left side elevational view of the embodiment of Fig. 1.

[0011] Fig. 6 is a side elevational view of an exemplary embodiment showing a sleeve garment.

[0012] Fig. 7 is a front elevational view of an exemplary embodiment showing a shoulder garment.

[0013] Fig. 8 is a front elevational view of an exemplary embodiment showing a heel garment.

[0014] Fig. 9 is a front elevational view of a portion of a legging garment showing an alternative embodiment that includes a covered opening proximate to the expanded joint area.

[0015] Fig. 10 is a side elevational view of the embodiment of Fig. 9.

[0016] Fig. 11 is a front elevational view of an alternative embodiment showing a portion of a legging garment having an opening and a flap covering the opening.

#### DETAILED DESCRIPTION

[0017] Unless otherwise indicated, the drawings are intended to be read (for example, cross-hatching, arrangement of parts, proportion, degree, or the like) together with the specification, and are to be considered a portion of the entire written description of this invention. As used in the following description, the terms “horizontal”, “vertical”, “left”, “right”, “up” and “down”, “upper” and “lower” as well as adjectival and adverbial derivatives thereof (for example, “horizontally”, “upwardly”, or the like), simply refer to the orientation of the illustrated structure as the particular drawing figure faces the reader. Similarly, the terms “inwardly” and “outwardly” generally refer to the orientation of a surface relative to its axis of elongation, or axis of rotation, as appropriate.

[0018] Fig. 1 shows one exemplary embodiment of a legging garment being made of an elastic fabric material having elasticity in both the warp and weft directions. In exemplary embodiments, the garment is constructed one or more fabric panels. In exemplary embodiments, a garment may be constructed of a first leg panel, a second leg panel, a first knee panel, a second knee panel, and a waist panel. In exemplary embodiments, additional panels, such as a gusset panel, may be used.

[0019] Each knee panel may be constructed of a piece of fabric material having elasticity in both the warp and weft directions. In exemplary embodiments, the fabric has a modulus of elasticity that is approximately equivalent in both the warp and the weft directions. Such fabric, commonly known as having “four-way stretch” is desirable because it stretches generally about the same amount in both the lengthwise and crosswise directions. The knee panel is constructed so as to have an expanded area that, when incorporated into the garment, will be located at the wearer’s patella area.

[0020] In one exemplary embodiment, the knee panel may be constructed as follows. The knee panel fabric is cut to the desired shape and size panel. It is then placed in a female mold part. In exemplary embodiments, the mold is a “plunge” mold, as is known to those skilled in the art. The edges of the fabric panel are clamped or otherwise held to maintain the fabric panel in place. The male mold part is placed on the fabric panel to sandwich the fabric panel between the male and female mold parts. In one exemplary embodiment the male and female mold parts are heated and the fabric panel is stretched by the male mold part into the female mold part for a predetermined amount of time, called the “dwell” time, which depends on a variety of factors, including, but not limited to, the fabric composition, thickness, amount of stretching to be done, and the like. In one exemplary embodiment, the male mold part may be 185 degrees F, and the female mold part may be 205 degrees F. In one exemplary embodiment, the dwell time is 45 seconds.

[0021] After the desired dwell time has elapsed, the male mold part is separated from the female mold part and the fabric panel removed. The fabric panel has been stretched pursuant to the shape of the male and female mold parts to create an expanded area that is convex or cup-shaped, or that is otherwise slightly expanded compared to the rest of the fabric panel. The fabric panel is allowed to cure at room temperature. The formed fabric panel is then sewn along with the other panels to form the desired garment. The amount of expansion of the fabric panel can be determined by the size and shape of the mold parts. In exemplary embodiments, the expanded area is large enough and deep enough to relieve pressure of the fabric on the patella when the wearer bends his or her knee. In exemplary embodiments, the expanded area still contacts the patella. Accordingly, the several Figures show the expanded area not to scale, but so as to illustrate the expanded area visually. In practice, in exemplary embodiments, the expanded area of the garment may not even be very noticeable by the wearer or someone viewing the garment not being worn. In exemplary embodiments, the size and depth of the expanded area of the fabric panel can be designed to accommodate either different knee shapes, and/or to accommodate bandages or other objects or protrusions from the knee.

[0022] In exemplary embodiments, when the fabric panel is initially cut a notch is placed in a small area of the fabric. The notch permits the person or machine to register the fabric panel after being molded to the pattern so that it can be properly placed for stitching to the other panels.

[0023] In exemplary embodiments different size garments will incorporated a molded fabric panel according to the overall dimensions of the garment and where the patella area needs to be for the given size garment.

[0024] In an alternative embodiment, shown in Fig. 6, a sleeve garment may be formed of one or more fabric panels. The expanded area is formed as described hereinabove in an area proximate to the olecranon (outside point, also known as the “funny bone”) area of the elbow. The sleeve garment may be fitted over a portion of the forearm and upper arm such that the expanded area is proximate to the olecranon area.

[0025] In another alternative embodiment, shown in Fig. 7, a shoulder garment may be formed of one or more fabric panels. The expanded area is formed as described hereinabove in the area proximate to the humerus or deltoid area.

[0026] In yet another alternative embodiment, shown in Fig. 8, a foot-ankle garment may be formed as described hereinabove that can be worn in the area between the ankle and the foot, with the expanded area being proximate to the heel.

[0027] For the legging and other garment embodiments, a feature of the present disclosure is that the expanded area of the elastic fabric creates an area of reduced elastic force applied by the fabric proximate to the patella or other outside joint area. The expanded area reduces or eliminates the pinching of fabric proximate to the opposite side of the garment (i.e., for the legging garment, the area behind the patella area of the knee; for the sleeve garment, the area in the crook of the elbow; for the shoulder garment, the armpit area; and, for the ankle-foot garment, the heel area). This relaxed force application provides greater comfort to a wearer to the patella, elbow, shoulder, or heel area, which will be very tender after surgery. A feature of the present disclosure is the formation of an expanded area in an elastic fabric having elasticity in both the warp and weft directions.

[0028] In another exemplary embodiment, for example, with a legging garment, as shown in Figs. 9-11, the fabric area proximate to the knee area generally may have an opening (or more than one opening) defined therein to permit access to the patella or other area of the knee without having to remove the garment (which act may be discomforting to a wearer after surgery). In one exemplary

embodiment, shown in Figs. 9-10, a first and second flap in the fabric partially overlap to cover the area, but provide access to the skin area. In another exemplary embodiment, shown in Fig. 11, a single flap can be used that overlaps an opening and is maintained as a covering by a fastener, such as, but not limited to, a hook-and-loop, button, tab-and-slot, or the like. Alternatively, the opening may be closable by a zipper or hook-and-eyelet mechanism. Such access may be desirable in order to change a dressing, observe the area, to clean the area, to access a drainage tube, or for other purposes. It is to be understood that the opening and covering is adaptable to any of the other embodiments described herein.

[0029] The following numbered clauses include embodiments that are contemplated and non-limiting:

[0030] Clause 1: A garment having a molded expanded area, such as proximate to an articulable area such as a knee, elbow, shoulder, heel, or other joint area, comprising at least one panel of a woven fabric having elasticity in both the warp and weft directions, and an expanded area in the fabric material formed by heating a portion of the fabric material in a mold such that the fabric is stretched and maintained after removal from the mold in the stretched state.

[0031] Clause 2: The garment of Clause 1, further comprising at least one opening in a panel proximate to the expanded area for permitting access to the wearer's skin while wearing the garment.

[0032] Clause 3: The garment of Clause 2, wherein the at least one opening is formed by a first and second flap, with a portion of the first flap overlapping the second flap.

[0033] Although only a number of exemplary embodiments have been described in detail above, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages. Accordingly, all such modifications are intended to be included within the scope of this disclosure as defined in the following claims.

[0034] While the methods, equipment and systems have been described in connection with specific embodiments, it is not intended that the scope be limited to the particular embodiments

set forth, as the embodiments herein are intended in all respects to be illustrative rather than restrictive.

[0035] “Optional” or “optionally” means that the subsequently described event or circumstance may or may not occur, and that the description includes instances where said event or circumstance occurs and instances where it does not.

[0036] Throughout the description and claims of this specification, the word “comprise” and variations of the word, such as “comprising” and “comprises,” means “including but not limited to,” and is not intended to exclude, for example, other additives, components, integers or steps. “Exemplary” means “an example of” and is not intended to convey an indication of a preferred or ideal embodiment. “Such as” is not used in a restrictive sense, but for explanatory purposes.

[0037] Disclosed are components that can be used to perform the disclosed methods, equipment and systems. These and other components are disclosed herein, and it is understood that when combinations, subsets, interactions, groups, etc., of these components are disclosed that while specific reference of each various individual and collective combinations and permutation of these may not be explicitly disclosed, each is specifically contemplated and described herein, for all methods, equipment and systems. This applies to all aspects of this application including, but not limited to, steps in disclosed methods. Thus, if there are a variety of additional steps that can be performed it is understood that each of these additional steps can be performed with any specific embodiment or combination of embodiments of the disclosed methods.

## CLAIMS

## WHAT IS CLAIMED IS:

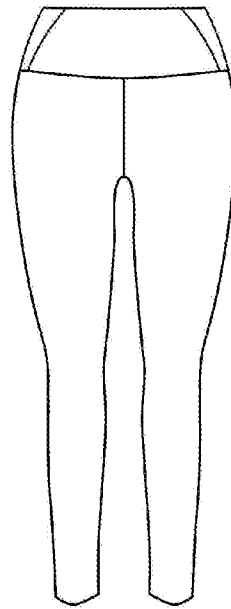
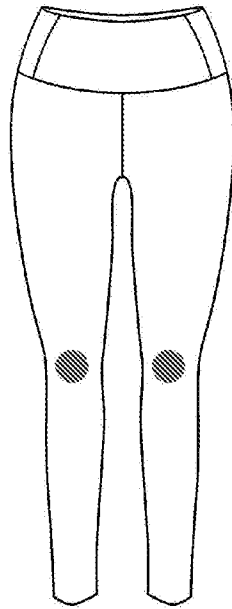
1. A garment having a molded expanded area, comprising:
  - a) at least one panel of a woven fabric having elasticity in both the warp and weft directions; and,
  - b) an expanded area in the fabric material formed by heating a portion of the fabric material in a mold such that the fabric is stretched and maintained after removal from the mold in the stretched state.
2. The garment of Claim 1, further comprising at least one opening in a panel proximate to the expanded area for permitting access to the wearer's skin while wearing the garment.
3. The garment of Claim 2, wherein the at least one opening is formed by a first and second flap, with a portion of the first flap overlapping the second flap.

Fig. 1

Fig. 2

front

back



left

right

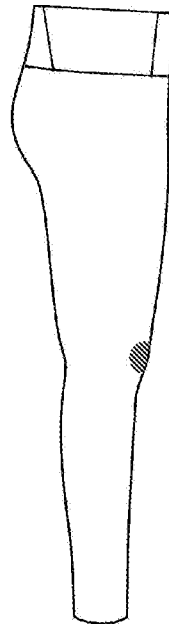
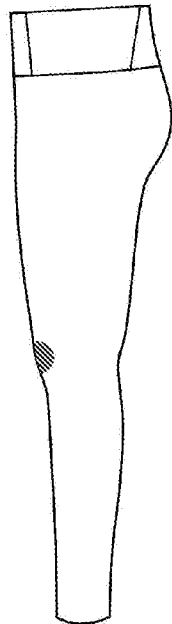


Fig. 3

Fig. 4

Fig. 5

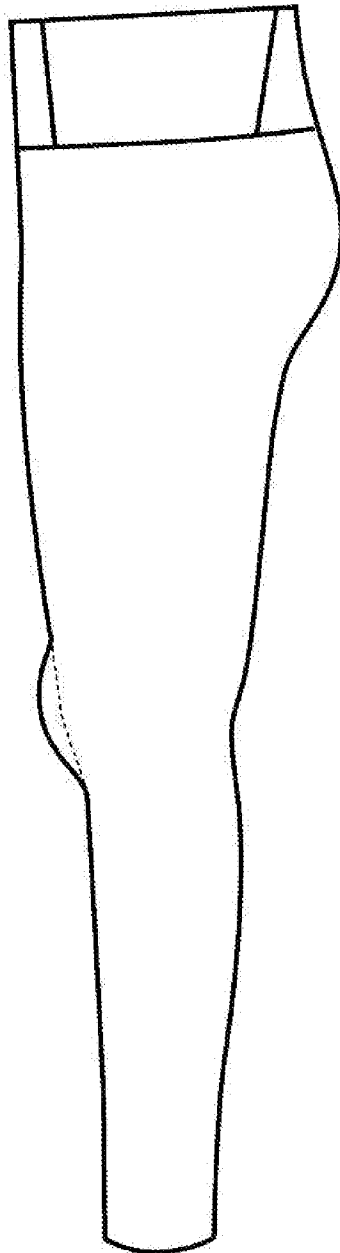


Fig. 6

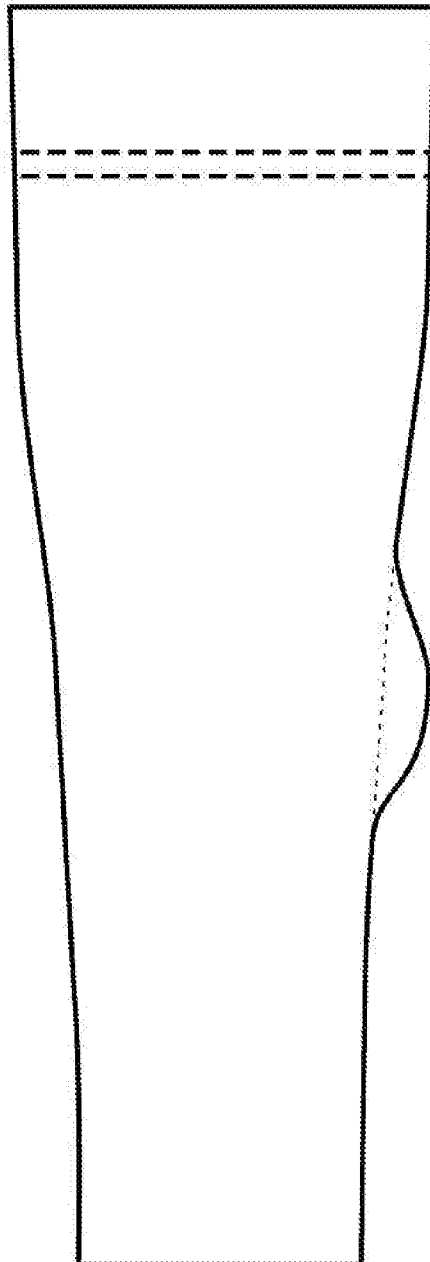


Fig. 7

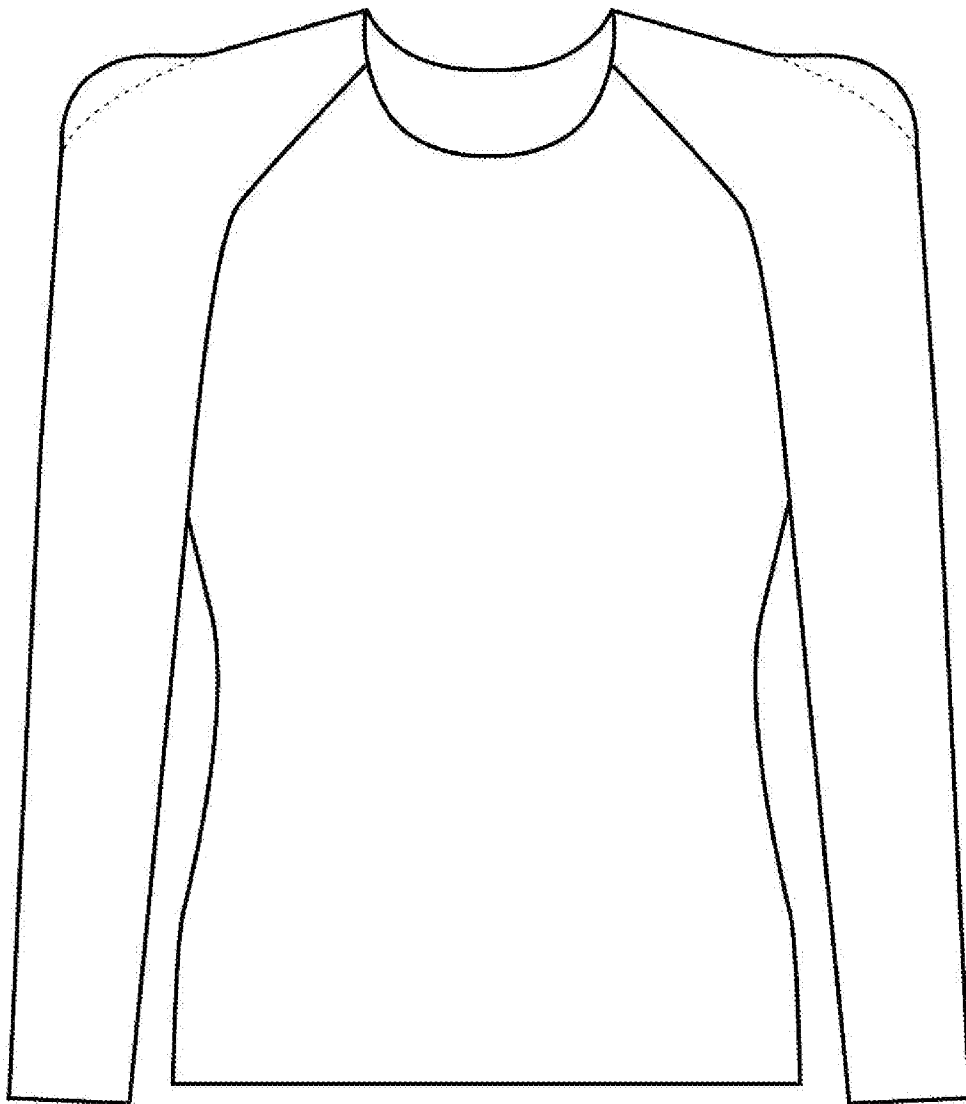


Fig. 8



Fig. 9

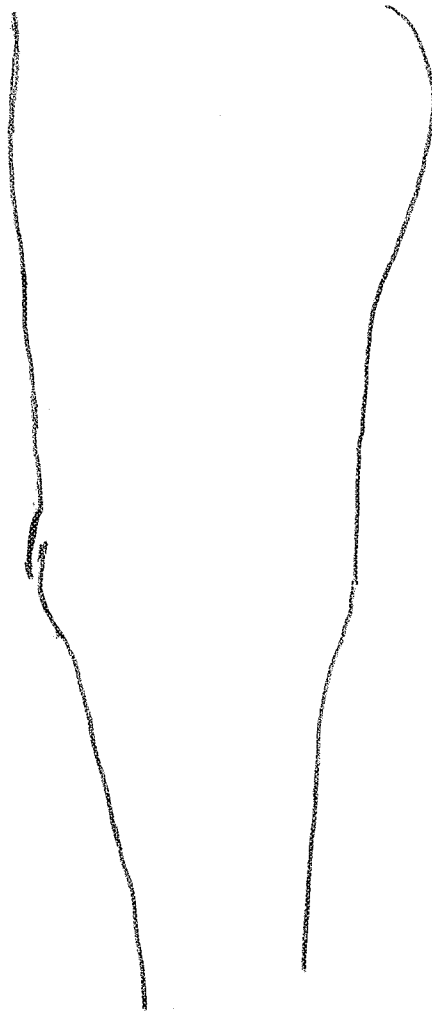


Fig. 10

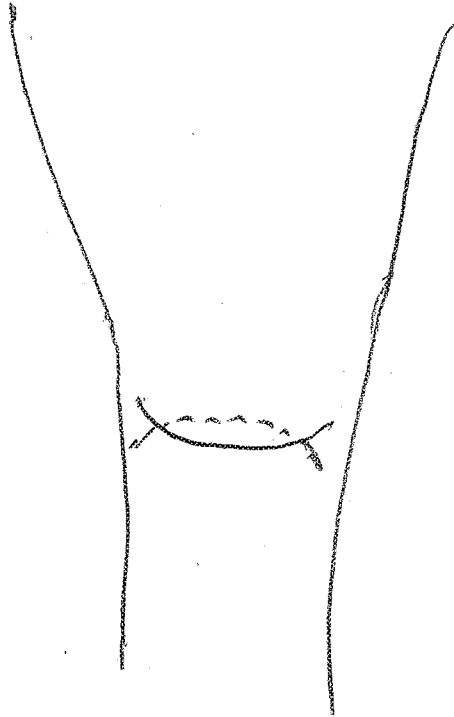
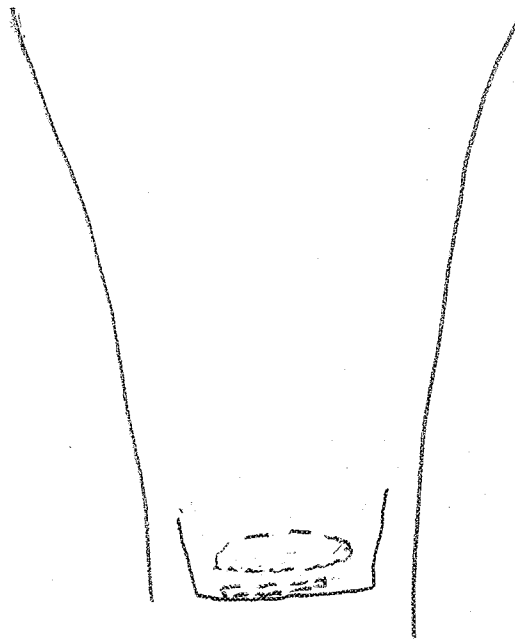


Fig. 11



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2019/034619

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A41D 27/00; A41D 1/00; A41D 1/06; A41D 13/00; A41D 13/06; A41D 13/12 (2019.01)

CPC - A41D 27/00; A41D 1/00; A41D 1/06; A41D 1/067; A41D 13/00; A41D 13/0002; A41D 13/0005; A41D 13/06; A41D 13/065; A41D 13/12; A41D 13/1236; B29L 2031/48; B29L 2031/4842; B29L 2031/4857 (2019.05)

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)

See Search History document

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

USPC - 2/1; 2/45; 2/62; 2/69; 2/243.1; 2/272; 264/299; 264/320; 264/324 (keyword delimited)

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

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2475234 A (WOODHALL et al) 18 May 2011 (18.05.2011) entire document	1-3
Y	US 4,895,751 A (KATO et al) 23 January 1990 (23.01.1990) entire document	1-3
Y	US 7,100,214 B1 (MURRAY) 05 September 2006 (05.09.2006) entire document	2, 3

Further documents are listed in the continuation of Box C.

See patent family annex.

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Date of the actual completion of the international search

16 July 2019

Date of mailing of the international search report

12 AUG 2019

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