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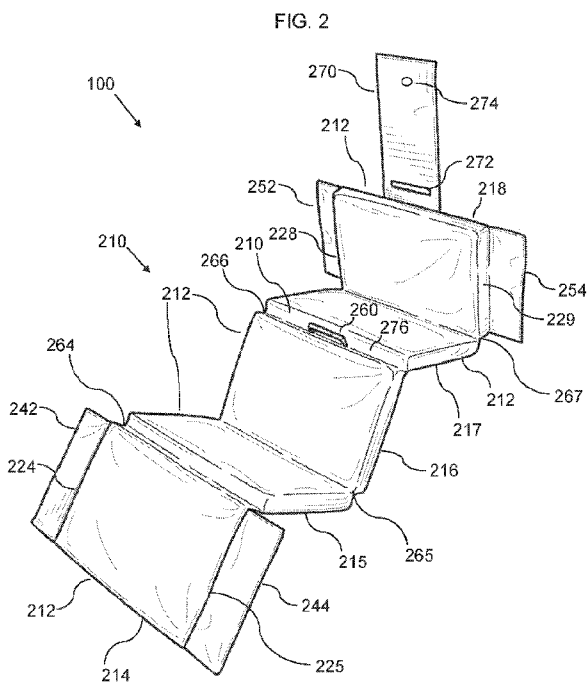
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(54) Title: FOLDABLE LOUNGE CHAIR CUSHION



(57) Abstract: A foldable lounge chair cushion, including a plurality of connected cushion segments right and left front flaps, right and left rear flaps, a handle that can be hidden in a fold between successive cushion segments, and a rear end flap with a handle aperture, such that the connected cushion segments form a pleated structure, which can be folded-out for use and folded-up for storage and transportation.

TITLE OF INVENTION

Foldable lounge chair cushion

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This International Application claims the benefit of United States Non-Provisional Application No. 15/485,825, filed April 12, 2017 and of U.S. Design Application No. 29/600,335, filed April 11, 2017, both of which are included herein by reference in their entirety.

FIELD OF THE INVENTION

[0002] The present invention relates generally to the field of lounge chair cushions, and more particularly to methods and systems for lounge chair cushions that are foldable, storable, and transportable.

BACKGROUND OF THE INVENTION

[0003] Lounge chairs are popular for use in backyard patios and by pools. However, such cushions are typically cumbersome to remove for storage, and are not convenient for travel.

[0004] As such, considering the foregoing, it may be appreciated that there continues to be a need for novel and improved devices and methods for foldable and transportable lounge chair cushions.

SUMMARY OF THE INVENTION

[0005] The foregoing needs are met, to a great extent, by the present invention, wherein in aspects of this invention, enhancements are provided to the existing model of lounge chair cushions.

[0006] In an aspect, a foldable lounge chair cushion can include:

a plurality of connected cushion segments,

such that the connected cushion segments can be connected with cushion connections that shift successively from lower cushion segment connections to upper cushion segment connections, and from upper cushion segment connections to lower cushion segment connections;

such that the connected cushion segments form a pleated structure, which can be configurable to be folded-out and configurable to be folded-up.

[0007] In a related aspect, the foldable lounge chair cushion can further include:

- a) a right front flap, which can be connected along a right edge of a front cushion segment;
- b) a left front flap, which can be connected along a left edge of the front cushion segment;
- c) a right rear flap, which can be connected along a right edge of a rear cushion segment;
- d) a left rear flap, which can be connected along a left edge of the rear cushion segment;

such that when the foldable lounge chair cushion is in a folded-out state, the right and left front flaps and the right and left rear flaps can be configured to be folded behind the plurality of connected cushion segments, whereby the right and left front flaps and the right and left rear flaps can be at least partially hidden behind the plurality of connected cushion segments;

such that when the foldable lounge chair cushion is in a folded-up state, the right front flap can be configured to be detachably connectable to the right rear flap and the left front flap can be configured to be detachably connectable to the left rear flap.

[0008] In another related aspect, the foldable lounge chair cushion can further include:

a rear end flap, which can be connected to a rear end of a rear cushion segment of the plurality of connected cushion segments, the rear end flap including:

a handle aperture, which can be configured to allow the handle to protrude through the handle aperture, when the foldable lounge chair cushion is in a folded-up state;

such that when the foldable lounge chair cushion is in a folded-out state, the rear end flap can be folded behind the plurality of connected cushion segments, whereby the rear end flap can be partially hidden behind the plurality of connected cushion segments;

such that when the foldable lounge chair cushion is in a folded-up state, the rear end flap can be folded around a top of the folded-up plurality of connected cushion segments, such that an outer end of the rear end flap can be detachably connected to an upper side of the front cushion segment, which is a front of the folded-up plurality of connected cushion segments.

[0009] In yet another related aspect, the foldable lounge chair cushion can further include:

a rear end flap, which can be connected to a rear end of a rear cushion segment of the plurality of connected cushion segments, the rear end flap including:

a handle aperture, which can be configured to allow the handle to protrude through the handle aperture, when the foldable lounge chair cushion is in a folded-up state;

such that when the foldable lounge chair cushion is in a folded-out state, the rear end flap can be folded behind the plurality of connected cushion segments, whereby the rear end flap can be partially hidden behind the plurality of connected cushion segments;

such that when the foldable lounge chair cushion is in a folded-up state, the rear end flap can be folded around a top of the folded-up plurality of connected cushion segments, such that an outer end of the rear end flap can be detachably connected to an upper side of the front cushion segment, which is a front of the folded-up plurality of connected cushion segments.

[00010] In a further related aspect, the foldable lounge chair cushion can further include:

a handle, which is connected to the plurality of cushion segments, between successive cushion segments;

wherein the rear end flap can further include:

a handle aperture, which can be configured to allow the handle to protrude through the handle aperture when the foldable lounge chair cushion is in a folded-up state;

such that when the foldable lounge chair cushion is in the folded-up state and the rear end flap is folded around the top of the folded-up plurality of connected cushion segments, the handle can protrude through the handle aperture.

[00011] There has thus been outlined, rather broadly, certain embodiments of the invention in order that the detailed description thereof herein may be better understood, and in order that the present contribution to the art may be better appreciated. There are, of course, additional embodiments of the invention that will be described below and which will form the subject matter of the claims appended hereto.

[00012] In this respect, before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and to the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of embodiments in addition to those described and of being practiced and carried out in various ways. In addition, it is to be understood that the phraseology and terminology employed herein, as well as the abstract, are for the purpose of description and should not be regarded as limiting.

[00013] As such, those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for the designing of other structures, methods and systems for carrying out the several purposes of the

present invention. It is important, therefore, that the claims be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[00014] FIG. 1 is a perspective view of a foldable lounge chair cushion that is positioned on a lounge chair, according to an embodiment of the invention.

[00015] FIG. 2 is a perspective view of a foldable lounge chair cushion in a partially folded-out state, according to an embodiment of the invention.

[00016] FIG. 3 is a perspective view of a foldable lounge chair cushion in a folded-out state, according to an embodiment of the invention.

[00017] FIG. 4 is a perspective view of a foldable lounge chair cushion in a folded-up state, according to an embodiment of the invention.

[00018] FIG. 5 is a bottom view of a foldable lounge chair cushion in a folded-up state, according to an embodiment of the invention.

[00019] FIG. 6 is a rear view of a foldable lounge chair cushion in a folded-up state, according to an embodiment of the invention.

[00020] FIG. 7 is a right side view of a foldable lounge chair cushion in a folded-up state, according to an embodiment of the invention.

[00021] FIG. 8 is a top view of a foldable lounge chair cushion in a folded-out state, according to an embodiment of the invention.

[00022] FIG. 9 is a right side view of a foldable lounge chair cushion in a folded-out state, according to an embodiment of the invention.

[00023] FIG. 10 is front view of a foldable lounge chair cushion in a folded-out state, according to an embodiment of the invention.

[00024] FIG. 11 is a rear view of a foldable lounge chair cushion in a folded-out state, according to an embodiment of the invention.

[00025] FIG. 12 is a bottom view of a foldable lounge chair cushion in a folded-out state, according to an embodiment of the invention.

[00026] FIG. 13 is a left side view of a foldable lounge chair cushion in a folded-out state, according to an embodiment of the invention.

[00027] FIG. 14 is a rear perspective view of a foldable lounge chair cushion in a folded-out state, according to an embodiment of the invention.

[00028] FIG. 15 is a top view of a foldable lounge chair cushion in a folded-up state, according to an embodiment of the invention.

[00029] FIG. 16 is a front view of a foldable lounge chair cushion in a folded-up state, according to an embodiment of the invention.

[00030] FIG. 17 is a left side view of a foldable lounge chair cushion in a folded-up state, according to an embodiment of the invention.

[00031] FIG. 18 is a perspective view of a foldable lounge chair cushion in a partially folded-out state, according to an embodiment of the invention.

DETAILED DESCRIPTION

[00032] Before describing the invention in detail, it should be observed that the present invention resides primarily in a novel and non-obvious combination of elements and process steps. So as not to obscure the disclosure with details that will readily be apparent to those skilled in the art, certain conventional elements and steps have been presented with lesser detail, while the drawings and specification describe in greater detail other elements and steps pertinent to understanding the invention.

[00033] The following embodiments are not intended to define limits as to the structure or method of the invention, but only to provide exemplary constructions. The embodiments are permissive rather than mandatory and illustrative rather than exhaustive.

[00034] In the following, we describe the structure of an embodiment of a foldable lounge chair cushion **100** for installation on a lounge chair **180** with reference to FIG. **1**, in such manner that like reference numerals refer to like components throughout; a convention that we shall employ for the remainder of this specification.

[00035] In an embodiment, as shown in FIGS. **1** and **2**, a foldable lounge chair cushion **100** can include:

- a) a plurality **210** of connected cushion segments **212**, such that:
 - i. a first/front cushion segment **214** is connected along a lower rear end to a lower front end of a second cushion **215**; and
 - ii. a last/rear cushion segment **218** is connected along an upper front end to a preceding/next to last cushion segment **217**;

such that the connected cushion segments **214 215 216 217 218** are connected with cushion connections **264 265 266 267** that shift successively from lower cushion segment connections **264 266** to upper cushion segment connections **265 267**, and from upper cushion segment connections **265 267** to lower cushion segment connections **264 266**, such that first successive cushion segments **214 215** are

connected along lower or upper ends and second successive cushion segments **215 216** are connected along opposite upper or lower ends respectively;

such that the plurality of cushion segments form a pleated structure, which can be folded flat, i.e. in a folded-out state, as shown in FIG. **3**, and folded up, i.e. in a folded-up state, such as shown in FIG. **4**. FIG. **2** shows the plurality of cushion segments in a partially folded-up/unfolded state;

- b) a right front flap **242**, which can be connected along a right edge **224** of the front cushion segment **214**;
- c) a left front flap **244**, which can be connected along a left edge **225** of the front cushion segment **214**;
- d) a right rear flap **252**, which can be connected along a right edge **228** of the rear cushion segment **218**;
- e) a left rear flap **254**, which can be connected along a left edge **229** of the rear cushion segment **218**;
- f) a handle **260**, which is connected to the plurality of cushion segments, between successive cushion segments **216 217**; and
- g) a rear end flap **270**, which can be connected to a rear end of the rear cushion segment **218**, the rear end flap **270** further comprising:

a handle aperture **272**, which can be elongated, which is configured to allow the handle **260** to protrude through the handle aperture **272** when the foldable lounge chair cushion **100** is in a folded-up state, as shown in FIG. **4**;

wherein, when the foldable lounge chair cushion **100** is in a folded-out state, as shown in FIG. **1**, the right and left front flaps **242 244**, the right and left rear flaps **252 254**, and the rear end flap **270** can be folded behind,

and thereby partially hidden behind, the plurality **210** of connected cushion segments **212**;

wherein, when the foldable lounge chair cushion **100** is in a folded-up state, as shown in FIG. **4**, the right front flap **242** can be detachably connected to the right rear flap **252**, the left front flap **244** can be detachably connected to the left rear flap **254**, and the rear end flap **270** can be folded around a top **410** of the folded-up plurality **210** of connected cushion segments **212**, such that an outer end **476** of the rear end flap **270** is detachably connected to an upper side of the front cushion segment **214**, which is a front **420** of the folded-up plurality **210** of connected cushion segments **212**, such that the handle **260** protrudes through the handle aperture **272**.

[00036] In a related embodiment, the right and left front flaps **242 244** can be detachably connectable to respectively the right and left rear flap **252 254** with buttons **358**, hook and loop fasteners **358**, magnets connectors **358**, or other well-known connectors. The magnet connectors **358** can be hidden inside a surface of the flaps **242 244 252 254**, such that the magnet connectors **358** are not externally visible.

[00037] In another related embodiment, the outer end **476** of the rear end flap **270** can be detachably connectable to an upper side of the front cushion segment **214** with buttons **274**, hook and loop fastener **274**, magnet connectors **274**, or other well-known connectors for use in bags and suitcases.

[00038] In yet a related embodiment, as shown in FIG. **1**, the handle can be configured to be hidden in an upward opening fold **276** between successive cushion segments **216 217** that are connected in a lower cushion segment connection **266** along lower ends of the successive cushion segments **216 217**, when the foldable lounge chair cushion **100** is in a folded-out state.

[00039] In another related embodiment, as shown in FIGS. **2** and **3**:

- a) the right front flap **242** can be connected along an upper side of the right edge **224** of the front cushion segment **214**;

- b) the left front flap **244** can be connected along an upper side of the left edge **225** of the front cushion segment **214**;
- c) the right rear flap **252** can be connected along a lower side of the right edge **228** of the rear cushion segment **218**;
- d) the left rear flap **254** can be connected along a lower side of the left edge **229** of the rear cushion segment **218**; and
- e) the rear end flap **270** can be connected to a lower side of the rear end of the rear cushion segment **218**.

[00040] In related embodiments the plurality **210** of connected cushion segments **212** can include, three, five, seven, or a larger odd number of connected cushion segments **212**. In the various embodiments shown in FIGS **1 - 6**, the foldable lounge chair cushion **100** is configured with five connected cushion segments **212**.

[00041] In related embodiments, FIGS. **5, 6, and 7** show respectively bottom, rear, and right side views of the foldable lounge chair cushion **100** in a folded-up state. FIGS. **8-17** show various views of the foldable lounge chair cushion **100** in a folded-out or folded-up state.

[00042] In related embodiments, the foldable lounge chair cushion **100** can be manufactured in a variety of sizes and styles. An oversized foldable lounge chair cushion **100** can for example accommodate two or three users side-by-side, for example for use at hotels and pool or beach resorts. In a further related embodiment, FIG. **18** shows an oversized foldable lounge chair cushion **1800**, comprising a plurality **1810** of connected cushion segments **1812**, wherein the oversized foldable lounge chair cushion **1800** can be configured with right and left handles **1862 1864**, such that the oversized foldable lounge chair cushion **100** may be carried by two people, for example to allow resort staff to transport the oversized foldable lounge chair cushion **100** from the beach or pool to storage at close of business. As shown, the oversized foldable lounge chair cushion **1800** can be configured with a rear end flap **1870** without a handle aperture **272**. In other related embodiments, the oversized foldable lounge chair cushion **1800** can be configured with right and left rear end flaps, each

with a handle aperture **272**, that is configured to match respectively the right and left handles **1862 1864**.

[00043] Here has thus been described a multitude of embodiments of the foldable lounge chair cushion **100**, and methods related thereto, which can be employed in numerous modes of usage.

[00044] The many features and advantages of the invention are apparent from the detailed specification, and thus, it is intended by the appended claims to cover all such features and advantages of the invention, which fall within the true spirit and scope of the invention.

[00045] Many such alternative configurations are readily apparent, and should be considered fully included in this specification and the claims appended hereto. Accordingly, since numerous modifications and variations will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation illustrated and described, and thus, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

CLAIMS

What is claimed is:

1. A foldable lounge chair cushion, comprising:
 - a plurality of connected cushion segments;
 - such that the connected cushion segments are connected with cushion connections that shift successively from lower cushion segment connections to upper cushion segment connections, and from upper cushion segment connections to lower cushion segment connections;
 - such that the connected cushion segments form a pleated structure, which is configurable to be folded-out and configurable to be folded-up.
2. The foldable lounge chair cushion of claim 1, wherein:
 - a) a first cushion segment of the plurality of connected cushion segments is connected along a lower rear end to a lower front end of a second cushion segment of the plurality of connected cushion segments; and
 - b) a last cushion segment of the plurality of connected cushion segments is connected along an upper front end to a next to last cushion segment of the plurality of connected cushion segments.
3. The foldable lounge chair cushion of claim 1, further comprising:
 - a) a right front flap, which is connected along a right edge of a front cushion segment;
 - b) a left front flap, which is connected along a left edge of the front cushion segment;
 - c) a right rear flap, which is connected along a right edge of a rear cushion segment; and
 - d) a left rear flap, which is connected along a left edge of the rear cushion segment;

wherein, when the foldable lounge chair cushion is in a folded-out state, the right and left front flaps and the right and left rear flaps are configured to be folded behind the plurality of connected cushion segments, whereby the right and left front flaps and the right and left rear flaps are partially hidden behind the plurality of connected cushion segments;

wherein, when the foldable lounge chair cushion is in a folded-up state, the right front flap is configured to be detachably connectable to the right rear flap and the left front flap is configured to be detachably connectable to the left rear flap.

4. The foldable lounge chair cushion of claim 1, further comprising:

at least one rear end flap, which is connected to a rear end of a rear cushion segment of the plurality of connected cushion segments;

wherein, when the foldable lounge chair cushion is in a folded-out state, the at least one rear end flap is configured to be folded behind the plurality of connected cushion segments, whereby the at least one rear end flap is partially hidden behind the plurality of connected cushion segments;

wherein, when the foldable lounge chair cushion is in a folded-up state, the at least one rear end flap is configured to be folded around a top of the folded-up plurality of connected cushion segments, such that an outer end of the at least one rear end flap is detachably connected to an upper side of the front cushion segment, which is a front of the folded-up plurality of connected cushion segments.

5. The foldable lounge chair cushion of claim 1, further comprising:

at least one handle, which is connected to the plurality of cushion segments, between successive cushion segments.

6. The foldable lounge chair cushion of claim 4, further comprising:

a handle, which is connected to the plurality of cushion segments, between successive cushion segments;

wherein the at least one rear end flap further comprises:

a handle aperture, which is configured to allow the handle to protrude through the handle aperture, when the foldable lounge chair cushion is in a folded-up state;

wherein, when the foldable lounge chair cushion is in the folded-up state and the at least one rear end flap is folded around the top of the folded-up plurality of connected cushion segments, the handle protrudes through the handle aperture.

7. The foldable lounge chair cushion of claim 4, wherein the successive cushion segments are connected in a lower cushion segment connection along lower ends of the successive cushion segments;
wherein, when the foldable lounge chair cushion is in the folded-out state, the handle is configured to be hidden in an upward opening fold between the successive cushion segments.
8. The foldable lounge chair cushion of claim 1, wherein the plurality of connected cushion segments is five connected cushion segments.
9. The foldable lounge chair cushion of claim 3, wherein:
 - a) the right front flap is connected along an upper side of the right edge of the front cushion segment;
 - b) the left front flap is connected along an upper side of the left edge of the front cushion segment;
 - c) the right rear flap is connected along a lower side of the right edge of the rear cushion segment; and
 - d) the left rear flap is connected along a lower side of the left edge of the rear cushion segment.

10. The foldable lounge chair cushion of claim 4, wherein the at least one rear end flap is connected to a lower side of the rear end of the rear cushion segment.
11. The foldable lounge chair cushion of claim 3, further comprising a plurality of magnet connectors, wherein the right front flap is detachably connectable to the right rear flap and the left front flap is configured detachably connectable to the left rear flap with the plurality of magnet connectors.
12. The foldable lounge chair cushion of claim 4, further comprising magnet connectors, wherein the outer end of the at least one rear end flap is detachably connected to the upper side of the front cushion segment with the magnet connectors.
13. A foldable lounge chair cushion, comprising:
 - a plurality of connected cushion segments,

such that the connected cushion segments are connected with cushion connections, such that the connected cushion segments form a pleated structure, which is configurable to be folded-out and configurable to be folded-up.
14. The foldable lounge chair cushion of claim 13, wherein the connected cushion segments are connected with cushion connections that shift successively from lower cushion segment connections to upper cushion segment connections, and from upper cushion segment connections to lower cushion segment connections.
15. The foldable lounge chair cushion of claim 13, wherein:
 - a) a first cushion segment of the plurality of connected cushion segments is connected along a lower rear end to a lower front end of a second cushion segment of the plurality of connected cushion segments; and

- b) a last cushion segment of the plurality of connected cushion segments is connected along an upper front end to a next to last cushion segment of the plurality of connected cushion segments.

16. The foldable lounge chair cushion of claim 13, further comprising:

- a) a right front flap, which is connected along a right edge of a front cushion segment;
- b) a left front flap, which is connected along a left edge of the front cushion segment;
- c) a right rear flap, which is connected along a right edge of a rear cushion segment; and
- d) a left rear flap, which is connected along a left edge of the rear cushion segment;

wherein, when the foldable lounge chair cushion is in a folded-out state, the right and left front flaps and the right and left rear flaps are configured to be folded behind the plurality of connected cushion segments, whereby the right and left front flaps and the right and left rear flaps are partially hidden behind the plurality of connected cushion segments;

wherein, when the foldable lounge chair cushion is in a folded-up state, the right front flap is configured to be detachably connectable to the right rear flap and the left front flap is configured to be detachably connectable to the left rear flap.

17. The foldable lounge chair cushion of claim 13, further comprising:

at least one rear end flap, which is connected to a rear end of a rear cushion segment of the plurality of connected cushion segments, the at least one rear end flap comprising:

- a handle aperture, which is configured to allow the handle to protrude through the handle aperture, when the foldable lounge chair cushion is in a folded-up state;

wherein, when the foldable lounge chair cushion is in a folded-out state, the at least one rear end flap is configured to be folded behind the plurality of connected cushion segments, whereby the at least one rear end flap is partially hidden behind the plurality of connected cushion segments;

wherein, when the foldable lounge chair cushion is in a folded-up state, the at least one rear end flap is configured to be folded around a top of the folded-up plurality of connected cushion segments, such that an outer end of the at least one rear end flap is detachably connected to an upper side of the front cushion segment, which is a front of the folded-up plurality of connected cushion segments.

18. The foldable lounge chair cushion of claim 13, further comprising:

a handle, which is connected to the plurality of cushion segments, between successive cushion segments.

19. The foldable lounge chair cushion of claim 16, further comprising:

a handle, which is connected to the plurality of cushion segments, between successive cushion segments;

wherein the at least one rear end flap, further comprises:

a handle aperture, which is configured to allow the handle to protrude through the handle aperture, when the foldable lounge chair cushion is in a folded-up state;

wherein, when the foldable lounge chair cushion is in the folded-up state and the at least one rear end flap is folded around the top of the folded-up plurality of connected cushion segments, the handle protrudes through the handle aperture.

20. The foldable lounge chair cushion of claim 16, wherein the successive cushion segments are connected in a lower cushion segment connection along lower ends of the successive cushion segments;

wherein, when the foldable lounge chair cushion is in the folded-out state, the

handle is configured to be hidden in an upward opening fold between the successive cushion segments.

FIG. 1

Foldable lounge chair cushion

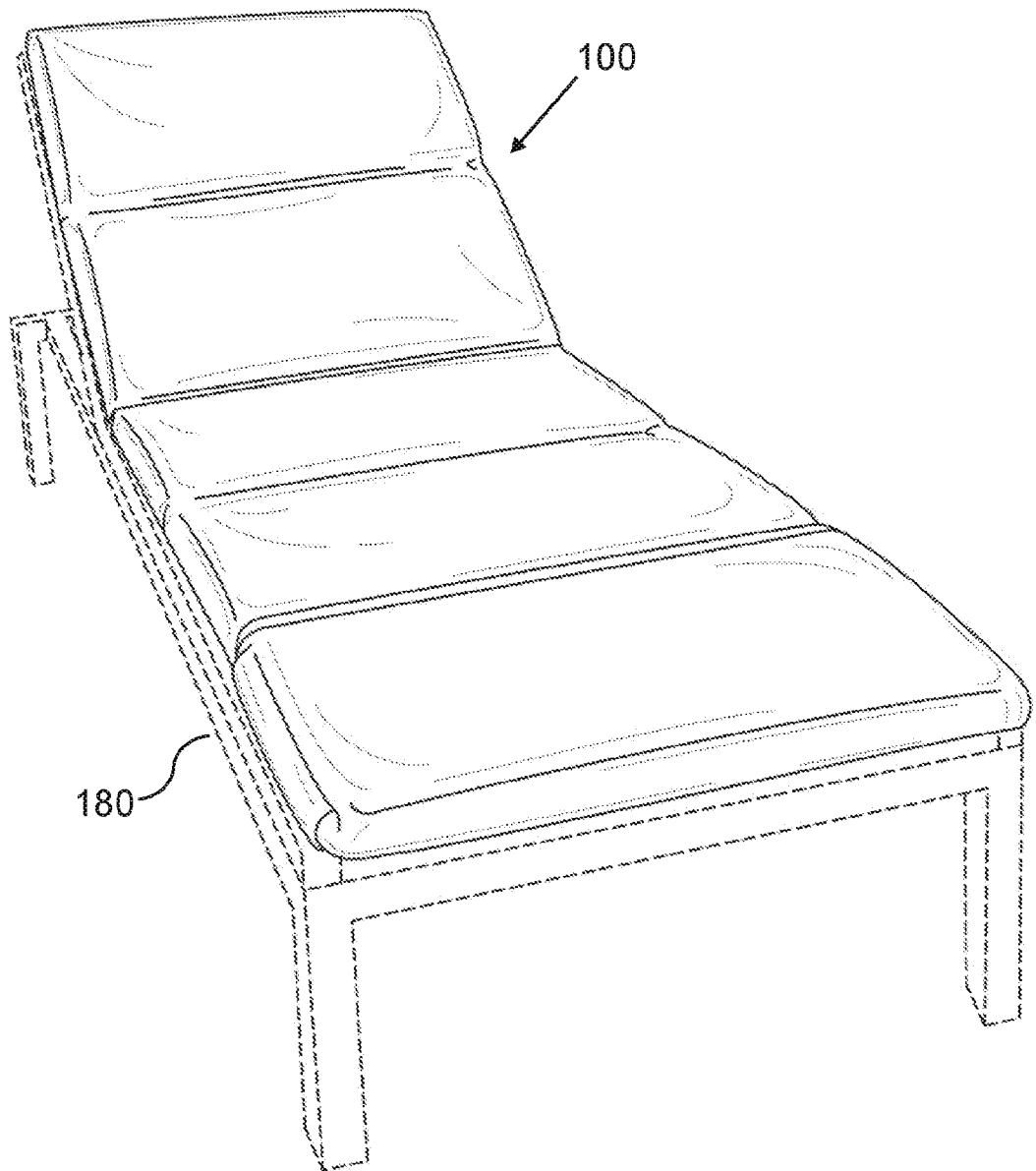


FIG. 2

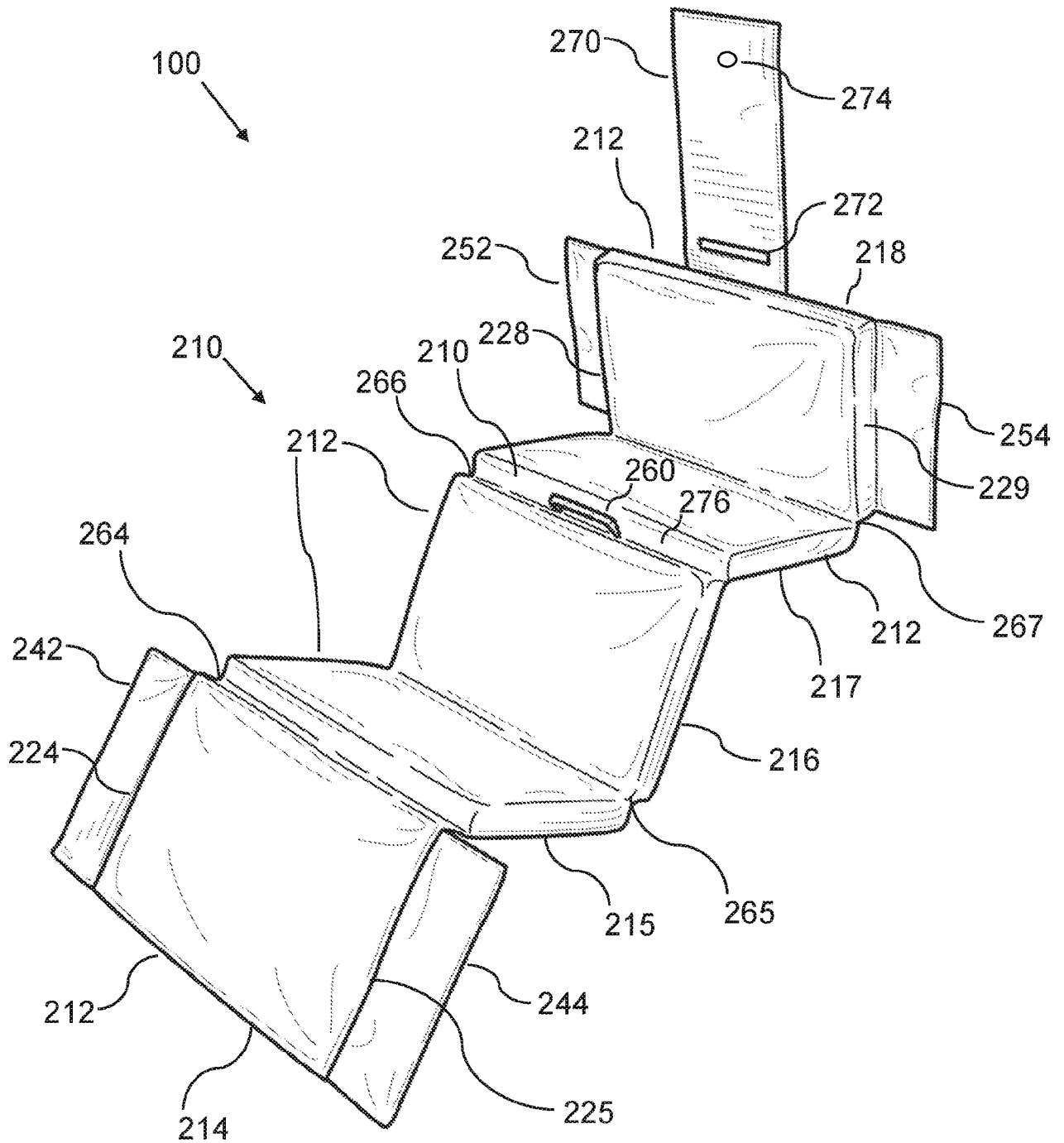


FIG. 3

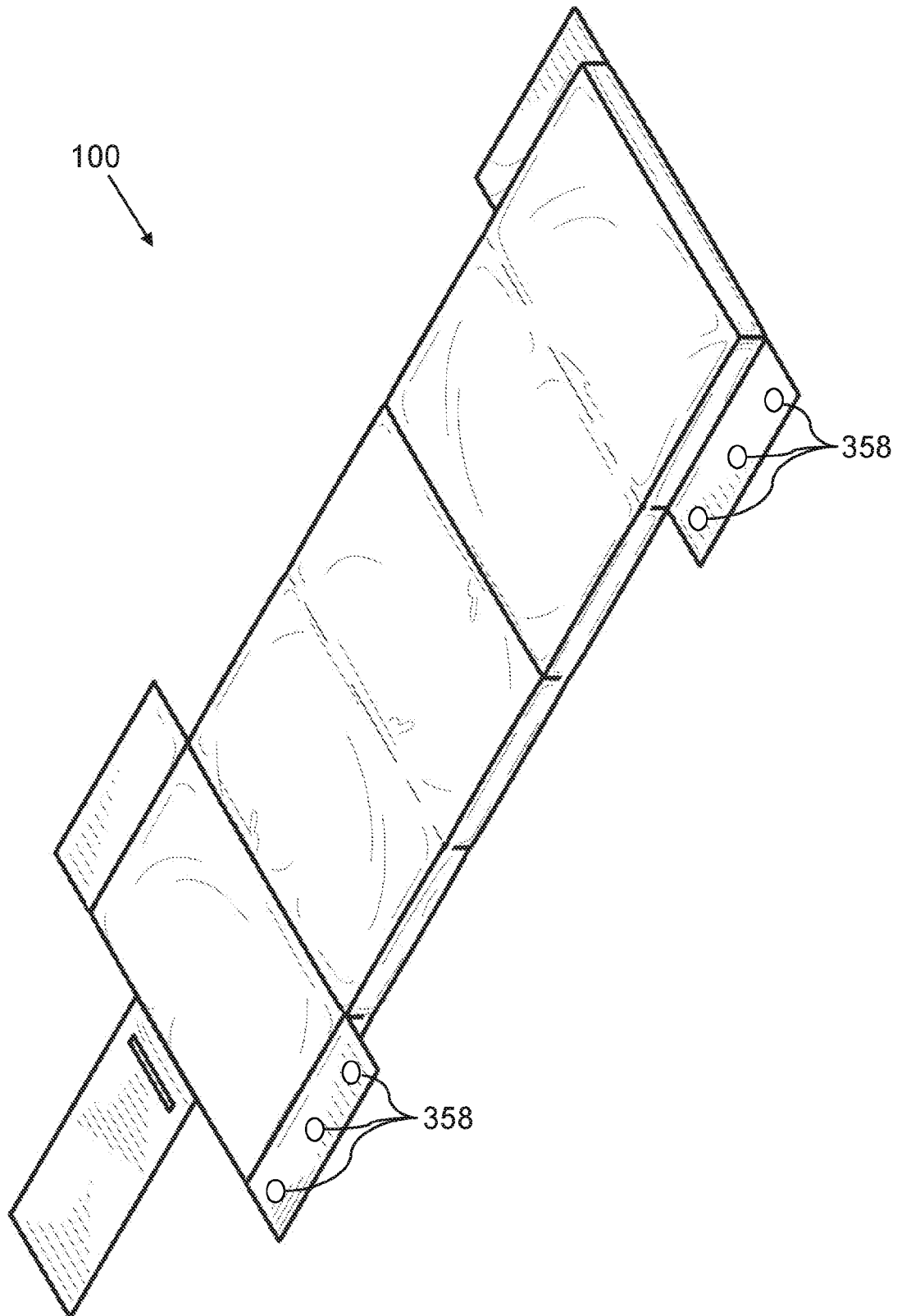


FIG. 4

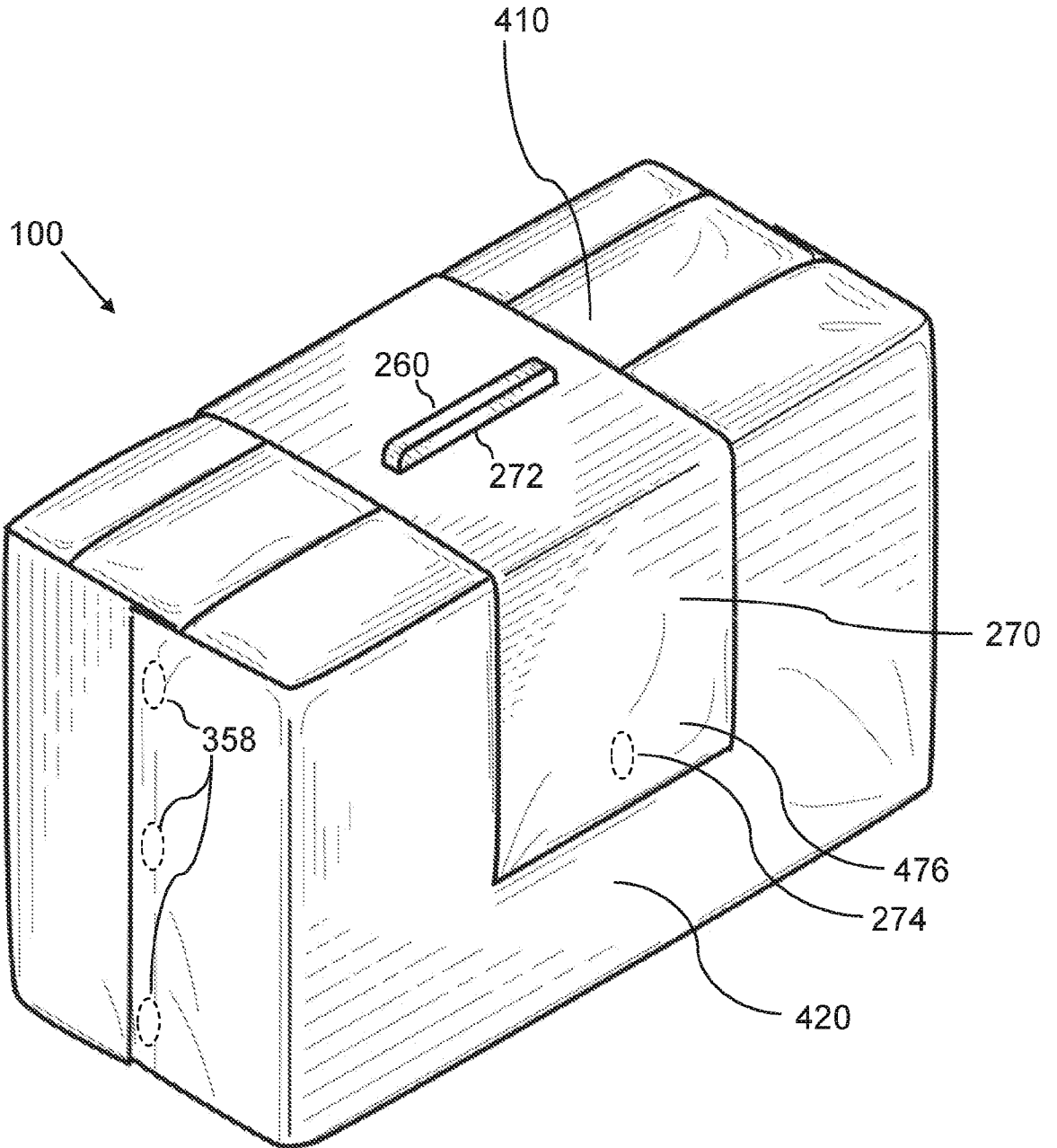


FIG. 5

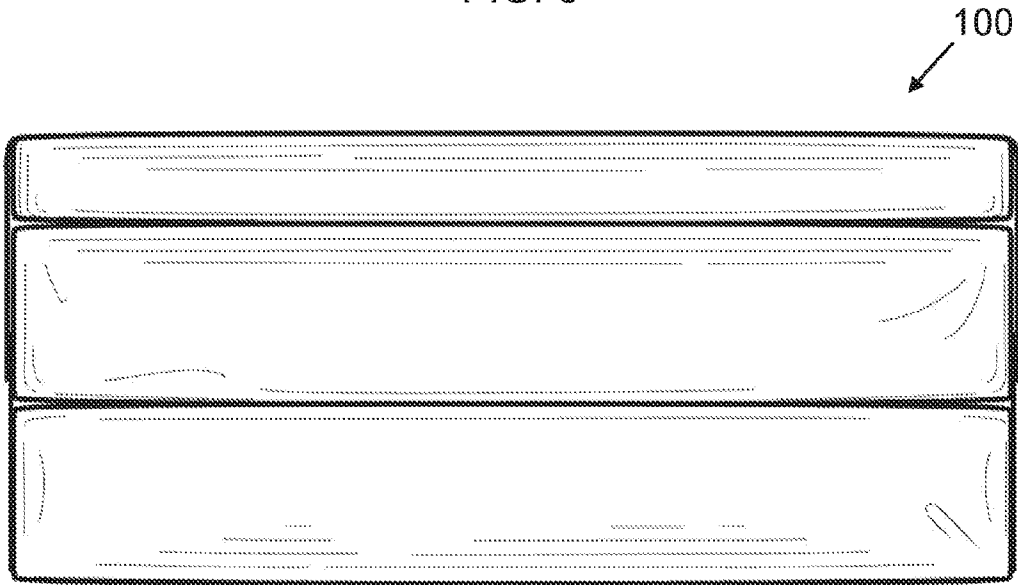


FIG. 6

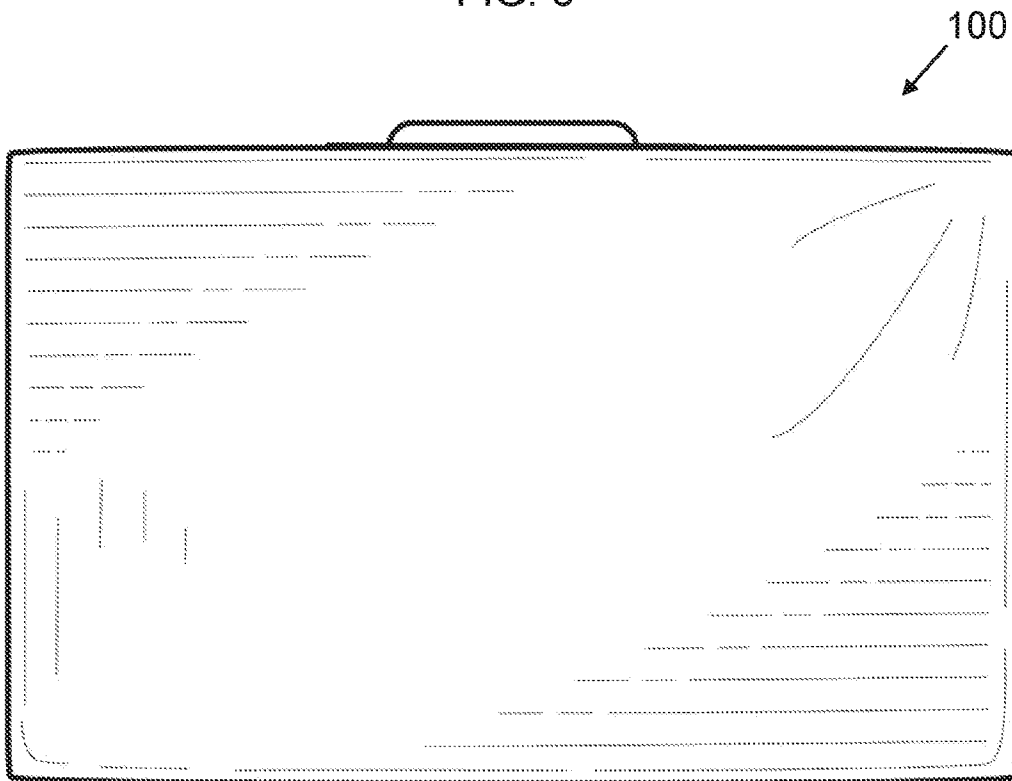


FIG. 7

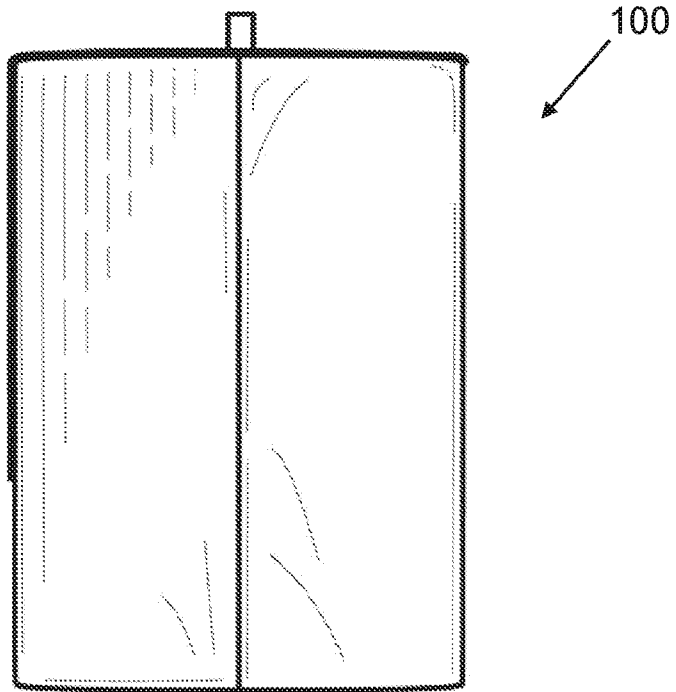


FIG. 8

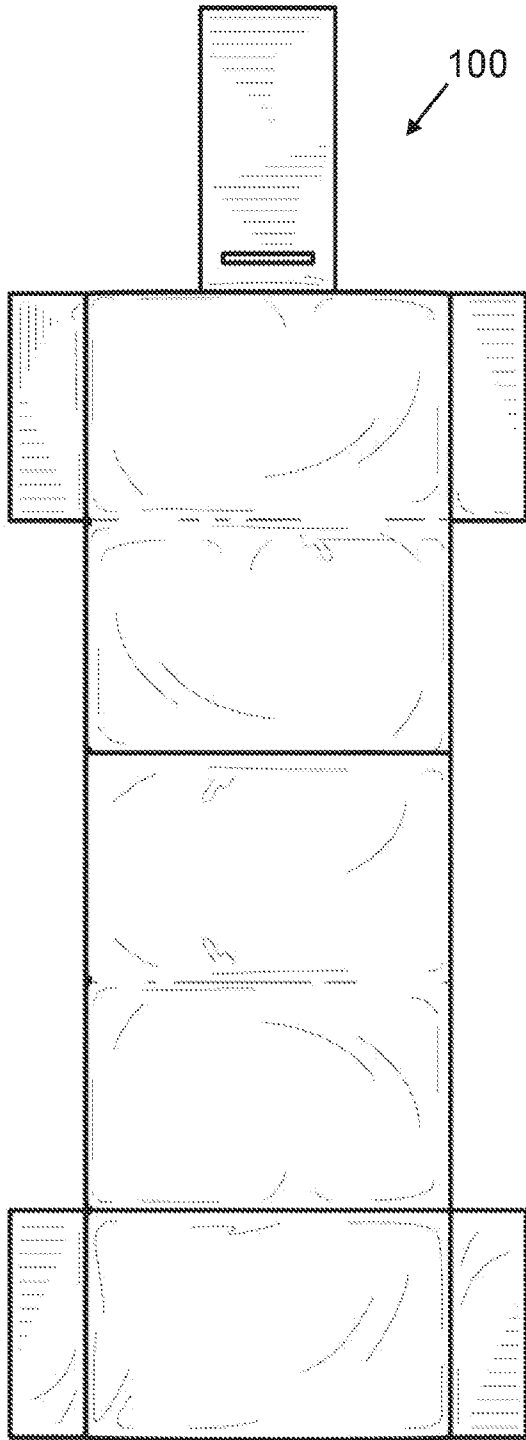


FIG. 9

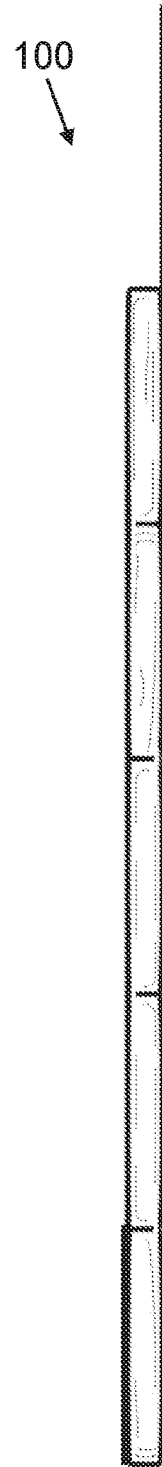


FIG. 10

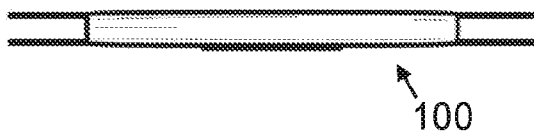


FIG. 11

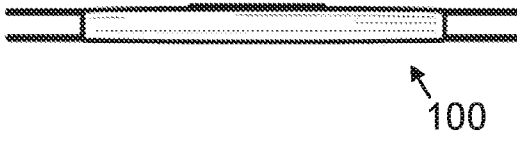


FIG. 12

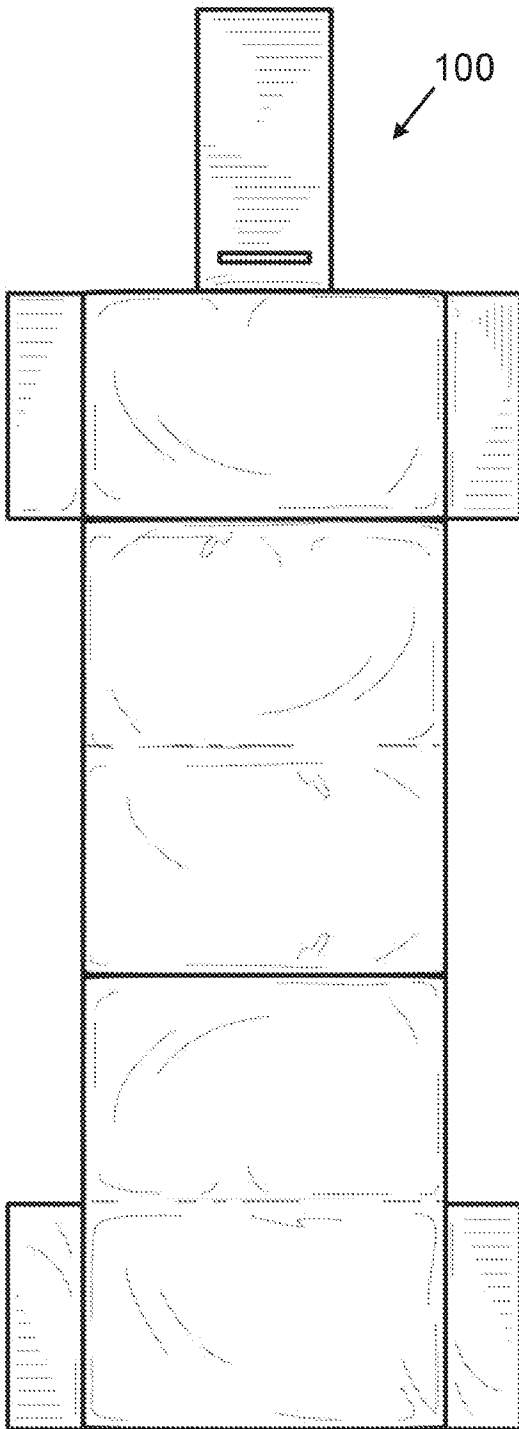


FIG. 13



FIG. 14

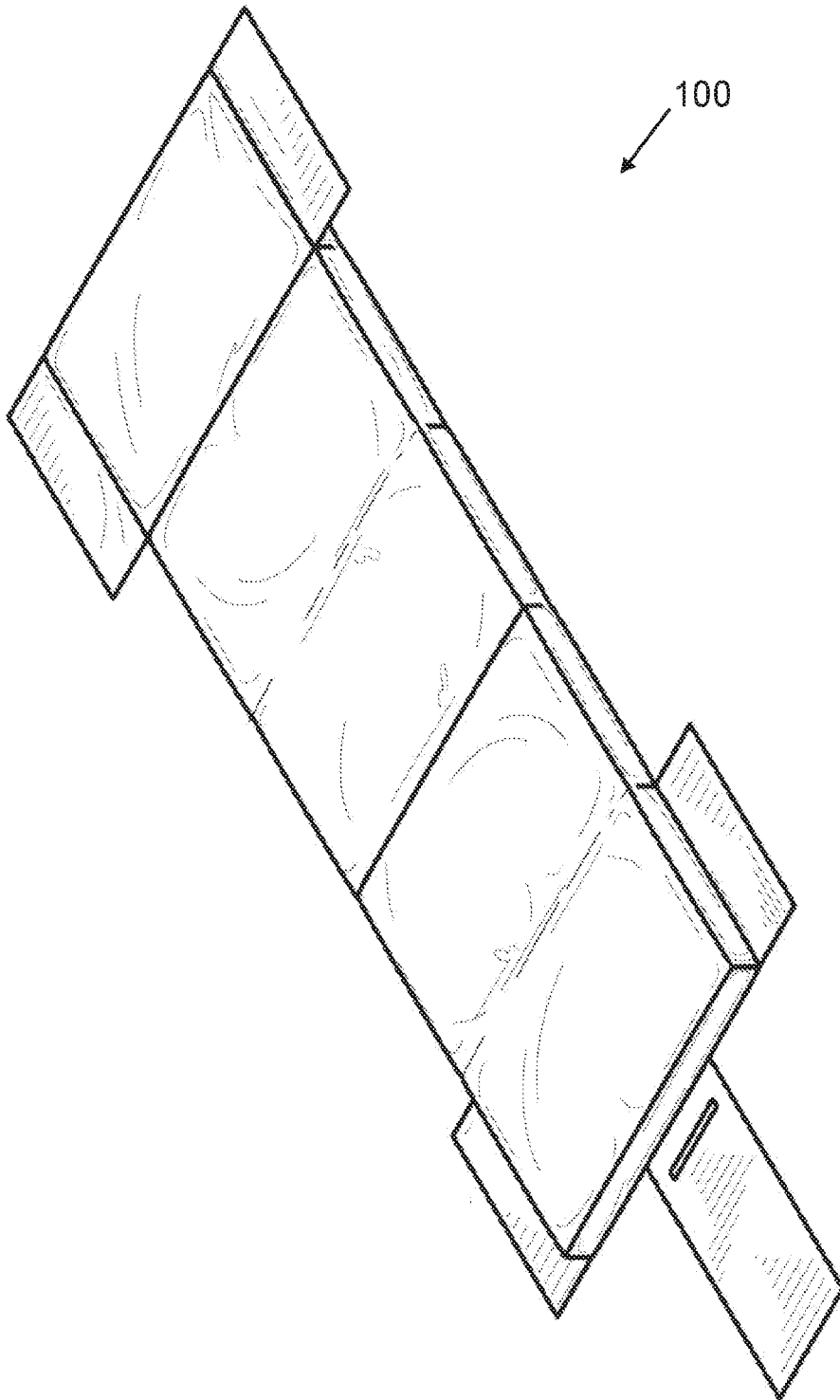


FIG. 15

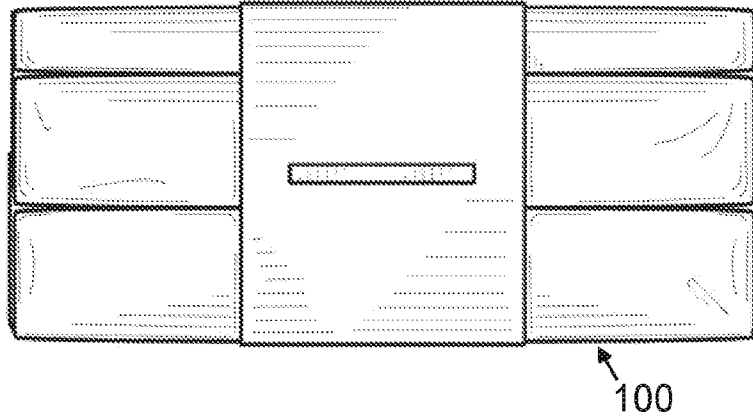


FIG. 16

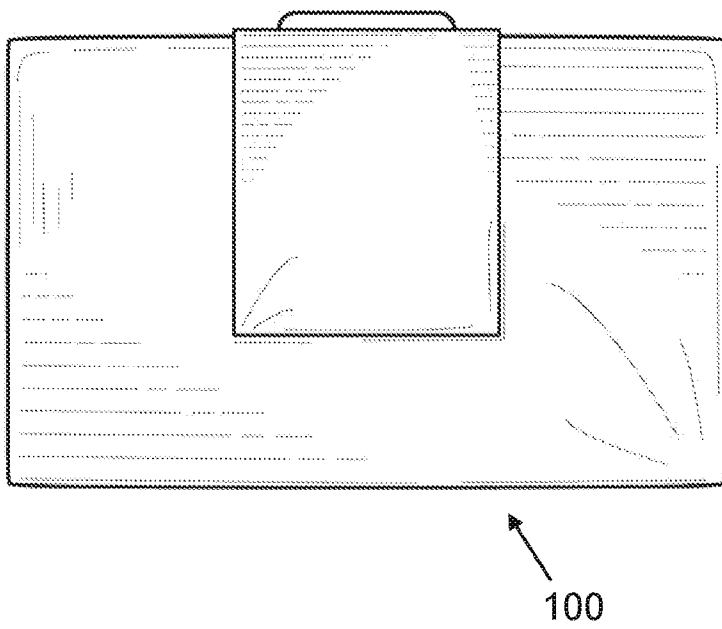


FIG. 17

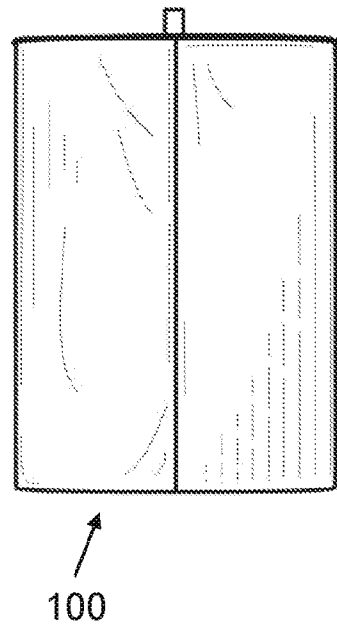
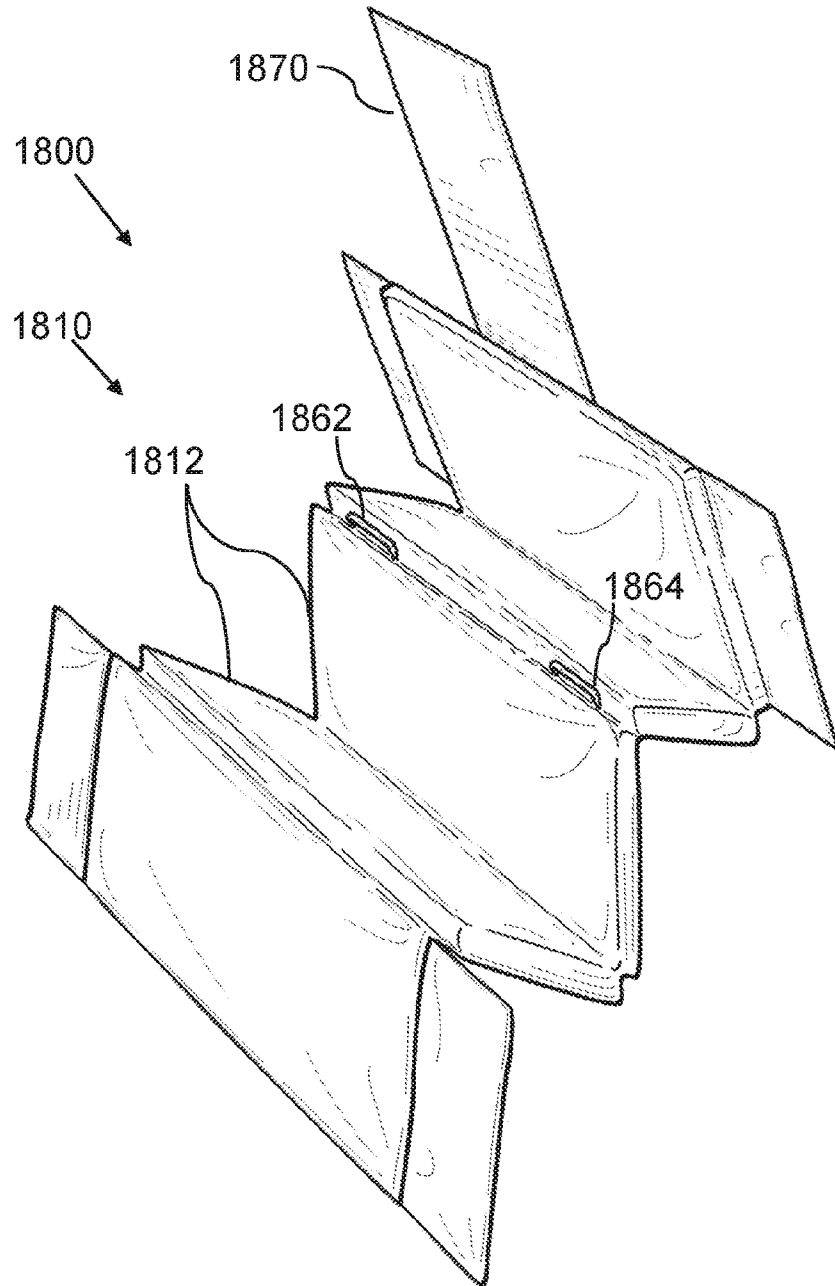


FIG. 18



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US17/30845

A. CLASSIFICATION OF SUBJECT MATTER

IPC - A47C 13/00, 4/04 (2017.01)

CPC - A47C 1/146, 1/143, 4/04

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

See Search History document

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.
X	US 3,555,581 A (FRIANT CHARLES) January 19, 1971; Figure 2, Figure 6	1-2, 8 and 13-15
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Y		1, 3, 9, 11
X	US 4,654,907 A (HAUGAARD BRADLEY R) April 07, 1987; Figures 3 and 4	1-2, 4-7, 10, 12-15, 17-18
X	US 2,528,768 A (FRANK MARSH) November 07, 1950; Figures 3 and 5	1, 3, 9, 11, 13, 16 and 19-20
Y	US 5,265,292 A (UNDERELL RAYMOND R) November 30, 1993; Figure 2; Column 3 Lines 1-2	5-7 and 17-20
Y	US 5,762,170 A (SHYR GODFREY S) June 09, 1998; Figure 2	6, 17 and 19
Y	US 4,190,918 A (HARVELL GLENN M) March 04, 1980; Figure 3	9 and 20
Y	US 4,249,267 A (VOSS CLIFFORD C) February 10, 1981; Figure 10	11 and 12

 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

30 June 2017 (30.06.2017)

Date of mailing of the international search report

03 AUG 2017

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