



(51) International Patent Classification:

B65D 25/14 (2006.01) B31B 50/64 (2017.01)

B65D 77/20 (2006.01)

(21) International Application Number:

PCT/FI2020/050392

(22) International Filing Date:

03 June 2020 (03.06.2020)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

20195619 08 July 2019 (08.07.2019) FI

(71) Applicant: LAPPEENRANNAN-LAHDEN TEKNILINEN YLIOPISTO LUT [FI/FI]; PL 20 / Yliopistonkatu 34, 53851 LAPPEENRANTA (FI).

(72) Inventors: TANNINEN, Panu; c/o Lappeenrannan-Lahden teknillinen yliopisto LUT, PL 20, FI-53851 LAPPEENRANTA (FI). VARIS, Juha; c/o Lappeenrannan-Lahden teknillinen yliopisto LUT, PL 20, 53851 Lappeenranta (FI). KAINUSALMI, Mika; c/o Lappeenrannan-Lahden teknillinen yliopisto LUT, PL 20, FI-53851 LAPPEENRANTA (FI). LEMINEN, Ville; c/o Lappeenrannan-Lah-

den teknillinen yliopisto LUT, PL 20, FI-53851 LAPPEENRANTA (FI).

(74) Agent: FINNPATENT OY; Smart Chemistry Park, Raisio 55, 21200 RAISIO (FI).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

(54) Title: A COATED AND SHAPED BOARD PRODUCT AND A METHOD FOR MANUFACTURING THE SAME

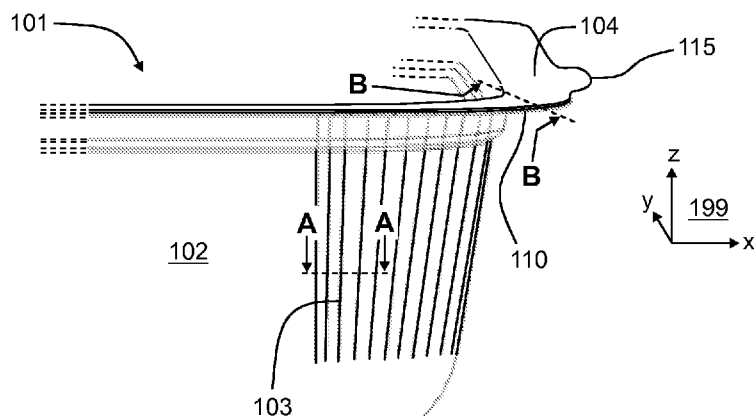


Figure 1a

(57) Abstract: A coated and shaped board product (101) comprises a shaped element (102) made of board, for example paperboard or metal foil. The shaped element is seamless and has folds (103) to form a three-dimensional shape of the shaped element. The coated and shaped board product further comprises a coating membrane (104) attached to a surface of the shaped element. The coating membrane is arranged to cover the folds of the shaped element so that the coating membrane is free from folds and wrinkles. As the coating membrane is free from folds and wrinkles, a hermetic room can be implemented by attaching a cover element to edge areas of the coating membrane.

TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Published:

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

A coated and shaped board product and a method for manufacturing the same**Technical field**

The disclosure relates to a coated and shaped board product that can be, for
5 example but not necessarily, a casserole, a tray, a deep plate, or another receptacle.
The board can be for example paperboard or metal foil. Furthermore, the disclosure
relates to a method for manufacturing a coated and shaped board product.

Background

Nowadays there is a great endeavor to reduce amount of plastics in many
10 disposable products such as e.g. disposable food containers and other receptacles.
Thus, there is an incentive to use paperboard or metal foil instead of plastic. An
inherent challenge related to paperboard and metal foil is their poor formability,
which complicates the use of these for manufacturing products having a three-
dimensional shape, for example casseroles, trays, deep plates, and other
15 receptacles. One method for manufacturing products having a three-dimensional
shape is to make seams between different parts of a blank of paperboard or metal
foil. The seams however complicate a manufacturing process and constitute a
leakage risk. Another method for manufacturing products having a three-
dimensional shape is to fold a blank of paperboard or metal foil on appropriate
20 places so that the paperboard or metal foil constitutes a desired three-dimensional
shape. Press formed creases are often used to guide the folding when a blank of
paperboard or metal foil is shaped to constitute the desired three-dimensional
shape. In a case of e.g. food containers made of paperboard, there is often a need
to use coated paperboard because many liquids can penetrate uncoated
25 paperboard by infiltrating through it.

The above-mentioned method based on folding provides seamless products, but
products manufactured with this method are however not free from challenges. One
of the challenges is related to a need to close a product, such as e.g. a food
container or another receptacle, in a hermetic way. For example, modified
30 atmosphere packing "MAP" can be needed to extend a shelf life of goods such as

e.g. food and/or other perishable goods. In many cases, the folding a blank of paperboard or metal foil leads to an uneven surface to which a cover element is to be attached and thus it may be challenging to implement a reliable and tight joint between the product and the cover element. Another challenge is that folds on wall portions of e.g. a food container or another receptacle may act as capillary channels in which liquids may rise based on the capillary effect and thereby the liquids may get in contact with a joint between the receptacle and a cover element closing the receptacle. The liquids may deteriorate the joint so that the joint gets leaking and thus e.g. protective gas may leak out from the receptacle and, on the other hand, airborne impurities may get into the receptacle. Thus, in many cases where a tight sealing is required, plastic packages are still widely being used.

Summary

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 a more detailed description of exemplifying embodiments of the invention.

In this document, the word “geometric” when used as a prefix means a geometric concept that is not necessarily a part of any physical object. The geometric concept can be for example a geometric point, a straight or curved geometric line, a geometric plane, a non-planar geometric surface, a geometric space, or any other geometric entity that is zero, one, two, or three dimensional.

In this document the word “board” means a flat object having a substantially uniform thickness, such as e.g. paper board or metal foil.

In accordance with the invention, there is provided a new coated and shaped board product that can be, for example but not necessarily, a food container, a casserole, a tray, a deep plate, or another receptacle.

A coated and shaped board product according to the invention comprises:

- a shaped element made of board, the shaped element being seamless and having folds to form a three-dimensional shape of the shaped element, and
- a coating membrane attached to a surface of the shaped element, the coating membrane being arranged to cover the folds of the shaped element so that
5 the coating membrane is free from folds and wrinkles.

As the coating membrane covers the folds of the shaped element and is free from folds and wrinkles, a hermetic room can be implemented by attaching a cover element to edge areas of the coating membrane in which case the hermetic room is formed between the cover element and the coating membrane. Furthermore, folds
10 on wall portions of e.g. a food container or another receptacle according to the invention cannot act as capillary channels because the coating membrane covers the folds and prevents liquids from getting into the folds. In a coated and shaped board product according to an advantageous and non-limiting embodiment, the coating membrane is attached to the shaped element so that the coating membrane
15 can be detached from the shaped element after use. Thus, the shaped element and the coating membrane can be recycled separately. The coating membrane may comprise e.g. a projection or the like with the aid of which the coating membrane can be torn off the shaped element. The board can be for example uncoated paperboard because the shaped element made of the board does not need to
20 provide sealing but mechanical stiffness only. Shaped elements made of same board material, e.g. uncoated paperboard, can be used for manufacturing packages for different products so that the coating membrane and a cover element are selected according to properties of the products to be packed.

A coated and shaped board product according to an exemplifying and non-limiting
25 embodiment comprises one or more electronic components such as e.g. a radio frequency identifier "RFID" between the shaped element and the coating membrane. Thus, the one or more electronic components do not need a separate fastening arrangement.

In accordance with the invention, there is provided also a new method for
30 manufacturing a coated and shaped board product e.g. a food container, a casserole, or another receptacle.

A method according to the invention comprises:

- shaping a piece of board to constitute a shaped element that is seamless and has folds to form a three-dimensional shape of the shaped element, and subsequently
- 5 - attaching a coating membrane to a surface of the shaped element to cover the folds of the shaped element so that the coating membrane is free from folds and wrinkles.

As the coating membrane is attached after the piece of board has been shaped, the coating membrane does not get folded together with the piece of board.

10 Furthermore, the coating membrane does not get subjected to mechanical stresses related to the shaping the piece of board.

Exemplifying and non-limiting embodiments are described in accompanied dependent claims.

Various exemplifying and non-limiting embodiments both as to constructions and to methods of operation, together with additional objects and advantages thereof, will

15 be best understood from the following description of specific exemplifying and non-limiting embodiments when read in conjunction with the accompanying drawings.

The verbs “to comprise” and “to include” are used in this document as open limitations that neither exclude nor require the existence of unrecited features. The

20 features recited in dependent claims are mutually freely combinable unless otherwise explicitly stated. Furthermore, it is to be understood that the use of “a” or “an”, i.e. a singular form, throughout this document does not exclude a plurality.

Brief description of figures

Exemplifying and non-limiting embodiments and their advantages are explained in

25 greater detail below in the sense of examples and with reference to the accompanying drawings, in which:

figures 1a, 1b, and 1c illustrate a coated and shaped board product according to an exemplifying and non-limiting embodiment,

figure 2 shows a flowchart of a method according to an exemplifying and non-limiting embodiment for manufacturing a coated and shaped board product,

figure 3a, 3b, and 3c illustrate a manufacturing phase of a coated and shaped board product, and

- 5 figures 4a, 4b, and 4c illustrate an exemplifying usage of coated and shaped board products according to an exemplifying and non-limiting embodiment.

Description of exemplifying and non-limiting embodiments

The specific examples provided in the description below should not be construed as limiting the scope and/or the applicability of the accompanied claims. Lists and
10 groups of examples provided in the description are not exhaustive unless otherwise explicitly stated.

Figure 1a shows a part of a coated and shaped board product 101 according to an exemplifying and non-limiting embodiment. Figure 1b shows a section taken along a line A - A shown in figure 1a, and figure 1c shows a section taken along a line B -
15 B shown in figure 1a. The viewing directions related to figures 1b and 1c are illustrated with a coordinate system 199. In this exemplifying case, the coated and shaped board product 101 is a receptacle that comprises a bottom portion, wall portions connected to the bottom portion, and a rim portion 110 connected to the wall portions at the opening of the receptacle. The coated and shaped board product
20 101 comprises a shaped element 102 made of board such as for example paperboard or metal foil. The shaped element is seamless and has folds to form a three-dimensional shape of the shaped element. In figures 1a and 1b, one of the folds is denoted with a reference 103. The coated and shaped board product 101 comprises a coating membrane 104 attached to the shaped element 102. In this
25 exemplifying case, the coating membrane 104 covers an upper surface of the rim portion 110 and an inner surface of a cavity formed by the shaped element 102. As illustrated in figures 1b and 1c, the coating membrane 104 is arranged to cover the folds of the shaped element 102 so that the coating membrane 104 is free from folds and wrinkles. The coating membrane 104 can be for example a plastic membrane,
30 an organic barrier coating, a metallized membrane, a multilayer membrane, a

nanocomposite membrane, or another suitable membrane. Thus, the invention is not limited to any specific membrane types and/or materials.

As the coating membrane 104 covers the folds of the shaped element 102 and is free from folds and wrinkles, a hermetic room can be implemented by attaching a
5 cover element to a portion of the coating membrane 104 that is coating the rim portion 110. A part of the cover element is illustrated in figure 1c, where the cover element is denoted with a reference 107. The cover element is not shown in figure 1a. As the joint is made between the coating membrane 104 and the cover element 107, grooves on the folded surface of the rim portion 110 are not problematic from
10 the viewpoint of sealing. In figure 1c, one of the grooves is denoted with a reference 106. Furthermore, folds on the wall portions of the shaped element 102 cannot act as capillary channels because the coating membrane 104 covers the folds and thus prevents liquids from getting into the folds. In figure 1b, a channel that might act as a capillary channel if there were no coating membrane is denoted with a reference
15 105. The cover element 107 can be for example a plastic membrane, an organic membrane, a metallized membrane, a multilayer membrane, a nanocomposite membrane, or another suitable flat element.

In a coated and shaped board product according to an exemplifying and non-limiting embodiment, the coating membrane 104 is attached to the shaped element 102 so
20 that the coating membrane 104 can be detached from the shaped element 102 after use. Thus, the shaped element 102 and the coating membrane 104 can be recycled separately. In the exemplifying coated and shaped board product 101 shown in figure 1a, the coating membrane 104 comprises a projection 115 the aid of which the coating membrane 104 can be torn off the shaped element 102.

25 A coated and shaped board product according to an exemplifying and non-limiting embodiment comprises at least one electronic component 118 such as e.g. a radio frequency identifier "RFID" between the shaped element 102 and the coating membrane 104. Thus, the electronic component 118 does not need a separate fastening arrangement.

Figure 2 shows a flowchart of a method according to an exemplifying and non-limiting embodiment for manufacturing a coated and shaped board product. The method comprises the following actions:

- 5 - action 201: shaping a piece of board, e.g. paperboard or metal foil, to constitute a shaped element that is seamless and has folds to form a three-dimensional shape of the shaped element, and subsequently
 - action 202: attaching a coating membrane to a surface of the shaped element to cover the folds of the shaped element so that the coating membrane is free from folds and wrinkles.
- 10 The above-mentioned action 201 can be carried out with any suitable method for shaping the board. For example, the board can be shaped by means of a shaping tool that comprises a female tool element and a male tool element such that one of these tool elements is movable relative to the other one. Furthermore, the shaping tool may comprise a frame tool element for pressing a rim portion of the piece of
- 15 board against edges of a cavity of the female tool element when or after the male tool element presses the center area of the piece of board into the cavity of the female tool element. The shaping tool comprises advantageously heating means for warming up the board so as to facilitate the shaping of the board. It is to be noted that the invention is not limited to any specific method for shaping the board.
- 20 Figure 3a shows an exemplifying shaped element 302 made of board, and figures 3b and 3c illustrate an exemplifying way to attach a coating membrane 304 to a surface of the shaped element 302. In this exemplifying case, the coating membrane 304 is pressed against the surface of the shaped element 302 with the aid of a gas pressure difference Δp so that the gas pressure is greater on a surface of the coating
- 25 membrane 304 facing away from the shaped element 302 than on an opposite surface of the coating membrane 304 facing towards the shaped element 302. It is worth noting that there is no need for a tool having a tailored shape and against which the coating membrane 304 is pressed because the shaped element 302 acts as an element against which the coating membrane 304 is pressed. The gas
- 30 pressure difference Δp can be accomplished with excess-pressure, under-pressure, or both. The gas can be e.g. air. The coating membrane 304 and/or the shaped

element 302 can have a layer of adhesive material, or the coating membrane 304 can be made of material that is adhesive e.g. when it is hot. It is to be noted that the invention is not limited to any specific method for attaching the coating membrane to the shaped element.

- 5 In the exemplifying case illustrated in figures 3a-3c, the shaped element 302 comprises through-holes allowing gas to flow out from a room between the coating membrane 304 and the shaped element 302 when the coating membrane 304 is being pressed towards the shaped element 302 by the gas pressure difference Δp . In figure 3a, one of the through-holes is denoted with a reference 307.
- 10 Advantageously, the through-holes are made prior to the board is shaped i.e. when the board has a flat form. To minimize a production time, the through-holes can be made at the same time when a blank of board is cut from a sheet or web of the board. It is however also possible that the through-holes are made prior to or after the blank of board is cut from the sheet or web of the board. The through-holes can
- 15 be made with e.g. laser cutting, water jet cutting, or mechanically with a punching tool.

In the exemplifying case illustrated in figure 3a, distances between adjacent ones of the above-mentioned through-holes are smaller on areas where radii of curvature of the three-dimensional shape of the shaped element 302 are smaller than on areas

20 where radii of curvature of the three-dimensional shape of the shaped element 302 are greater. For example, the radii of curvature are smaller on a corner area 308 than on a wall area 309. The wall area 309 is substantially flat and thus the radius of curvature is infinite. The fact that the through-holes are more densely on areas with smaller radii of curvature facilitates the attachment of the coating membrane

25 304 to the whole area to be coated on the surface of the shaped element 302. Furthermore, in cases where the through-holes are made prior to shaping the board, the fact that the through-holes are more densely on areas with smaller radii of curvature facilitates the shaping the board.

Figures 4a, 4b, and 4c illustrate an exemplifying usage of coated and shaped board products according to an exemplifying and non-limiting embodiment. In the

30 exemplifying case shown in figures 4a and 4b, the coated and shaped board

products are connected to each other by the coating membrane 404. In figure 4a and 4b, two of the coated and shaped board products are denoted with references 401 and 421. Products being packed are placed into the coated and shaped board products, and thereafter the coated and shaped board products are closed one-by-one so that a web 417 constitutes cover elements of the coated and shaped board products. In figures 4a and 4b, one of the products being packed is denoted with a reference 430. The web 417 is attached to the coated and shaped board products with the aid of pressing tools 440 and 441. The attachment between the coating membrane 404 and the web 417 can be based on materials which can be joined by heat, or there can be an adhesive layer on the surface of the coating membrane 404 and/or on the surface of the web 417. Figure 4c illustrates a process phase where the coated and shaped board products are cut off each other with a cutting tool 450.

The specific examples provided in the description given above should not be construed as limiting the applicability and/or interpretation of the appended claims. It is to be noted that lists and groups of examples given in this document are non-exhaustive lists and groups unless otherwise explicitly stated.

What is claimed is:

1. A coated and shaped board product (101) comprising:
 - a shaped element (102, 302) made of board, the shaped element being seamless and having folds (103) to form a three-dimensional shape of the shaped element, and
 - a coating membrane (104, 304) attached to a surface of the shaped element,

characterized in that the coating membrane is arranged to cover the folds of the shaped element so that the coating membrane is free from folds and wrinkles.
2. A coated and shaped board product according to claim 1, wherein the shaped element (302) comprises through-holes (307).
3. A coated and shaped board product according to claim 2, wherein distances between adjacent ones of the through holes are smaller on areas (308) where radii of curvature of the three-dimensional shape of the shaped element are smaller than on areas (309) where radii of curvature of the three-dimensional shape of the shaped element are greater.
4. A coated and shaped board product according to any one of claims 1-3, wherein the coated and shaped board product (102, 302) is a receptacle comprising a bottom portion, wall portions connected to the bottom portion, and a rim portion (110) connected to the wall portions at an opening of the receptacle, the surface of the shaped element covered by the coating membrane comprising a surface of the rim portion and an inner surface of the receptacle.
5. A coated and shaped board product according to claim 4, wherein the coated and shaped board product further comprises a cover element (107) attached to a portion of the coating membrane coating the rim portion, the coating membrane and the cover element defining a hermitically sealed room.
6. A coated and shaped board product according to any one of claims 1-5, wherein the coated and shaped board product comprises at least one electronic component (118) between the shaped element and the coating membrane.

7. A coated and shaped board product according to any one of claims 1-6, wherein the shaped element is made of paperboard.
8. A coated and shaped board product according to any one of claims 1-6, wherein the shaped element is made of metal foil.
- 5 9. A method for manufacturing a coated and shaped board product, the method comprising shaping (201) a piece of board to constitute a shaped element that is seamless and has folds to form a three-dimensional shape of the shaped element, **characterized** in that the method subsequently comprises attaching (202) a coating membrane to a surface of the shaped element to cover the folds of the shaped
- 10 element so that the coating membrane is free from folds and wrinkles.
10. A method according to claim 9, wherein the attaching the coating membrane comprises pressing the coating membrane against the surface of the shaped element with a gas pressure difference so that gas pressure is greater on a surface of the coating membrane facing away from the shaped element than on an opposite
- 15 surface of the coating membrane facing towards the shaped element.
11. A method according to claim 9 or 10, wherein the method comprises arranging the shaped element to comprise through-holes allowing gas to flow out from a room between the coating membrane and the shaped element when the coating membrane is being pressed against the surface of the shaped element.
- 20 12. A method according to claim 11, wherein distances between adjacent ones of the through holes are smaller on areas where radii of curvature of the three-dimensional shape of the shaped element are smaller than on areas where radii of curvature of the three-dimensional shape of the shaped element are greater.
13. A method according to claim 11 or 12, wherein the through-holes are made
- 25 prior to the shaping the piece of board.
14. A method according to any of claims 9-13, wherein the coated and shaped board product is a receptacle comprising a bottom portion, wall portions connected to the bottom portion, and a rim portion connected to the wall portions at an opening of the receptacle, the surface of the shaped element to which the coating membrane

is attached comprising a surface of the rim portion and an inner surface of the receptacle.

15. A method according to claim 14, wherein the method comprises attaching a cover element to a portion of the coating membrane coating the rim portion, the
5 coating membrane and the cover element defining a hermitically sealed room.

16. A method according to any one of claims 9-15, wherein the method comprises placing at least one electronic component on the surface of the shaped element prior to attaching the coating membrane to the surface of the shaped element.

1 / 4

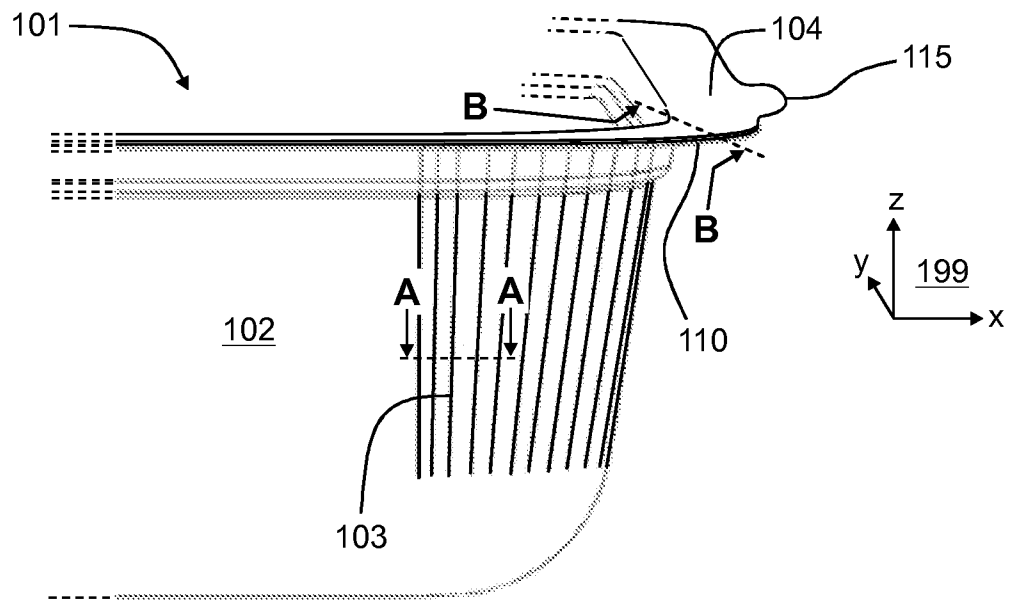


Figure 1a

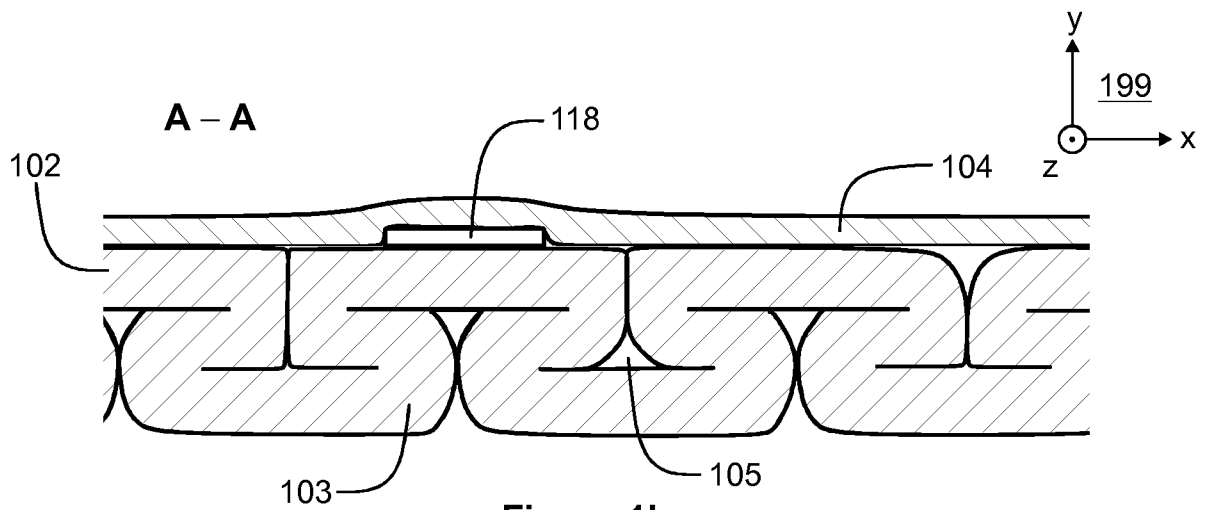


Figure 1b

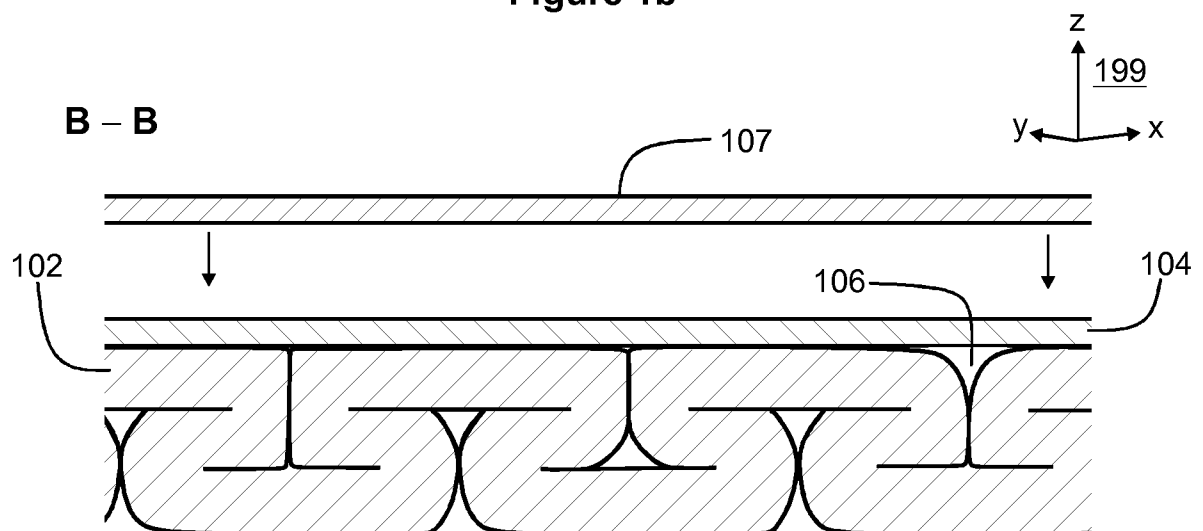


Figure 1c

2 / 4

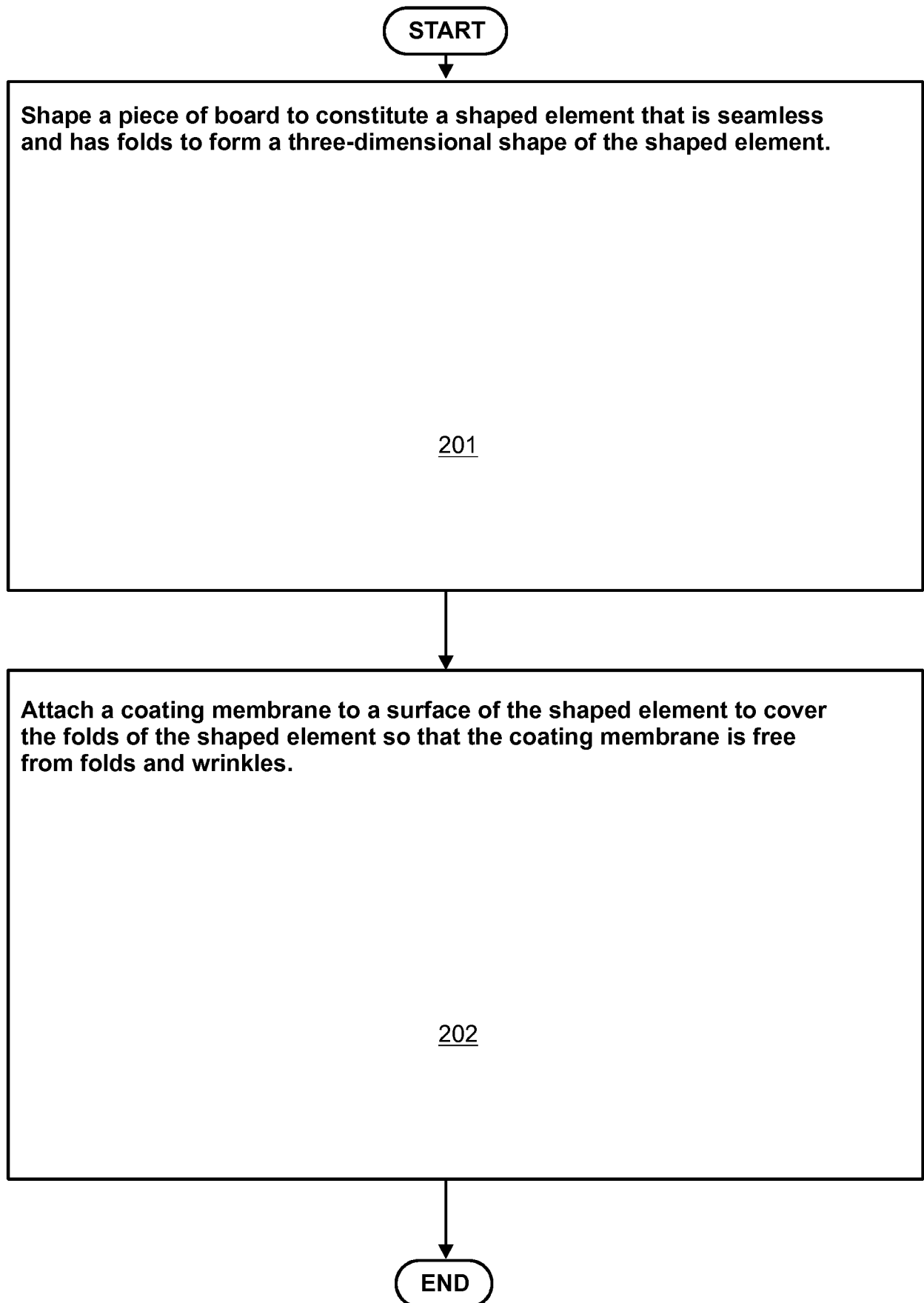


Figure 2

3 / 4

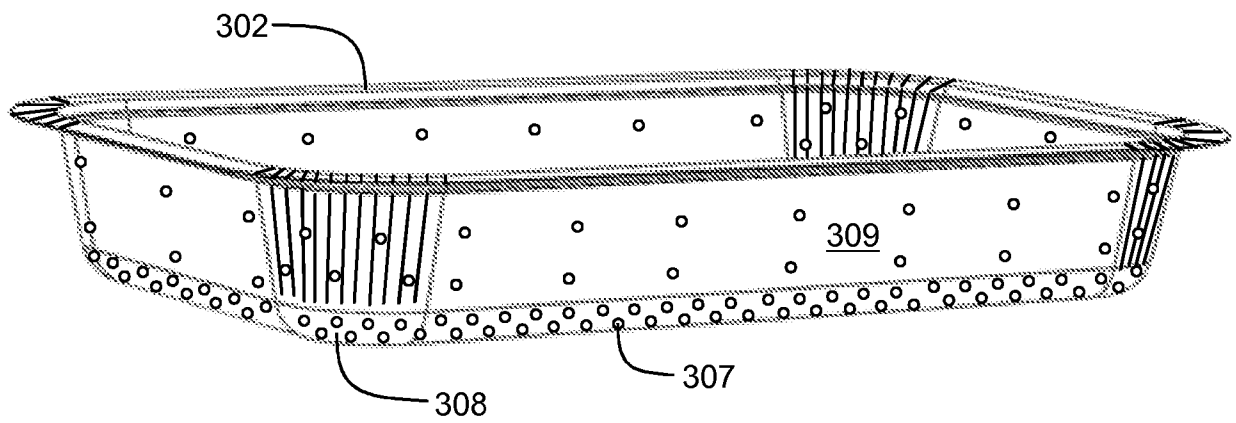


Figure 3a

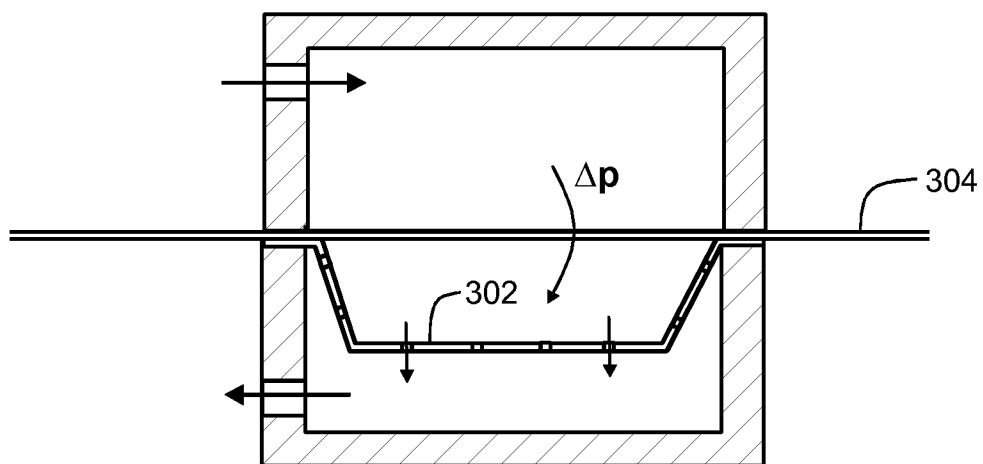


Figure 3b

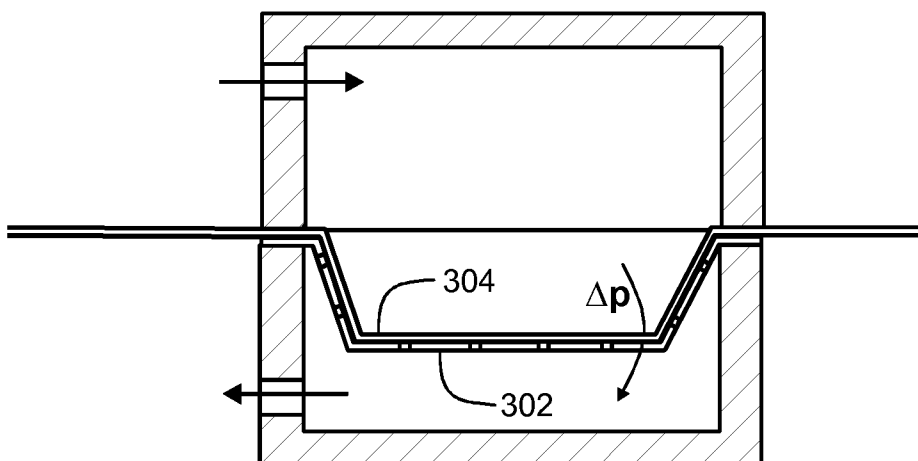


Figure 3c

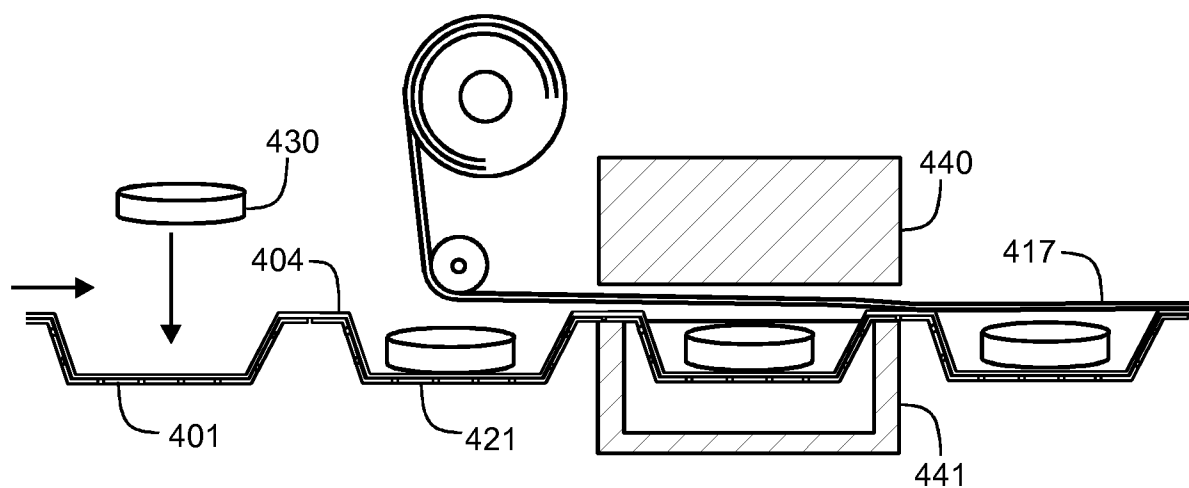


Figure 4a

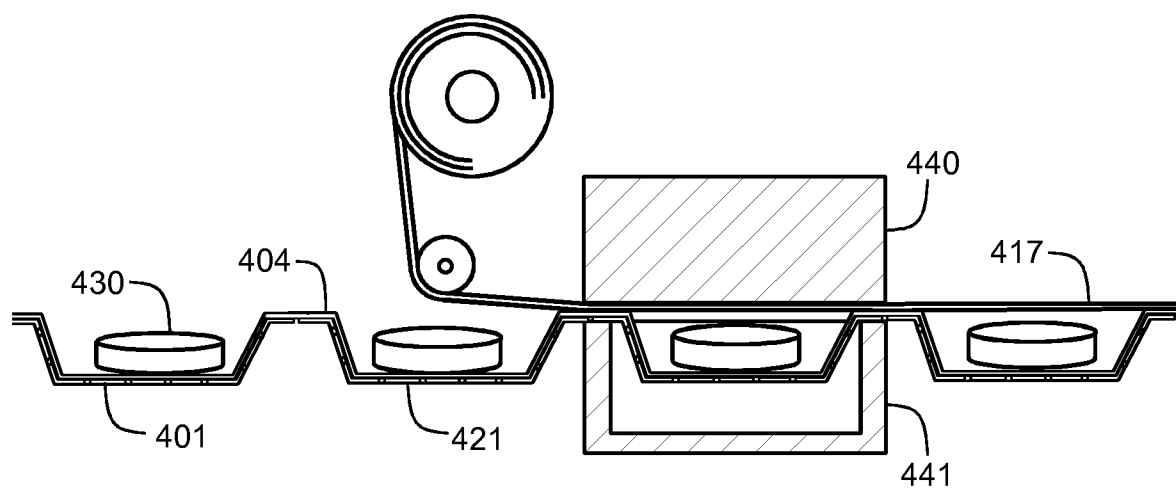


Figure 4b

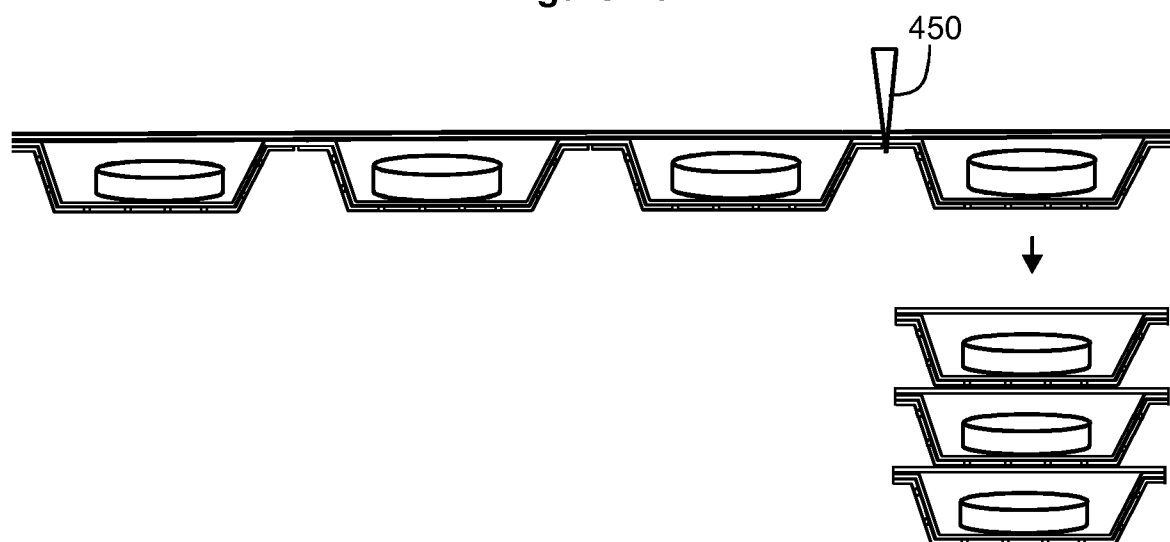


Figure 4c

INTERNATIONAL SEARCH REPORT

International application No
PCT/FI2020/050392

A. CLASSIFICATION OF SUBJECT MATTER

INV. B65D25/14 B65D77/20 B31B50/64
ADD.

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)

B65D B31F B31B

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

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2015/009518 A1 (MEADWESTVACO CORP [US]) 22 January 2015 (2015-01-22) paragraph [0047] - paragraph [0060]; figures 1-11 -----	1-5,7, 9-15
X	JP 2001 192014 A (DAINIPPON PRINTING CO LTD) 17 July 2001 (2001-07-17) paragraph [0009]; figures 1-4 -----	1,2,4,5, 7,9,11, 14,15
X	US 2012/228306 A1 (WALLACE MILLARD F [US]) 13 September 2012 (2012-09-13) paragraph [0139]; figures 1-12 -----	1,4,5,8, 9,14,15
X	DE 203 06 120 U1 (SIEBERTZ NORBERT [DE]) 14 August 2003 (2003-08-14) page 11, lines 18-27 page 23, line 17 - page 24, line 7; figures 1-11 -----	1,6,9,16



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"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

4 September 2020

Date of mailing of the international search report

14/09/2020

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Grondin, David

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/FI2020/050392

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2015009518	A1	22-01-2015	NONE
JP 2001192014	A	17-07-2001	JP 4478269 B2 09-06-2010 JP 2001192014 A 17-07-2001
US 2012228306	A1	13-09-2012	US 2012228306 A1 13-09-2012 US 2016176611 A1 23-06-2016 US 2019152678 A1 23-05-2019
DE 20306120	U1	14-08-2003	NONE