

(19)



(11)

EP 2 959 791 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
22.01.2020 Bulletin 2020/04

(21) Application number: **13875502.0**

(22) Date of filing: **01.08.2013**

(51) Int Cl.:
A45C 7/00 (2006.01) A45C 13/10 (2006.01)

(86) International application number:
PCT/CN2013/000908

(87) International publication number:
WO 2014/127497 (28.08.2014 Gazette 2014/35)

(54) LUGGAGE CASE STRUCTURE

KOFFERSTRUKTUR

STRUCTURE DE BAGAGE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **20.02.2013 CN 201320079218 U**
05.07.2013 CN 201320401203 U

(43) Date of publication of application:
30.12.2015 Bulletin 2015/53

(73) Proprietor: **Twinkle Leatherware Co., Ltd.**
Hong Kong (CN)

(72) Inventors:
• **TSENG, Tzu-Wei**
Hong Kong (CN)
• **LIN, Hung-Sheng**
Hong Kong (CN)

- **CHEN, Cheng-Cheng**
Hong Kong (CN)
- **HSIEH, Yi-Ju**
Hong Kong (CN)
- **WONG, Wai-Ming**
Hong Kong (CN)

(74) Representative: **Pons**
Glorieta Ruben Dario 4
28010 Madrid (ES)

(56) References cited:
CN-U- 202 222 610 CN-U- 202 222 610
GB-A- 520 473 JP-A- 2006 218 145
JP-A- 2006 218 145 US-A1- 2014 299 430
US-B1- 7 175 010

EP 2 959 791 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

Technical Field

[0001] The disclosure relates to a suitcase, more particularly to a suitcase capable of being easily stored.

Background

[0002] Before long distance travels, travelers are used to putting all the things needed during the journey in a suitcase. Due to the limit of suitcase's capacity, travelers, however, usually can only store the relatively important belongings in the suitcase and the relatively not important belongings can only be left. Travelers need to buy necessities which cannot be stored in the suitcase after arriving the destinations. Therefore, to avoid the waste caused by repeat purchases of the same necessities, travelers are often fond of high capacity suitcases, in order to store plenty of personal belongings in those suitcases.

[0003] Although the high capacity suitcase is able to accommodate more belongings, it may cause storage problems for travelers after their travels. For those families with limited storage spaces, they are particularly troubled by the storage of big suitcases.

[0004] Consequently, in order to store suitcases more conveniently, how to make a suitcase with the feature that the size thereof can be reduced after the travels is a problem to be solved for the designers. CN202222610 is a prior art example of a foldable suitcase.

SUMMARY

[0005] The disclosure provides a suitcase according to claims 1 or 3 for solving the storage problems to users after traveling.

[0006] An embodiment outside the scope of the claimed invention but herein disclosed provides a suitcase including a back case component, a front lid component and a ring-shaped gusset component. Two opposite sides of the ring-shaped gusset component are connected to an edge of the back case component and an edge of the front lid component, respectively, to form an accommodating space. The ring-shaped gusset component includes a plurality of first supporting parts and a plurality of second supporting parts. The first supporting parts are disposed on the corners of the back case component, respectively. The second supporting parts are disposed on edges of the back case component, respectively. The ring-shaped gusset component includes a plurality of bending parts. The bending parts are disposed between the first supporting parts and the second supporting parts. The flexible deformation capability of each bending part is greater than the flexible deformation capability of each first supporting part and the flexible de-

formation capability of each second supporting part, and the bending parts are bendable, allowing the first supporting parts and the second supporting parts to be folded upward or downward on the back case component.

[0007] An embodiment according to claim 1 discloses a suitcase, comprising: a back case components front lid component; and a ring-shaped gusset component, two opposite sides of the ring-shaped gusset component connected to an edge of the back case component and an edge of the front lid component, respectively, to form an accommodating space, the ring-shaped gusset component comprising a plurality of bending sections and a plurality of sidewall sections which are configured for connecting the plurality of bending sections, the plurality of bending sections disposed on corners of the back case component, respectively, the plurality of sidewall sections disposed on edges of the back case component, respectively, wherein the flexible deformation capability of each of the plurality of bending sections is greater than the flexible deformation capability of each of the plurality of sidewall sections, and the plurality of bending sections are bendable, allowing the plurality of sidewall sections to be folded upward or downward on the back case component, being the suitcase characterized in that: - the front lid component and the ring-shaped gusset component are connected to each other by a connection element, so as to form the accommodating space, wherein the connection element is a zipper, and - the ring-shaped gusset component has a first opening, the front lid component has a second opening, the zipper comprises two chains and a zipper head, the two chains are disposed on an edge of the first opening and an edge of the second opening, respectively, the two chains are connected to each other to form a connection section, wherein the connection section is disposed between the front lid component and the ring-shaped gusset component, the connection section has a length which allows the front lid component and the ring-shaped gusset component to be maintained at a specific distance when the front lid component and the ring-shaped gusset component are separated from each other, and the zipper head is configured for tying the two chains or separating the two chains.

[0008] An embodiment outside of the scope of the claimed invention but herein disclosed provides a suitcase including a back case component, a front lid component and a ring-shaped gusset component. Two opposite sides of the ring-shaped gusset component are connected to an edge of the back case component and an edge of the front lid component, respectively, to form an accommodating space. The ring-shaped gusset component includes a plurality of first accommodating parts, a plurality of second accommodating parts, a plurality of first reinforcement element and a plurality of second reinforcement elements. The first accommodating parts are disposed on corners of the back case component, respectively. The second accommodating parts are disposed on edges of the back case component, respectively. Each first accommodating part is parted from each

second accommodating part. The first enforcement elements are detachably disposed on the first accommodating parts, respectively. The second reinforcement elements are detachably disposed on the second accommodating parts, respectively, to form a plurality of bending parts. The flexible deformation capability of each bending part is greater than the flexible deformation capability of each first accommodating part and the flexible deformation capability of each second accommodating part, and the bending parts are bendable, allowing the second accommodating parts to be folded upward or downward on the back case component.

[0009] An embodiment according to claim 3 provides a suitcase comprising: a back case components front lid component; and a ring-shaped gusset component, two opposite sides of the ring-shaped gusset component connected to the back case component and the front lid component, respectively, to form an accommodating space capable of being closed, the ring-shaped gusset component comprising a plurality of sidewall parts and a plurality of flexible parts that are configured for connecting the plurality of sidewall parts, the flexible deformation capability of each of the plurality of flexible parts is greater than the flexible deformation capability of each of the plurality of sidewall parts, an acute angle formed between one of the plurality of flexible parts and the ring-shaped gusset component, two of the plurality of sidewall parts that are adjacent to each other are able to be folded upward or downward on the back case component by the bending of one of the plurality of flexible parts which is connected therebetween, being the suitcase characterized in that- the front lid component and the ring-shaped gusset component are connected to each other by a connection element, so as to form the accommodating space,- the connection element is a zipper, and- the ring-shaped gusset component has a first opening, the front lid component has a second opening, one of the sidewall parts comprises a sidewall body, and there is a connecting body sticks out from the front lid component, the sidewall body has a depression, the depression is located on an outer surface of the sidewall body, the connecting body has two opposite edges, one of the edges is connected to an edge of the sidewall body which forms the depression, the other edge of the connecting body is connected to an edge of the second opening of the front lid component, the zipper comprises two chains and a zipper head, one of the chains is disposed on an edge of the first opening and the edge of the depression, the other chain is disposed on the edge of the second opening and an edge of the connecting body connected to the sidewall body, the zipper head is configured for tying or separating the two chains; when the zipper head ties the two chains, the connecting body covers the outer surface of the sidewall body; and when the zipper head separates the two chains, the connecting body allows the front lid component and the ring-shaped gusset component to be spaced apart and maintained at a specific distance.

[0010] According to the suitcase as discussed above,

since the ring-shaped gusset component is consisted of the plurality of bending parts and the plurality of supporting parts which have different flexible deformation capabilities, and the bending parts are bendable, thus the user is able to fold the supporting parts downward and stack the supporting parts on the back case component. By doing this, the size of the suitcase after being folded is much smaller than the size of the suitcase before being folded, allowing the user to store the suitcase conveniently.

[0011] In addition, since the ring-shaped gusset component is consisted of the plurality of bending sections and the plurality of sidewall sections with different flexible deformation capabilities, and the bending sections are bendable, thus the user is able to fold the sidewall sections downward and close the sidewall sections relative to the back case component. By doing this, the size of the suitcase after being folded is much smaller than the size of the suitcase before being folded, allowing the user to store the suitcase conveniently.

[0012] Furthermore, as the suitcase disclosed above, since the acute angle is formed between each flexible part and the back case component, the flexible deformation capabilities of the flexible parts are greater than the flexible deformation capabilities of all the sidewall part, and the flexible parts are bendable, thus the two sidewall parts, which are adjacent to each other, are able to be folded upward or downward on the back case component by the bending of the flexible part which is connected therebetween, so that the size of the suitcase after being folded is significantly smaller than the size of the suitcase before being folded, allowing the user to store the suitcase conveniently.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only and thus are not limitative of the present invention and wherein:

FIG. 1 is a perspective view of a suitcase according to claim 3;

FIG. 2 is a perspective view of the suitcase of FIG. 1 being opened;

FIG. 3 is an enlarged partial cross-section view of a ring-shaped gusset component of FIG. 2;

FIG. 4 is an enlarged view of a zipper of FIG. 2;

FIG. 5 to FIG. 8 are schematic views of the storage process of FIG. 2;

FIG. 9 is a perspective view of a suitcase according to an embodiment outside the scope of the claimed invention but herein disclosed;

FIG. 10 is a perspective view of the suitcase of FIG. 9 being opened;

FIG. 11 is an enlarged view of a zipper of FIG. 10;

FIG. 12 to FIG. 15 are schematic views of the storage

process of FIG. 10;
 FIG. 16 is a perspective view of a front lid component of a suitcase being opened according to a third embodiment of the disclosure;
 FIG. 17 is a perspective view of a suitcase according to a fourth embodiment of the disclosure;
 FIG. 18 is a perspective view of the suitcase of FIG. 17 being opened;
 FIG. 19A is an enlarged view of FIG. 18;
 FIG. 19B is a cross-sectional view of FIG. 19A;
 FIG. 19C is a perspective view of the suitcase of FIG. 19A being bent;
 FIG. 20 is an enlarged view of a zipper of FIG. 18;
 FIG. 21 to FIG. 24 are schematic views of the storage process of FIG. 18;
 FIG. 25 is a perspective view of a suitcase according to claim 1;
 FIG. 26 is a perspective view of a suitcase of FIG. 25 being opened;
 FIG. 27A is a partial enlarged view of FIG. 26;
 FIG. 27B is a perspective view of the suitcase of FIG. 27A being bent;
 FIG. 28 is an enlarged view of the zipper of FIG. 26;
 FIG. 29 is a perspective view of a suitcase being opened according to a sixth embodiment of the disclosure;
 FIG. 30 to FIG. 33 are schematic views of the storage process of the suitcase of FIG. 26; and
 FIG. 34 is a perspective view of a suitcase according to an embodiment outside of the scope of the claimed invention but herein disclosed;

DETAILED DESCRIPTION

[0014] In the following detailed description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosed embodiments. It will be apparent, however, that one or more embodiments may be practiced without these specific details. In other instances, well-known structures and devices are schematically shown in order to simplify the drawing.

[0015] Please refer to FIG. 1 to FIG. 4. FIG. 1 is a perspective view of a suitcase according to a first embodiment of the disclosure. FIG. 2 is a perspective view of the suitcase of FIG. 1 being opened. FIG. 3 is an enlarged partial cross-section view of a ring-shaped gusset component of FIG. 2. FIG. 4 is an enlarged view of a zipper of FIG. 2.

[0016] In this embodiment, a suitcase 10 includes a back case component 100, a front lid component 200 and a ring-shaped gusset component 300. The back case component 100 and the front lid component 200 are made of relatively harder materials for providing better protection. For example, the back case component 100 and the front lid component 200 are made of plastic plates such as polyethylene (PE), polypropylene (PP), ethylene-vinyl acetate (EVA), polyvinyl chloride (PVC) or acry-

lonitrile butadiene styrene (ABS) resin, or made of fabrics.

[0017] Two opposite sides of the ring-shaped gusset component 300 are connected to an edge of the back case component 100 and an edge of the front lid component 200, respectively, to form an accommodating space 330. In this embodiment, the ring-shaped gusset component 300 is made of composite materials including, for example, 1268D fabric, PE, PVC, PP, EVA or ABS and relatively softer materials such as cane fabric, butadiene resin (SBR), 150D jersey fabric, polyurethane (PU), rubber, thermoplastic polyurethane (TPU), Sandwich Mesh Fabric, neoprene, polyester, thermoplastic rubbers (TPR), webbing, or leather. In detail, the ring-shaped gusset component 300 has a plurality of sidewall parts 3100 and a plurality of flexible parts 3200, which are configured for connecting the sidewall parts 3100, to form the accommodating space 330.

[0018] Each flexible part 3200 extends along a direction from an edge which the ring-shaped gusset component 300 is connected to the back case component 100 to an edge which the ring-shaped gusset component 300 is connected to the front lid component 200, and an acute angle θ is formed between each flexible part 3200 and the back case component 100. In detail, in this embodiment, the flexible parts 3200 extend from corners of the ring-shaped gusset component 300, respectively, to the sidewall parts 3100 which are disposed on the top side and bottom side of the suitcase 10, respectively, to form the acute angles θ , but the disclosure is not limited thereto. For example, in some embodiments, the flexible parts 3200 are able to extend from the corners of the ring-shaped gusset component 300 to the sidewall parts 3100 which are disposed on the right side and left side of the suitcase 10, respectively.

[0019] In this embodiment, a width of each flexible part 3200 continuously decreases from the back case component 100 to the front lid component 200, but the disclosure is not limited thereto. For example, in some embodiments, the width of each flexible part 3200 is constant or gradually increases in a direction away from the back case component 100. The flexible deformation capability of each flexible part 3200 is greater than the flexible deformation capability of each sidewall part 3100, and the flexible parts 3200 are bendable, thus each two of the sidewall parts 3100, which are adjacent to each other, are able to be folded upward or downward on the back case component 100 by the bending of one of the flexible parts 3200 connected therebetween, thereby having a storage position and a use position.

[0020] In detail, in this embodiment, each of the sidewall parts 3100 is, for example, made of a PU 1682D fabric layer 3310, an EVA layer 3320 and a PP plate layer 3330 which are stacked on one another. Each of the flexible parts 3200 is, for example, made of a cane fabric layer 3340, a SBR layer 3350 and a 150D jersey fabric layer 3360 which are stacked on one another. Furthermore, the flexible deformation capabilities of the cane

cloth layer 3340, the SBR layer 3350 and the 150D jersey fabric layer 3360 are greater than the flexible deformation capabilities of PU 1682D fabric layer 3310, the EVA layer 3320 and the PP plate layer 3330, and the cane cloth layer 3340, the SBR layer 3350 and the 150D jersey fabric layer 3360 are bendable, thus when the flexible parts 3200 are bent, two sidewall parts 3100, which are adjacent to each other, are able to be folded upward or downward on the back case component 100. The cane cloth layer 840 is, for example, made of SBR. In this embodiment, a thickness of the SBR layer is 3 mm, a thickness of the EVA layer is 1.5 mm, and a thickness of the PP plate layer is 0.8, but the disclosure is not limited thereto.

[0021] In this embodiment, the ring-shaped gusset component 300 has a first opening 340. The front lid component 200 has a second opening 210. One of the sidewall parts 3100 includes a sidewall body 386 and a connecting body 387. The sidewall body 386 has an outer surface 386a and a depression 386b. The depression 386b is located on the outer surface 386a of the sidewall body 386. The connecting body 387 has two opposite edges, one of the edges is connected to an edge of the sidewall body 386 which forms the depression 386b, and the other edge is connected to an edge of the second opening 210 of the front lid component 200. That is to say, the connecting body 387 is connected between the front lid component 200 and the sidewall body 386. In some embodiments, the sidewall body 386 has hollows which are corresponding to the depression 386b.

[0022] The front lid component 200 is connected to the ring-shaped gusset component 300 by a zipper 400, so as to form the accommodating space 330. The zipper 400 includes two chains 410, two zipper heads 420 and two pull tabs 430. One of the chains 410 is disposed around an edge of the first opening 340 and the edge of the depression 386b. The other chain 410 is disposed around the edge of the second opening 210 and the edge of the connecting body 387. The two zipper heads 420 are configured for tying or separating the two chains 410 in order to close or open the suitcase 10, allowing the connecting body 387 to cover or uncover the sidewall body 386. The two pull tabs 430 are movably installed on the zipper heads 420, respectively, and disposed outside of the accommodating space 330. The disclosure is not limited to the quantity of the zipper heads 420. For example, in some embodiments, the quantity of the zipper head 420 is one. The zipper 400 is just one of the connection elements for connecting the front lid component 200 and the ring-shaped gusset component 300, and the aforementioned connection element is, for example, a Velcro or a button.

[0023] In this and some embodiments, the ring-shaped gusset component 300 further includes a fixing belt 3400. The fixing belt 3400 includes a first belt body 3410 and a second belt body 3420. The first belt body 3410 and the second belt body 3420 are disposed on any two opposite sidewall parts 3100, respectively. The first belt body 3410 is detachably connected to the second belt

body 3420. In this embodiment, the first belt body 3410 and the second belt body 3420 are disposed on left side sidewall part 3100 and right side sidewall part 3100, respectively, but the disclosure is not limited thereto. For example, in some embodiments, the first belt body 3410 and the second belt body 3420 are able to be disposed on the top side sidewall part 3100 and bottom side sidewall part 3100. Words of orientation, such as right, left, top, bottom, front, rear, etc., as used herein, are based on the position of the wheels. For example, a side where the wheels are disposed is defined as the bottom side.

[0024] In this and some embodiments, the front lid component 200 further includes a belt 395. The belt 395 includes a first belt body 396 and a second belt body 397. The first belt body 396 and the second belt body 397 are disposed on the front lid component 200. The first belt body 396 is detachably connected to the second belt body 397. In addition, the first belt body 396 and the second belt body 397 are disposed on the top side and the bottom side of front lid component 200, but the disclosure is not limited thereto. For example, in some embodiments, the first belt body 396 and the second belt body 397 are disposed on the left side and the right side of the front lid component 200.

[0025] In this and some embodiments, the suitcase 10 further includes two third reinforcement element 3510 disposed on two sidewall parts 3100 which are disposed on the right side and the left side of the suitcase 10, respectively. The disclosure is not limited to the quantity of the third reinforcement element 3510. For example, in some embodiments, the quantity of the third reinforcement element 3510 is three, and the three third reinforcement elements 3510 are disposed on three of the sidewall parts 3100, respectively.

[0026] In this and some embodiments, the suitcase 10 further includes a handle 3610 and a fourth reinforcement element 3620. The handle 3610 and the fourth reinforcement element 3620 are disposed on the same sidewall part 3100. The handle 3610 is disposed on the outer surface of the sidewall part 3100. An orthogonal projection of the fourth reinforcement element 3620 on the sidewall part 3100 at least partially overlaps an orthogonal projection of the handle 3610 on the sidewall part 3100, thereby improving structural strength of the sidewall part 3100.

[0027] In this embodiment, the third reinforcement element 3510 and the fourth reinforcement element 3620 are, for example, honeycomb boards. Each of the honeycomb boards has a thickness of, for example, 6mm.

[0028] In addition, in this and some embodiments, the honeycomb board is able to be disposed on the bottom side sidewall part 3100 for improving the bearing capacity of the suitcase 10.

[0029] The storage process of the suitcase 10 of this embodiment is illustrated hereinafter. Please refer to FIG. 2 and FIG. 5 to FIG. 8, which are schematic views of the storage process of FIG. 2.

[0030] First, as shown in FIG. 2, the ring-shaped gus-

set component 300 is opened relative to the back case component 100 and therefore to be at the use position, allowing users to store goods in the accommodating space 330. Then, the action of folding the ring-shaped case frame 300 starts. As shown in FIG. 5, the two opposite sidewall parts 3100 are pressed or folded downward to form fold lines 311 on the flexible parts 3200 which are connected between the adjacent sidewall parts 3100, respectively.

[0031] Then, as shown in FIG. 6, the rest two opposite sidewall parts 3100 are pressed or folded downward, and thus all the sidewall parts 3100 are able to be closed relative to the back case component 100 to be at the storage position. More specifically, when the flexible parts 3200 are bent, any two of the adjacent sidewall parts 3100 connected to each flexible part 3200 will be closed relative to the back case component 100 according to the flexible deformation capability of the flexible part 3200, and each sidewall part 3100 will be bent to form bending lines 312. Then, the first belt body 3410 is fixed to the second belt body 3420 for fixing the sidewall parts 3100 to be at the storage position.

[0032] Then, as shown in FIG. 7, the back case component 100 and the stored ring-shaped gusset component 300 are stacked on the front lid component 200. Lastly, as shown in FIG. 8, the first belt body 396 and the second belt body 397 are buckled up to tie the back case component 100 and the front lid component 200 together. Moreover, by comparing FIG. 8 to FIG. 1, it is obvious that the size of the suitcase 10 at the storage position is significantly smaller than the size of the suitcase 10 at the use position.

[0033] Please refer to FIG. 9 to FIG. 12. FIG. 9 is a perspective view of a suitcase according to an embodiment outside the scope of the claimed invention but herein disclosed, FIG. 10 is a perspective view of the suitcase of FIG. 9 being opened, and FIG. 11 is an enlarged view of a zipper of FIG. 10.

[0034] In this embodiment, a suitcase 10 includes a back case component 100, a front lid component 200 and a ring-shaped gusset component 300. The back case component 100 and the front lid component 200 are made of relatively harder materials for providing better protection. For example, the back case component 100 and the front lid component 200 are made of plastic plates such as PE, PP, EVA, PVC or ABS resin, or made of fabrics.

[0035] Two opposite sides of the ring-shaped gusset component 300 are connected to an edge of the back case component 100 and an edge of the front lid component 200, respectively, to form an accommodating space 330. In this embodiment, the ring-shaped gusset component 300 is made of composite materials including, for example, PE, PVC, PP, EVA or ABS and relatively softer materials such as PU, rubber, TPU, Sandwich Mesh Fabric, neoprene, polyester, TPR, webbing, or leather. In detail, the ring-shaped gusset component 300 has a plurality of first supporting parts 380 and a plurality

of second supporting parts 385 which are connected to the first supporting parts 380. The first supporting parts 380 are disposed on corner of the back case component 100, respectively, and the second supporting parts 385 are disposed on edges of the back case component 100, respectively.

[0036] The materials inside the first supporting parts 380 and the second supporting parts 385 are, for example, made of iron wire frame, wood plate, plastic plate, iron plate, aluminum plate or magnesium alloy plate.

[0037] The ring-shaped gusset component 300 includes a plurality of bending parts 390. Each bending part 390 is disposed between the first supporting part 380 and the second supporting part 385 which are adjacent to each other and extends from the back case component 100 to the front lid component 200. In other word, two opposite sides of each bending part 390 are connected to first supporting part 380 and the second supporting part 385, respectively. In addition, the flexible deformation capability of each bending part 390 is greater than the flexible deformation capability of each first supporting part 380 and the flexible deformation capability of each second supporting part 385, and the bending parts 390 are bendable, allowing the first supporting parts 380 and the second supporting parts 385 to be closed relative to the back case component 100 to be at a storage position and to be opened relative to the back case component 100 to be at a use position.

[0038] In detail, in this embodiment, each of the first supporting parts 380 is, for example, made of a PVC layer 810, an EVA layer 820, a PP plate layer 830, a sugar cane cloth layer 840, a neoprene layer 850 and a PVC bottom layer 860 which are stacked on one another. Each of the second supporting parts 385 is, for example, made of a PVC layer 810, a EVA layer 820 and a PP plate layer 830 which are stacked on one another. In addition, each bending part 390 is disposed between one of the first supporting parts 380 and one of the second supporting part 385 which are adjacent to each other. Each bending part 390 is, for example, made of a sugar cane cloth layer 840, a neoprene layer 850 and a PVC bottom layer 860. Since the flexible deformation capabilities of the sugar cane cloth layer 840, the neoprene layer 850 and the PVC bottom layer 860 are greater than the flexible deformation capabilities of the PVC layer 810 and the PP plate layer 830, and the sugar cane cloth layer 840, the neoprene layer 850 and the PVC bottom layer 860 are bendable, the first supporting parts 380 and the second supporting parts 385 are able to be folded upward or downward on the back case component 100, thereby having a storage position and a use position. The aforementioned sugar cane cloth layer 840 is made of, for example, SBR. In this and some embodiments, the aforementioned PVC bottom layer 860 is attached with a PVC film. In addition, in this embodiment, the PP plate layer 830 is disposed within the first supporting parts 380 and the second supporting parts 385 by sewing, but the disclosure is not limited thereto. In some embodiments, the

PP plate layer 830 is detachably disposed in the first supporting parts 385 and the second supporting parts 390.

[0039] In this embodiment, the ring-shaped gusset component 300 has a first opening 340, and the front lid component 200 has a second opening 210. One of the second supporting parts 385 includes a sidewall body 386 and a connecting body 387. The sidewall body 386 has an outer surface 386a and a depression 386b. The depression 386b is located on the outer surface 386a of the sidewall body 386. The connecting body 387 has two opposite later edges, one of the edges of the connecting body 387 is connected to an edge of the sidewall body 386 which forms the depression 386b. The other edge of the connecting body 387 is connected to an edge of the second opening 210 of the front lid component 200. That is to say, the connecting body 387 is connected between the front lid component 200 and the sidewall body 386.

[0040] In addition, the front lid component 200 is connected to the ring-shaped gusset component 300 by a zipper 400, so as to form the accommodating space 330. The zipper 400 includes two chains 410, two zipper heads 420 and two pull tabs 430. One of the chains 410 is configured for surrounding the edge of the first opening 340 and the edge of the depression 386b. The other chain 410 is configured for surrounding the edge of the second opening 210 and the edge of the connecting body 387. The two zipper heads 420 are configured for tying the two chains 410 to close the suitcase 10 or separating the two chains 410 to open the suitcase 10, allowing the connecting body 387 to cover or away from the sidewall body 386. The two pull tabs 430 are movably installed on the zipper heads 420, respectively, and disposed outside of the accommodating space 330. The disclosure is not limited to the quantity of the zipper head 420. In some embodiments, the quantity of the zipper head 420 is one. The zipper 400 is just one of the connection elements for connecting the front lid component 200 and the ring-shaped gusset component 300, but the disclosure is not limited thereto. In some embodiments, the aforementioned connection element is, for example, a Velcro or a button.

[0041] In this and some embodiments, the ring-shaped gusset component 300 further includes a belt 395. The belt 395 includes a first belt body 396 and a second belt body 397. The first belt body 396 and the second belt body 397 are detachably disposed on the outer surface of the ring-shaped gusset component 300, but the disclosure is not limited thereto. In some embodiments, the first belt body 396 and the second belt body 397 are disposed on an inner surface of the ring-shaped gusset component 300. In yet another embodiment, the first belt body 396 is directly connected to the outer surface of the ring-shaped gusset component 300, that is, the first belt body 396 and the ring-shaped gusset component 300 are not detachable. When the first belt body 396 is connected to the second belt body 397, each first supporting part 380 and each second supporting part 385 are able to be fixed

at the storage position. In addition, in this embodiment, the first belt body 396 and the second belt body 397 are disposed on the top side and the bottom side of the ring-shaped gusset component 300, respectively, but the disclosure is not limited thereto. In some embodiments, the first belt body 396 and the second belt body 397 are disposed on the right side and the left side of the ring-shaped gusset component 300, respectively.

[0042] In addition, in this and some embodiments, the suitcase 10 further includes a gripping part 930. The gripping part 930 is connected to the second extending part 230. The user is able to grip the gripping part 930 for holding the position of the second extending part 230, and to pull the zipper head 420 by the other hand. However, in some embodiments, the gripping part 930 is connected to the first extending part 398, but the disclosure is not limited thereto.

[0043] The storage process of the suitcase 10 of this embodiment is illustrated hereinafter. Please refer to FIG. 10 and FIG. 12 to FIG. 15. FIG. 12 to FIG. 15 are schematic views of the storage process of FIG. 10.

[0044] First, as shown in FIG. 10, First, as shown in FIG. 2, the ring-shaped gusset component 300 is opened relative to the back case component 100 and therefore to be at the use position, allowing the user to store goods in the accommodating space 330. Then, the action of folding the ring-shaped case frame 300 starts. As shown in FIG. 12, the two opposite second supporting parts 385 are pressed or folded downward to form fold lines 311 on the bending parts 390.

[0045] Then, as shown in FIG. 13, the rest two opposite second supporting parts 385 are pressed or folded downward, and thus the first supporting parts 380 and the second supporting parts 385 are able to be stacked on the back case component 100 to be at the storage position. Then, as shown in FIG. 14, the front lid component 200 is stacked on the back case component 100 and the stored ring-shaped gusset component 300. Lastly, as shown in FIG. 15, the first belt body 396 and the second belt body 397 are buckled up to tie the back case component 100 and the front lid component 200 together. Moreover, by comparing FIG. 15 to FIG. 9, it is obvious that the size of the suitcase 10 at the storage position is significantly smaller than the size of the suitcase 10 at the use position.

[0046] When storing or folding the suitcase 10, as shown in FIG. 12, the connecting body 387 is bent relative to and away from the outer surface of the sidewall body 386, and a distance between the front lid component 200 and the second supporting part 385 is increased, so as to ensure that the front lid component 200 does not disturb the user to store or fold the suitcase 10.

[0047] Hence, the pull tab 430 is able to be disposed outside of the accommodating space 330. The user is able to open the front lid component 200 by pulling the pull tab 430 from outside of the suitcase 10.

[0048] The aforementioned depression 386b does not penetrate the second supporting parts 385, but the dis-

closure is not limited thereto. In some embodiments, the depression 386b penetrates the second supporting parts 385. Please refer to FIG. 16, which is a perspective view of a front lid component of a suitcase being opened according to a third embodiment of the disclosure, and the parts as shown in FIG. 9 which are the same as the third embodiment will not be further described.

[0049] In this embodiment, the ring-shaped gusset component 300 has a first opening 340. The front lid component 200 has a second opening 210. One of the second supporting parts 385 includes a sidewall body 386 and a connecting body 387. The sidewall body 386 has a depression 386b. The depression 386b is located on an edge of the first opening 340. The connecting body 387 has two opposite edges, one of the edges is connected to an edge of the sidewall body 386 which forms the depression 386b, and the other edge is connected to an edge of the second opening 210 of the front lid component 200. The zipper 400 includes two chains 410, two zipper heads 420 and two pull tabs 430. One of the chains 410 is disposed around an edge of the first opening 340 and the edge of the depression 386b. The other chain 410 is disposed around an edge of the second opening 210 and the edge of the connecting body 387. The two zipper heads 420 are configured for tying or separating the two chains 410. When the zipper head 420 ties the chains 410, the connecting body 387 and the sidewall body 386 together construct one of the second supporting parts 385.

[0050] Please refer to FIG. 17 to FIG. 20. FIG. 17 is a perspective view of a suitcase according to a fourth embodiment of the disclosure, FIG. 18 is a perspective view of the suitcase of FIG. 17 being opened, FIG. 19A is an enlarged view of FIG. 18, FIG. 19B is a cross-sectional view of FIG. 19A, FIG. 19C is a perspective view of the suitcase of FIG. 19A being bent, and FIG. 20 is an enlarged view of a zipper of FIG. 18.

[0051] In this embodiment, a suitcase 10 includes a back case component 100, a front lid component 200 and a ring-shaped gusset component 300. The back case component 100 and the front lid component 200 are made of relatively harder materials for providing better protection. For example, the back case component 100 and the front lid component 200 are made of plastic plates such as PE, PP, EVA, PVC or ABS resin, or made of fabrics.

[0052] Two opposite sides of the ring-shaped gusset component 300 are connected to an edge of the back case component 100 and an edge of the front lid component 200, respectively, to form an accommodating space 330. In this embodiment, the ring-shaped gusset component 300 is made of composite materials including, for example, PE, PVC, PP, EVA or ABS and relatively softer materials such as PU, rubbers, TPU, Sandwich Mesh Fabric, neoprene, polyester, TPR, webbing, or leather. In detail, the ring-shaped gusset component 300 has a plurality of first supporting parts 380 and a plurality of second supporting parts 385 which are connected to

the first supporting parts 380. The first supporting parts 380 are disposed on corners of the back case component 100, respectively, and the second supporting parts 385 are disposed on lateral sides of the back case component 100, respectively. The material inside the first supporting parts 380 and the second supporting parts 385 are, for example, made of iron wire frame, wood plate, plastic plate, iron plate, aluminum plate or magnesium alloy plate.

[0053] The ring-shaped gusset component 300 includes a plurality of bending parts 390. Each bending part 390 is disposed between the first supporting part 380 and the second supporting part 385 which are adjacent to each other and extends from the back case component 100 to the front lid component 200. In other word, two opposite sides of each bending part 390 are connected to first supporting part 380 and the second supporting part 385, respectively. In addition, the flexible deformation capability of each bending part 390 is greater than the flexible deformation capability of each first supporting part 380 and the flexible deformation capability of each second supporting part 385, and the bending parts 390 are bendable, allowing the first supporting parts 380 and the second supporting parts 385 to be closed relative to the back case component 100 to be at a storage position and to be opened relative to the back case component 100 to be at a use position.

[0054] In detail, in this embodiment, each of the first supporting parts 380 is, for example, made of a PVC layer 810, an EVA layer 820, a PP plate layer 830, a sugar cane cloth layer 840, a neoprene layer 850 and a PVC bottom layer 860 which are stacked on one another. Each of the second supporting parts 385 is, for example, made of a PVC layer 810, a EVA layer 820 and a PP plate layer 830 which are stacked on one another. In addition, each bending part 390 is disposed between one of the first supporting parts 380 and one of the second supporting part 385 which are adjacent to each other. Each bending part 390 is, for example, made of a sugar cane cloth layer 840, a neoprene layer 850 and a PVC bottom layer 860. Since the flexible deformation capabilities of the sugar cane cloth layer 840, the neoprene layer 850 and the PVC bottom layer 860 are greater than the flexible deformation capabilities of the PVC layer 810 and the PP plate layer 830, and the sugar cane cloth layer 840, the neoprene layer 850 and the PVC bottom layer 860 are bendable, the first supporting parts 380 and the second supporting parts 385 are able to be folded upward or downward on the back case component 100, thereby having a storage position and a use position. The aforementioned sugar cane cloth layer 840 is made of, for example, SBR. In this and some embodiments, the aforementioned PVC bottom layer 860 is attached with a PVC film. In addition, in this embodiment, the PP plate layer 830 is disposed within the first supporting parts 380 and the second supporting parts 385 by sewing, but the disclosure is not limited thereto. In some embodiments, the PP plate layer 830 is detachably disposed in the first sup-

porting parts 385 and the second supporting parts 390.

[0055] In this embodiment, the ring-shaped gusset component 300 has a first opening 340, and the front lid component 200 has a second opening 210. The ring-shaped gusset component 300 further includes a first extending part 398, the first extending part 398 is connected to an edge of the ring-shaped gusset component 300 which forms the first opening 340. The front lid component 200 further includes a second extending part 230, the second extending part 230 is connected to an edge of the front lid component 200 which forms the second opening 210. The front lid component 200 is connected to the ring-shaped gusset component 300 by a zipper 400, so as to form the accommodating space 330. The zipper 400 includes two chains 410 and two zipper heads 420. One of the chains 410 is disposed around an edge of the first opening 340 and an edge of the first extending part 398. The other chain 410 is disposed around an edge of the second opening 210 and an edge of the second extending part 230. The two zipper heads 420 are configured for tying or separating the two chains 410 in order to close or open the suitcase 10. The zipper head 420 has one single pull tab or a pair of pull tabs, the disclosure is not limited thereto. In this embodiment, the zipper head 420 has a pair of pull tabs, the user is able to tie or separate the chains 410 by pulling any one of the pull tabs. The zipper 400 is just one of the connection elements for connecting the front lid component 200 and the ring-shaped gusset component 300, and the aforementioned connection element is, for example, a Velcro or a button.

[0056] In this and some embodiments, the ring-shaped gusset component 300 further includes a belt 395. The belt 395 includes a first belt body 396 and a second belt body 397. The first belt body 396 and the second belt body 397 are detachably disposed on the outer surface of the ring-shaped gusset component 300, but the disclosure is not limited thereto. In some embodiments, the first belt body 396 and the second belt body 397 are disposed on an inner surface of the ring-shaped gusset component 300. In yet another embodiment, the first belt body 396 is directly connected to the outer surface of the ring-shaped gusset component 300, that is, the first belt body 396 and the ring-shaped gusset component 300 are not detachable. When the first belt body 396 is connected to the second belt body 397, each first supporting part 380 and each second supporting part 385 are able to be fixed at the storage position. In addition, in this embodiment, the first belt body 396 and the second belt body 397 are disposed on the top side and the bottom side of the ring-shaped gusset component 300, respectively, but the disclosure is not limited thereto. In some embodiments, the first belt body 396 and the second belt body 397 are disposed on the right side and the left side of the ring-shaped gusset component 300, respectively.

[0057] In addition, in this and some embodiments, the suitcase 10 further includes a gripping part 930. The gripping part 930 is connected to the second extending part 230. The user is able to grip the gripping part 930 for

holding the position of the second extending part 230, and to pull the zipper head 420 by the other hand. However, in some embodiments, the gripping part 930 is connected to the first extending part 398, but the disclosure is not limited thereto.

[0058] The storage process of the suitcase 10 of this embodiment is illustrated hereinafter. Please refer to FIG. 18 and FIG. 21 to FIG. 24. FIG. 21 to FIG. 24 are schematic views of the storage process of FIG. 18.

[0059] First, as shown in FIG. 18, the ring-shaped gusset component 300 is opened relative to the back case component 100 and therefore to be at the use position, allowing the user to store the goods in the accommodating space 330. Then, the action of folding the ring-shaped gusset component 300 starts. As shown in FIG. 21, two of the second supporting parts 385 that are pressed or folded downward to form the fold lines 311.

[0060] Then, as shown in FIG. 22, the rest two opposite second supporting parts 385 are pressed or folded downward, and thus each first supporting part 380 and each second supporting part 385 are stacked on the back case component 100 to be at the storage position. Then, as shown in FIG. 23, the front lid component 200 is stacked on the back case component 100 and the stored ring-shaped gusset component 300. Lastly, as shown in FIG. 24, the first belt body 396 and the second belt body 397 are buckled up to tie the back case component 100 and the front lid component 200 together. Moreover, by comparing FIG. 24 to FIG. 17, it is obvious that the size of the suitcase 10 at the storage position is significantly smaller than the size of the suitcase 10 at the use position.

[0061] In some embodiments, the suitcase 10 is able to have different bending parts. Please refer to FIG. 25 to FIG. 28. FIG. 26 is a perspective view of a suitcase of FIG. 25 being opened. FIG. 27A is a partial enlarged view of FIG. 26. FIG. 27B is a perspective view of FIG. 27A being bent. FIG. 28 is an enlarged view of the zipper of FIG. 26.

[0062] In this embodiment, the suitcase 10 includes a back case component 100, a front lid component 200 and a ring-shaped gusset component 300. The back case component 100 and the front lid component 200 are made of relatively harder materials for providing better protection. For example, the back case component 100 and the front lid component 200 are made of plastic plates such as polyethylene (PE), polypropylene (PP), EVA, PVC or ABS resin, or made of fabrics.

[0063] Two opposite sides of the ring-shaped gusset component 300 are connected to an edge of the back case component 100 and an edge of the front lid component 200, respectively, to form an accommodating space 330. In this embodiment, the ring-shaped gusset component 300 is made of composite materials, for example, the combination of plastic plates such as PE, PP, EVA or ABS and relatively softer materials such as PU, rubber, TPU, TPR. The ring-shaped gusset component 300 includes a plurality of bending sections 310 and a plurality of sidewall sections 320. The bending sections

310 are disposed on corners of the back case component 100, respectively. The sidewall sections 320 are disposed on edges of the back case component 100, respectively. Since the bending sections 310 are made of relatively softer materials such as PU, rubber, TPU or TPR while the inside of the sidewall sections 320 are made of relatively harder materials, for example, the plastic plate such as PE, PP or ABS, or made of wood plate, iron frame, paper plate, aluminum plate, iron wire frame, iron plate or magnesium alloy plate, and thus the flexible deformation capability of each bending section 310 is greater than the flexible deformation capability of each sidewall section 320. In addition, the bending sections 310 are bendable, thus when the sidewall sections 320 are able to be folded upward or downward on the back case component 100, thereby having a storage position and a use position.

[0064] Specifically, since the bending sections 310 has great flexible deformation capability and is bendable, the user is able to bend the bending sections 310 to change the form of the ring-shaped gusset component 300 for storing the suitcase 10. Since the flexible deformation capability of the sidewall section 320 is less than the flexible deformation capability of the bending section 310, namely the rigidity of the sidewall section 320 is greater than the rigidity of the bending section 310, thus the sidewall sections 320 are able to provide protection and support to the suitcase 10. In addition, for the purpose of opening or closing the sidewall sections 320 relative to the back case component 100 easier, a crease or a material with great flexible deformation capability is disposed between each sidewall section 320 and the back case component 100, allowing each sidewall sections 320 to be folded relative to the back case component 100.

[0065] In addition, as shown in FIG. 27B, the bending sections 310 has at least one fold line 311. The fold line 311 is, for example, handmade or produced by mechanical process such as imprinting in order to facilitate the user to store or use the suitcase 10.

[0066] In this and some embodiments, each bending section 310 and the adjacent sidewall section 320 has a convergence line 360 therebetween. The convergence line 360 is, for example, a curve as shown in FIG. 27A or an arc. In some embodiments, the convergence line 360 is a straight line, thus the two adjacent convergence lines 360 are able to be parallel to each other or not parallel to each other.

[0067] Moreover, in this embodiment, the ring-shaped gusset component 300 has a first opening 340, and the front lid component has a second opening 210. The front lid component 200 is connected to the ring-shaped gusset component 300 by a zipper 400, so as to form the accommodating space 330. The zipper 400 includes two chains 410 and two zipper heads 420. The two chains 410 are disposed around an edge of the first opening 340 and an edge of the second opening 210. The two zipper heads 420 are configured for tying or separating the two chains 410 in order to close or open the suitcase 10. The

zipper 400 is just one of the connection elements for connecting the front lid component 200 and the ring-shaped gusset component 300, and the aforementioned connection element is, for example, a Velcro or a button.

[0068] Besides, in some embodiments, the sidewall body 386 and the connecting body 387 as shown in FIG. 1 are able to be applied to the aforementioned sidewall sections 320.

[0069] The two chains 410 are connected to each other to form a connection section 411. The connection section 411 is disposed between the front lid component 200 and the ring-shaped gusset component 300. In addition, the connection section 411 has a length which allows the front lid component 200 and the ring-shaped gusset component 300 to be maintained at a specific distance when the front lid component 200 and the ring-shaped gusset component 300 are separated from each other. In this embodiment, the length of the connection section 411, namely the distance of the front lid component 200 and the ring-shaped gusset component 300 is, for example, bigger than a width of the ring-shaped gusset component 300. Therefore, the length of the connection section 411 is long enough for users to bend the bending sections 310 for closing all the sidewall sections 320 relative to the back case component 100.

[0070] In this embodiment, the suitcase 10 further includes a plurality of first wheels 600 and a plurality of second wheels 610. The first wheels 600 are disposed on the back case component 100, and the second wheels 610 are disposed on the front lid component 200. However, the positions and quantities of the wheels 600 and 610 are not intended to limit the disclosure.

[0071] In this and some embodiments, the suitcase 10 further includes at least one handle 350. The handle 350 is disposed on the ring-shaped gusset component 300. In addition, in some embodiments, the suitcase 10 are equipped with two handles 350 disposed on two of the sidewall sections 320, respectively, for users to carry the suitcase 10 in different orientations.

[0072] In this and some embodiments, the suitcase 10 further includes a telescoping handle 700. The telescoping handle 700 is disposed on the back case component 100 for transporting the suitcase 10.

[0073] In this and some other embodiments, the back case component 100 includes a belt 110. The belt 110 includes a first belt body 111 and a second belt body 112 which are able to be separated from each other and connected to each other. When the first belt body 111 and the second belt body 112 are connected to each other, the first belt body 111 and the second belt body 112 are able to surround the back case component 100 and the stored ring-shaped gusset component 300, allowing the back case component 100 and ring-shaped gusset component 300 to close to the front lid component 200. However, the belt 110 is not only be used to tight the stored back case component 100 and the ring-shaped gusset component 300, but also be used to constrain goods stored inside the back case component 100 and the ring-

shaped gusset component 300. In this and some embodiments, the front lid component 200 includes a belt 220. The belt 220 includes a first belt body 221 and a second belt body 222. The first belt body 221 and the second belt body 222 are disposed on two sides of the front lid component 200 that are opposite to each other, respectively. The first belt body 221 and the second belt body 222 are connected to each other for constraining the goods stored inside the front lid component 200.

[0074] In this and some embodiments, the ring-shaped gusset component 300 further includes two retaining rings 370. The two retaining rings 370 are disposed on two opposite sides of the first opening 340. The first belt body 111 and the second belt body 112 of the belt 110 of the back case component 100 are configured for passing through the two retaining rings 370 and being connected to each other.

[0075] Please refer to FIG. 29, which is a perspective view of a suitcase being opened according to a sixth embodiment of the disclosure. In this embodiment, the suitcase 10 further includes at least one honeycomb board 500. The honeycomb board 500 is fixed to the ring-shaped gusset component 300, and is configured for supporting the ring-shaped gusset component 300. Thereby, the structural strength of the suitcase structure 10 can be enhanced. However, in other embodiments, the honeycomb board 500 may be replaced by other components having stronger structural strength than the ring-shaped gusset component 300, such as an iron wire frame, a wood plate, a plastic plate, an iron plate, an aluminum plate, rubber, or a magnesium alloy plate.

[0076] The storage process of the suitcase 10 of this embodiment is illustrated hereinafter. Please refer to FIG. 25 and FIG. 30 to FIG. 33, which are schematic views of the storage process of FIG. 25.

[0077] First, as shown in FIG. 26, the ring-shaped gusset component 300 is opened relative to the back case component 100 and therefore to be at the use position, allowing the user to store the goods in the accommodating space 330. Then, the action of folding the ring-shaped gusset component 300 starts. As shown in FIG. 14, the opposite sidewall sections 320 are pressed or folded downward to form the fold lines 311. Since the four bending sections 310, which are connected to the two opposite sidewall sections 320, are bendable, thus the two opposite sidewall sections 320 are able to be closed relative to the back case component 100.

[0078] Then, as shown in FIG. 31, the rest two opposite sidewall sections 320 are pressed or folded downward, that is, all of the sidewall sections 320 are stacked on the back case component 100 to be at the storage position. The first belt body 111 and the second belt body 112 of the belt 110 are buckled up. As shown in FIG. 32, the back case component 100 and the stored ring-shaped gusset component 300 are stacked on the front lid component 200. Lastly, as shown in FIG. 33, the first belt body 221 and the second belt body 222 of the belt 220 are buckled up to tie the back case component 100 and

the front lid component 200 together. Moreover, by comparing FIG. 33 to FIG. 25, it is obvious that the size of the suitcase 10 at the storage position is significantly smaller than the size of the suitcase 10 at the use position.

[0079] Please refer to FIG. 34, which is a perspective view of a suitcase according to an embodiment outside the scope of the claimed invention but herein disclosed.

[0080] In this embodiment, a suitcase 10 includes a back case component 100, a front lid component 200 and a ring-shaped gusset component 300. The back case component 100 and the front lid component 200 are made of relatively harder materials for providing better protection. For example, the back case component 100 and the front lid component 200 are made of plastic plates such as polyethylene (PE), polypropylene (PP), EVA, PVC or ABS resin, or made of fabrics.

[0081] Two opposite sides of the ring-shaped gusset component 300 are connected to the an edge of the back case component 100 and an edge of the front lid component 200, respectively, to form an accommodating space 330. The ring-shaped gusset component 300 has a plurality of first accommodating parts 301, a plurality of second accommodating parts 302, a plurality of first reinforcement elements 910 and a plurality of second reinforcement elements 920. The first accommodating parts 301 are disposed on edges of the back case component 100, respectively. The second accommodating parts 302 are disposed on corners of the back case component 100, respectively. Each first accommodating part 301 and each second accommodating part 302 are spaced apart. The first reinforcement elements 910 are detachably disposed in the first accommodating parts 301, respectively. The second reinforcement elements 920 are detachably disposed in the second accommodating parts 302, respectively, allowing the first accommodating parts 301 and the second accommodating parts 302 together form a plurality of bending parts 303 therebetween. In this embodiment, the first reinforcement elements 910 and the second reinforcement elements 920 are plates which are harder than first accommodating parts 301 and the second accommodating parts 302, but the disclosure is not limited thereto. In some embodiments, the first reinforcement elements 910 and the second reinforcement elements 920 are made of iron wire frame, wood plate, plastic plate, iron plate, aluminum plate, paper plate or magnesium alloy plate. In this embodiment, the ring-shaped gusset component 300 has first accommodating parts 301 and second accommodating parts 302, but the disclosure is not limited thereto. In some embodiments, the ring-shaped gusset component 300 only has the first accommodating parts 301, the first reinforcement elements 910 are detachably disposed in the first accommodating parts 301, and thus a plurality of bending part 303 is formed between the adjacent first accommodating parts 301.

[0082] Since the first reinforcement elements 910 are disposed in the first accommodating parts 301, respectively, and the second reinforcement elements 920 are

disposed in the second accommodating parts 302, respectively, thereby increasing hardness of the first accommodating parts 301 and the second accommodating parts 302 and improving the protection of the suitcase 10. Moreover, since the bending parts 303 have no reinforcement elements, the flexible deformation capability of each bending part 303 is greater the flexible deformation capability of each first accommodating part 301 and the flexible deformation capability of each second accommodating part 302. The bending parts 303 are bendable, allowing the second accommodating parts 302 are able to be folded upward or downward on the back case component 100.

[0083] Besides, in some embodiments, the sidewall body 386 and the connecting body 387 as shown in FIG. 1 are able to be applied to the aforementioned first accommodating parts 301.

[0084] According to the suitcase as discussed above, since the ring-shaped gusset component is consisted of the plurality of bending parts and the plurality of supporting parts which have different flexible deformation capabilities, and the bending parts are bendable, thus the user is able to fold the supporting parts downward and stack the supporting parts on the back case component. By doing this, the size of the suitcase after being folded is much smaller than the size of the suitcase before being folded, allowing the user to store the suitcase conveniently.

[0085] Since the ring-shaped gusset component is consisted of the plurality of bending sections and the plurality of sidewall sections which have different flexible deformation capabilities, and the bending sections are bendable, thus the user is able to fold the sidewall sections downward and close the sidewall sections relative to the back case component. By doing this, the size of the suitcase after being folded is much smaller than the size of the suitcase before being folded, allowing the user to store the suitcase conveniently.

[0086] Besides, since the structural strength of the honeycomb board is stronger than that of the ring-shaped gusset component, thereby improving the overall structural strength of the suitcase.

[0087] In addition, the zipper has the connection section, thus the front lid component and the ring-shaped gusset component are able to be maintained at a specific distance when the front lid component and the ring-shaped gusset component are separated from each other so as to ensure that the front lid component does not disturb users to fold the ring-shaped gusset component.

[0088] Moreover, since the connecting body of the ring-shaped gusset component is disposed on or penetrating the depression located on the outer surface of the sidewall body, thus the user is able to pull the pull tab from outside of the suitcase for tying or separating the chains.

[0089] Furthermore, as the suitcase disclosed above, since the acute angle is formed between each flexible part and the back case component, the flexible deformation capabilities of the flexible parts are greater than the

flexible deformation capabilities of all the sidewall part, and the flexible parts are bendable, thus the two sidewall parts, which are adjacent to each other, are able to be closed relative to the back case component by the bending of the flexible part which is connected therebetween, so that the size of the suitcase after being folded is significantly smaller than the size of the suitcase before being folded, allowing the user to store the suitcase conveniently.

Claims

1. A suitcase (10), comprising:

a back case component (100);
a front lid component (200); and
a ring-shaped gusset component (300), two opposite sides of the ring-shaped gusset component (300) connected to an edge of the back case component (100) and an edge of the front lid component (200), respectively, to form an accommodating space (330), the ring-shaped gusset component (300) comprising a plurality of bending sections (310) and a plurality of sidewall sections which are configured for connecting the plurality of bending sections (310), the plurality of bending sections (310) disposed on corners of the back case component (100), respectively, the plurality of sidewall sections disposed on edges of the back case component (100), respectively,
wherein the flexible deformation capability of each of the plurality of bending sections (310) is greater than the flexible deformation capability of each of the plurality of sidewall sections, and the plurality of bending sections (310) are bendable, allowing the plurality of sidewall sections to be folded upward or downward on the back case component (100), wherein

- the front lid component (200) and the ring-shaped gusset component (300) are connected to each other by a connection element (400), so as to form the accommodating space (330), wherein the connection element (400) is a zipper (400), and
- the ring-shaped gusset component (300) has a first opening (340), the front lid component (200) has a second opening (210), the zipper (400) comprises two chains (410) and a zipper head (420), the two chains (410) are disposed on an edge of the first opening (340) and an edge of the second opening (210), respectively, the two chains (410) are connected to each other to form a connection section (411), wherein the connection section (411) is disposed be-

- tween the front lid component (200) and the ring-shaped gusset component (300), the connection section (411) has a length which allows the front lid component (200) and the ring-shaped gusset component (300) to be maintained at a specific distance when the front lid component (200) and the ring-shaped gusset component (300) are separated from each other, and the zipper head (420) is configured for tying the two chains (410) or separating the two chains (410).
2. The suitcase (10) according to claim 1, wherein each of the plurality of bending sections (310) has at least one fold line (311).
 3. A suitcase (10), comprising:
 - a back case component (100);
 - a front lid component (200); and
 - a ring-shaped gusset component (300), two opposite sides of the ring-shaped gusset component (300) connected to the back case component (100) and the front lid component (200), respectively, to form an accommodating space (330) capable of being closed, the ring-shaped gusset component (300) comprising a plurality of sidewall parts (3100) and a plurality of flexible parts that are configured for connecting the plurality of sidewall parts (3100), the flexible deformation capability of each of the plurality of flexible parts is greater than the flexible deformation capability of each of the plurality of sidewall parts (3100), an acute angle formed between one of the plurality of flexible parts and the ring-shaped gusset component (300), two of the plurality of sidewall parts (3100) that are adjacent to each other are able to be folded upward or downward on the back case component (100) by the bending of one of the plurality of flexible parts which is connected therebetween, wherein
 - the front lid component (200) and the ring-shaped gusset component (300) are connected to each other by a connection element (400), so as to form the accommodating space (330),
 - the connection element (400) is a zipper (400), and
 - the ring-shaped gusset component (300) has a first opening (340), the front lid component (200) has a second opening (210), one of the sidewall parts (3100) comprises a sidewall body (386), and there is a connecting body (387) sticks out from the front lid component (200), the sidewall body (386) has a depression (386b), the depression (386b) is located on an outer surface of the sidewall body (386), the connecting body (387) has two opposite edges, one of the edges is connected to an edge of the sidewall body (386) which forms the depression (386b), the other edge of the connecting body (387) is connected to an edge of the second opening (210) of the front lid component (200), the zipper (400) comprises two chains (410) and a zipper head (420), one of the chains (410) is disposed on an edge of the first opening (340) and the edge of the depression (386b), the other chain is disposed on the edge of the second opening (210) and an edge of the connecting body (387) connected to the sidewall body (386), the zipper head (420) is configured for tying or separating the two chains (410); when the zipper head (420) ties the two chains (410), the connecting body (387) covers the outer surface of the sidewall body (386); and when the zipper head (420) separates the two chains (410), the connecting body (387) allows the front lid component (200) and the ring-shaped gusset component (300) to be spaced apart and maintained at a specific distance.
 4. The suitcase (10) according to claim 3, wherein each of the plurality of flexible parts extends from an edge where the ring-shaped gusset component (300) is connected to the back case component (100) to an edge where the ring-shaped gusset component (300) is connected to the front lid component (200), and the flexible deformation capability of each of the plurality of the flexible parts is greater than the flexible deformation capability of each of the plurality of sidewall parts (3100).
 5. The suitcase (10) according to claim 4, wherein a width of each of the plurality of flexible parts continuously decreases from the back case component (100) to the front lid component (200).
 6. The suitcase (10) according to claim 3, wherein the ring-shaped gusset component (300) further comprises a fixing belt (395), the fixing belt (395) comprises a first belt body (3410) and a second belt body (3420), the first belt body (3410) and the second belt body (3420) are disposed on any two of the plurality of sidewall parts (3100) which are opposite to each other, respectively, and the first belt body (3410) is detachably connected to the second belt body (3420).
 7. The suitcase (10) according to claim 3, wherein the front lid component (200) comprises a belt (395), the belt (395) is configured for surrounding the back case component (100) and the ring-shaped gusset component (300) so as to make the back case compo-

nent (100) and the ring-shaped gusset component (300) close to the front lid component (200).

8. The suitcase (10) according to claim 3, wherein the connecting body (387) is detachably connected to the sidewall body (386). 5

Patentansprüche

1. Koffer (10), Folgendes umfassend: 10

eine hintere Gehäusekomponente (100);
eine vordere Deckelkomponente (200); und
eine ringförmige Zwickelkomponente (300),
zwei gegenüberliegende Seiten der ringförmigen Zwickelkomponente (300), die mit einem
Rand der hinteren Gehäusekomponente (100)
bzw. einem Rand der vorderen Deckelkomponente (200) verbunden sind, um einen Aufnahme-
raum (330) zu bilden, wobei die ringförmige Zwickelkomponente (300) eine Vielzahl von Biegeabschnitten (310) und eine Vielzahl von Seitenwandabschnitten umfasst, die konfiguriert
sind, um die Vielzahl von Biegeabschnitten (310) zu verbinden, wobei die Vielzahl von Biegeabschnitten (310) jeweils an Ecken der hinteren Gehäusekomponente (100) angeordnet ist,
wobei die Vielzahl von Seitenwandabschnitten jeweils an Rändern der hinteren Gehäusekomponente (100) angeordnet ist,
wobei die flexible Verformungskapazität jeder der Vielzahl von Biegeabschnitten (310) größer
als die flexible Verformungskapazität jeder der Vielzahl von Seitenwandabschnitten ist und die
Vielzahl von Biegeabschnitten (310) biegsam ist, weshalb die Vielzahl von Seitenwandabschnitten nach oben oder unten auf die hintere Gehäusekomponente (100) geklappt werden kann,
wobei 25 30 35 40

- die vordere Deckelkomponente (200) und die ringförmige Zwickelkomponente (300) miteinander verbunden sind durch ein Verbindungselement (400), um den Aufnahme-
raum (330) zu bilden, wobei das Verbindungselement (400) ein Reißverschluss (400) ist und 45
- die ringförmige Zwickelkomponente (300) eine erste Öffnung (340) aufweist, die vordere Deckelkomponente (200) eine zweite Öffnung (210) aufweist, der Reißverschluss (400) zwei Ketten (410) und einen Reißverschlusskopf (420) aufweist, die zwei Ketten (410) an einem Rand der ersten Öffnung (340) bzw. einem Rand der zweiten Öffnung (210) angeordnet sind, die zwei Ketten (410) miteinander verbunden werden, um 50 55

einen Verbindungsabschnitt (411) zu bilden, wobei der Verbindungsabschnitt (411) zwischen der vorderen Deckelkomponente (200) und der ringförmigen Zwickelkomponente (300) angeordnet ist, der Verbindungsabschnitt (411) eine Länge aufweist, die der vorderen Deckelkomponente (200) und der ringförmigen Zwickelkomponente (300) ermöglicht, in einem spezifischen Abstand gehalten zu werden, wenn die vordere Deckelkomponente (200) und die ringförmige Zwickelkomponente (300) voneinander getrennt sind und der Reißverschlusskopf (420) konfiguriert ist, um die zwei Ketten (410) zusammenzufügen oder die zwei Ketten (410) zu trennen.

2. Koffer (10) nach Anspruch 1, wobei jeder der Vielzahl von Biegeabschnitten (310) mindestens eine Klapplinie (311) aufweist.

3. Koffer (10), Folgendes umfassend:

eine hintere Gehäusekomponente (100);
eine vordere Deckelkomponente (200); und
eine ringförmige Zwickelkomponente (300),
zwei gegenüberliegende Seiten der ringförmigen Zwickelkomponente (300), die mit der hinteren Gehäusekomponente (100) bzw. der vorderen Deckelkomponente (200) verbunden sind, um einen Aufnahme-
raum (330) zu bilden, der geschlossen werden kann, die ringförmige Zwickelkomponente (300), umfassend eine Vielzahl von Seitenwandteilen (3100) und eine Vielzahl von flexiblen Teilen, die konfiguriert
sind, um die Vielzahl von Seitenwandabschnitten (3100) zu verbinden, die flexible Verformungskapazität jeder der Vielzahl von flexiblen Teilen größer als die flexible Verformungskapazität jeder der Vielzahl von Seitenwandteilen (3100) ist, einen spitzen Winkel, der zwischen einer der Vielzahl von flexiblen Teilen und der ringförmigen Zwickelkomponente (300) gebildet ist, zwei der Vielzahl von Seitenwandteilen (3100), die benachbart voneinander sind, nach oben oder unten auf die hintere Gehäuseabdeckung (100) geklappt werden können, indem eines der Vielzahl von flexiblen Teilen, das dazwischen verbunden ist, gebogen wird,
wobei

- die vordere Deckelkomponente (200) und die ringförmige Zwickelkomponente (300) miteinander verbunden sind durch ein Verbindungselement (400), um den Aufnahme-
raum (330) zu bilden,
- das Verbindungselement (400) ein Reißverschluss (400) ist und

- die ringförmige Zwickelkomponente (300) eine erste Öffnung (340) aufweist, die vordere Deckelkomponente (200) eine zweite Öffnung (210) aufweist, eines der Seitenwandteile (3100) einen Seitenwandkörper (386) umfasst und ein Verbindungskörper (387) vorhanden ist, der aus der vorderen Deckelkomponente (200) heraussteht, der Seitenwandkörper (386) eine Vertiefung (386b) aufweist, die Vertiefung (386b) auf einer äußeren Oberfläche des Seitenwandkörpers (386) angeordnet ist, der Verbindungskörper (387) zwei gegenüberliegenden Ränder aufweist, einer der Ränder mit einem Rand des Seitenwandkörpers (386) verbunden ist, der die Vertiefung (386b) bildet, der andere Rand des Verbindungskörpers (387) mit einem Rand der zweiten Öffnung (210) der vorderen Deckelkomponente (200) verbunden ist, der Reißverschluss (400) zwei Ketten (410) und einen Reißverschlusskopf (420) umfasst, eine der Ketten (410) an einem Rand der ersten Öffnung (340) und dem Rand der Vertiefung (386b) angeordnet ist, die andere Kette an dem Rand der zweiten Öffnung (210) und einem Rand des Verbindungskörpers (387), der mit dem Seitenwandkörper (386) verbunden ist, angeordnet ist, der Reißverschlusskopf (420) konfiguriert ist, um die zwei Ketten (410) zusammenzufügen oder zu trennen; wobei, wenn der Reißverschlusskopf (420) die zwei Ketten (410) zusammenfügt, der Verbindungskörper (387) die äußere Oberfläche des Seitenwandkörpers (386) abdeckt; und wobei, wenn der Reißverschlusskopf (420) die zwei Ketten (410) trennt, der Verbindungskörper (387) der vorderen Deckelkomponente (200) und der ringförmigen Zwickelkomponente (300) ermöglicht, voneinander beabstandet und in einem spezifischen Abstand gehalten zu werden.
4. Koffer (10) nach Anspruch 3, wobei sich jedes der Vielzahl von flexiblen Teilen von einem Rand, an dem die ringförmige Zwickelkomponente (300) mit der hinteren Gehäusekomponente (100) verbunden ist, zu einem Rand, an dem die ringförmige Zwickelkomponente (300) mit der vorderen Deckelkomponente (200) verbunden ist, erstreckt, und die flexible Verformungskapazität jedes der Vielzahl von flexiblen Teilen größer als die flexible Verformungskapazität jedes der Vielzahl von Seitenwandteilen (3100) ist.
5. Koffer (10) nach Anspruch 4, wobei eine Breite jedes der Vielzahl von Teilen durchgehend von der hinteren

ren Gehäusekomponente (100) zu der vorderen Deckelkomponente (200) abnimmt.

6. Koffer (10) nach Anspruch 3, wobei die ringförmige Zwickelkomponente (300) ferner einen Fixiergurt (395) umfasst, wobei der Fixiergurt (395) einen ersten Gurtkörper (3410) und einen zweiten Gurtkörper (3420) umfasst, wobei der erste Gurtkörper (3410) und der zweite Gurtkörper (3420) an einer beliebigen der Vielzahl von Seitenwänden (3100) angeordnet sind, die jeweils einander gegenüberliegt, und wobei der erste Gurtkörper (3410) lösbar mit dem zweiten Gurtkörper (3420) verbunden ist.
7. Koffer (10) nach Anspruch 3, wobei die vordere Deckelkomponente (200) einen Gurt (395) umfasst, der Gurt (395) konfiguriert ist, um die hintere Gehäusekomponente (100) und die ringförmige Zwickelkomponente (300) zu umgeben, um zu veranlassen, dass die hintere Gehäusekomponente (100) und die ringförmige Zwickelkomponente (300) zu der vorderen Deckelkomponente (200) schließen.
8. Koffer (10) nach Anspruch 3, wobei der Verbindungskörper (387) lösbar mit dem Seitenwandkörper (386) verbunden ist.

Revendications

1. Valise (10), comprenant :

un composant de bagage arrière (100) ;
un composant de couvercle avant (200) ; et
un composant de soufflet en forme d'anneau (300), deux côtés opposés du composant de soufflet en forme d'anneau (300) reliés à un bord du composant de bagage arrière (100) et à un bord du composant de couvercle avant (200), respectivement, pour former un espace de logement (330), le composant de soufflet en forme d'anneau (300) comprenant une pluralité de sections de pliage (310) et une pluralité de sections de flanc qui sont configurées pour relier la pluralité de sections de pliage (310), la pluralité de sections de pliage (310) étant disposées sur des coins du composant de bagage arrière (100), respectivement, la pluralité de sections de flanc étant disposées sur les bords du composant de bagage arrière (100), respectivement,
dans laquelle la capacité de déformation flexible de chacune de la pluralité de sections de pliage (310) est supérieure à la capacité de déformation flexible de chacune de la pluralité de sections de flanc, et la pluralité de sections de pliage (310) sont pliables, permettant à la pluralité de sections de flanc d'être pliées vers le haut ou

vers le bas sur le composant de bagage arrière (100),
dans laquelle

- le composant de couvercle avant (200) et le composant de soufflet en forme d'anneau (300) sont reliés l'un à l'autre par un élément de liaison (400), de manière à former l'espace de logement (330), dans laquelle l'élément de liaison (400) est une fermeture éclair (400), et 5
- le composant de soufflet en forme d'anneau (300) a une première ouverture (340), le composant de couvercle avant (200) a une deuxième ouverture (210), la fermeture éclair (400) comprend deux chaînes (410) et une tête de fermeture éclair (420), les deux chaînes (410) sont disposées sur un bord de la première ouverture (340) et un bord de la deuxième ouverture (210), respectivement, les deux chaînes (410) sont reliées l'une à l'autre pour former une section de liaison (411), dans laquelle la section de liaison (411) est disposée entre le composant de couvercle avant (200) et le composant de soufflet en forme d'anneau (300), la section de liaison (411) a une longueur qui permet au composant de couvercle avant (200) et au composant de soufflet en forme d'anneau (300) d'être maintenus à une distance spécifique lorsque le composant de couvercle avant (200) et le composant de soufflet en forme d'anneau (300) sont séparés l'un de l'autre, et la tête de fermeture éclair (420) est configurée pour attacher les deux chaînes (410) ou séparer les deux chaînes (410). 10 15 20 25 30 35

2. Valise (10) selon la revendication 1, dans laquelle chacune de la pluralité de sections de pliage (310) a au moins une ligne de pliage (311). 40

3. Valise (10), comprenant :

- un composant de bagage arrière (100) ; 45
- un composant de couvercle avant (200) ; et
- un composant de soufflet en forme d'anneau (300), deux côtés opposés du composant de soufflet en forme d'anneau (300) reliés au composant de bagage arrière (100) et au composant de couvercle avant (200), respectivement, pour former un espace de logement (330) pouvant être fermé, le composant de soufflet en forme d'anneau (300) comprenant une pluralité de parties de flanc (3100) et une pluralité de parties flexibles qui sont configurées pour relier la pluralité de parties de flanc (3100), la capacité de déformation flexible de chacune de la pluralité 50 55

de parties flexibles est supérieure à la capacité de déformation flexible de chacune de la pluralité de parties de flanc (3100), un angle aigu formé entre l'une de la pluralité de parties flexibles et le composant de soufflet en forme d'anneau (300), deux de la pluralité de parties de flanc (3100) qui sont adjacentes entre elles peuvent être pliées vers le haut ou vers le bas sur le composant de bagage arrière (100) par le pliage de l'une de la pluralité de parties flexibles qui est reliée entre elles,
dans laquelle

- le composant de couvercle avant (200) et le composant de soufflet en forme d'anneau (300) sont reliés l'un à l'autre par un élément de liaison (400), de manière à former l'espace de logement (330),
- l'élément de liaison (400) est une fermeture éclair (400), et
- le composant de soufflet en forme d'anneau (300) a une première ouverture (340), le composant de couvercle avant (200) a une deuxième ouverture (210), l'une des parties de flanc (3100) comprend un corps de flanc (386), et il y a un corps de liaison (387) qui ressort du composant de couvercle avant (200), le corps de flanc (386) a une dépression (386b), la dépression (386b) est située sur une surface externe du corps de flanc (386), le corps de liaison (387) a deux bords opposés, l'un des bords est relié à un bord du corps de flanc (386) qui forme la dépression (386b), l'autre bord du corps de liaison (387) est relié à un bord de la deuxième ouverture (210) du composant de couvercle avant (200), la fermeture éclair (400) comprend deux chaînes (410) et une tête de fermeture éclair (420), l'une des chaînes (410) est disposée sur un bord de la première ouverture (340) et sur le bord de la dépression (386b), l'autre chaîne est disposée sur le bord de la deuxième ouverture (210) et un bord du corps de liaison (387) relié au corps de flanc (386), la tête de fermeture éclair (420) est configurée pour attacher ou séparer les deux chaînes (410) ; lorsque la tête de fermeture éclair (420) attache les deux chaînes (410), le corps de liaison (387) recouvre la surface externe du corps de flanc (386) ; et lorsque la tête de fermeture éclair (420) sépare les deux chaînes (410), le corps de liaison (387) permet au composant de couvercle avant (200) et au composant de soufflet en forme d'anneau (300) d'être espacés et maintenus à une distance spécifique.

4. Valise (10) selon la revendication 3, dans laquelle
chacune de la pluralité de parties flexibles s'étend
d'un bord où le composant de soufflet en forme d'an-
neau (300) est relié au composant de bagage arrière
(100) à un bord où le composant de soufflet en forme 5
d'anneau (300) est relié au composant de couvercle
avant (200), et la capacité de déformation flexible de
chacune de la pluralité de parties flexibles est supé-
rieure à la capacité de déformation flexible de cha-
cune de la pluralité de parties de flanc (3100). 10

5. Valise (10) selon la revendication 4, dans laquelle
une largeur de chacune de la pluralité de parties flexi-
bles diminue de manière continue du composant de
bagage arrière (100) au composant de couvercle 15
avant (200).

6. Valise (10) selon la revendication 3, dans laquelle le
composant de soufflet en forme d'anneau (300) com-
prend en outre une ceinture de fixation (395), la cein- 20
ture de fixation (395) comprend un premier corps de
ceinture (3410) et un deuxième corps de ceinture
(3420), le premier corps de ceinture (3410) et le
deuxième corps de ceinture (3420) sont disposés 25
sur deux quelconques de la pluralité de parties de
flanc (3100) qui sont opposées les unes aux autres,
respectivement, et le premier corps de ceinture
(3410) est relié de manière amovible au deuxième
corps de ceinture (3420). 30

7. Valise (10) selon la revendication 3, dans laquelle le
composant de couvercle avant (200) comprend une
ceinture (395), la ceinture (395) est configurée pour
entourer le composant de bagage arrière (100) et le 35
composant de soufflet en forme d'anneau (300) de
manière à ce que le composant de bagage arrière
(100) et le composant de soufflet en forme d'anneau
(300) se ferment au composant de couvercle avant
(200). 40

8. Valise (10) selon la revendication 3, dans laquelle le
corps de liaison (387) est relié de manière amovible
au corps de flanc (386). 45

45

50

55

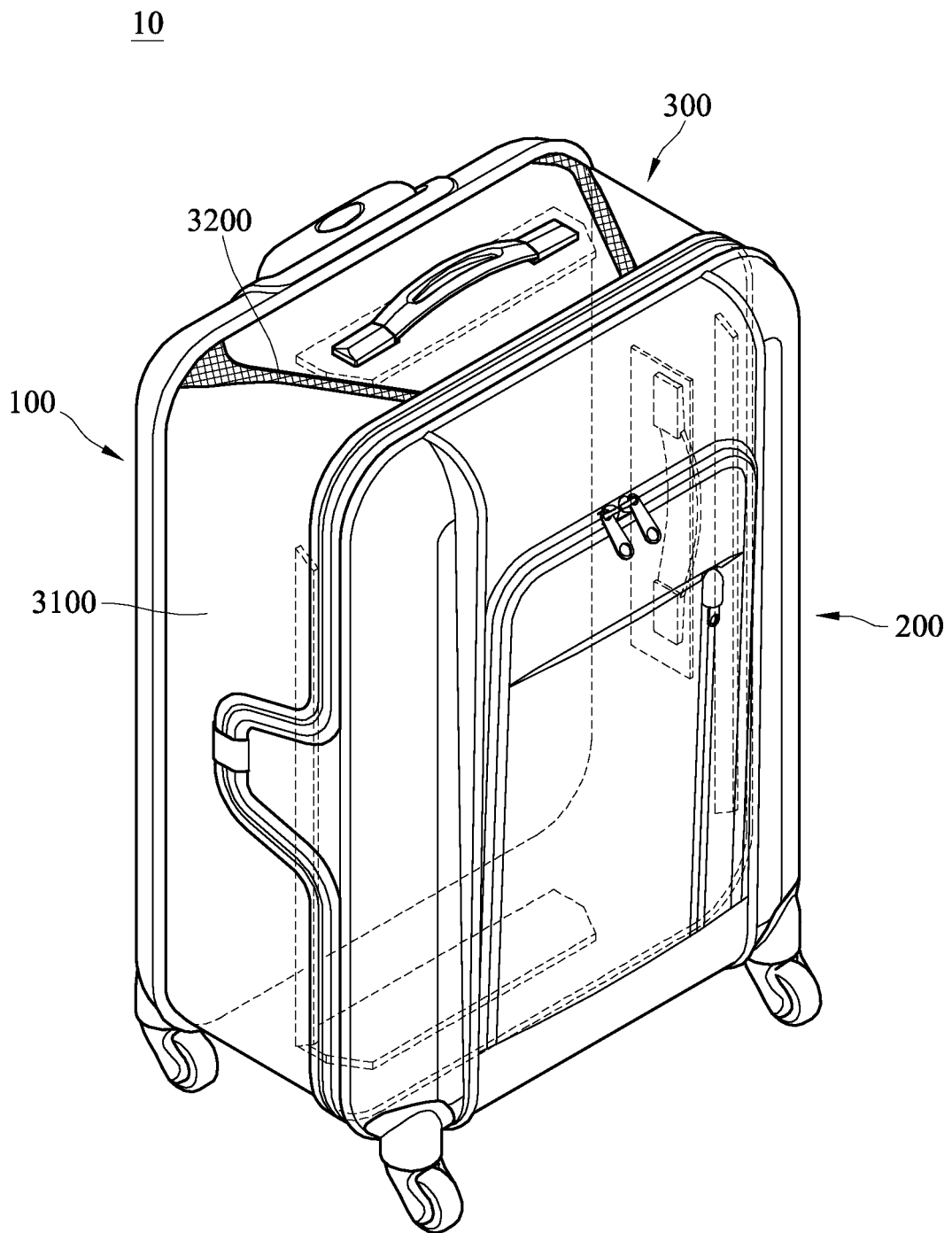


Fig 1

10

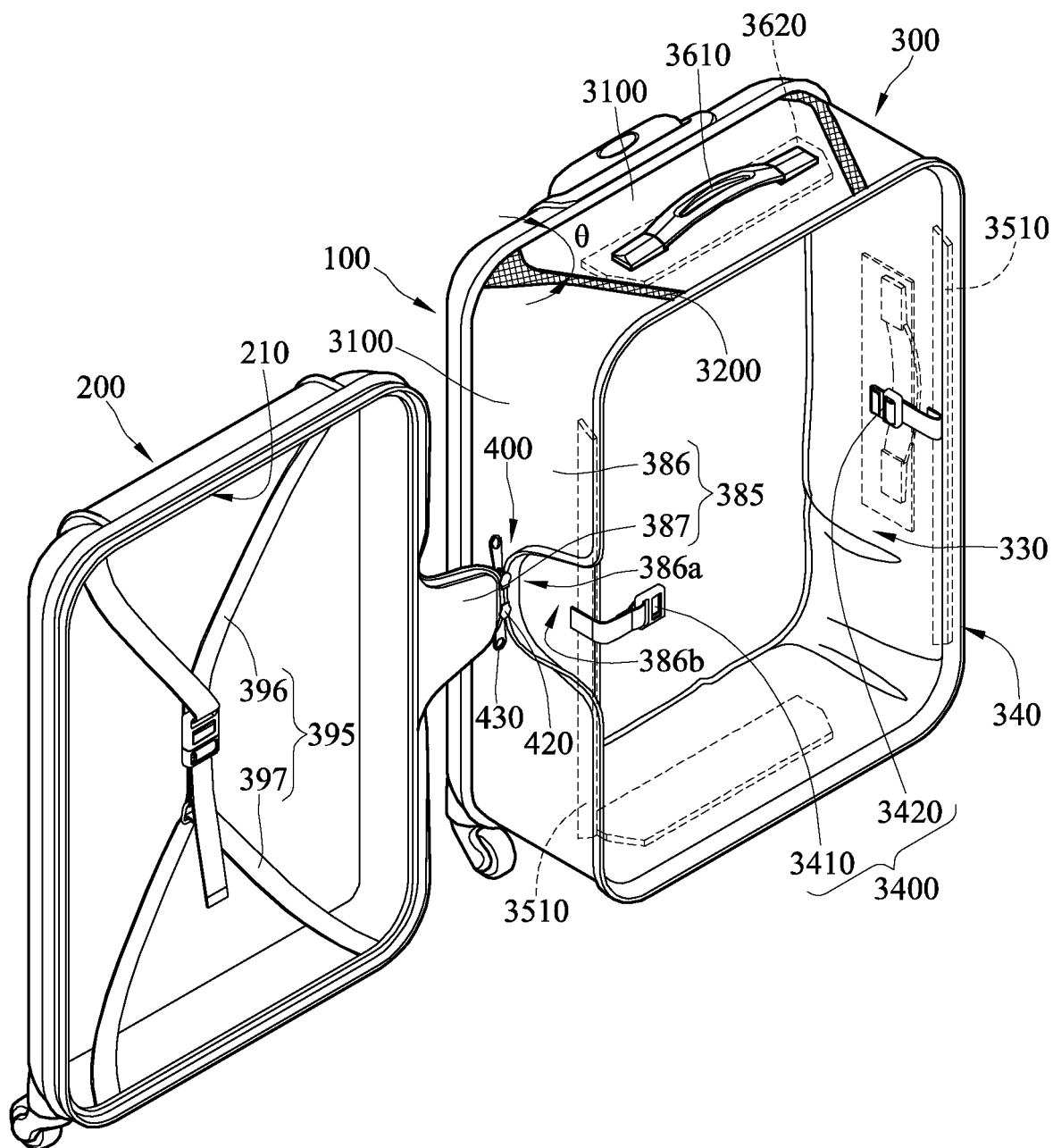


Fig 2

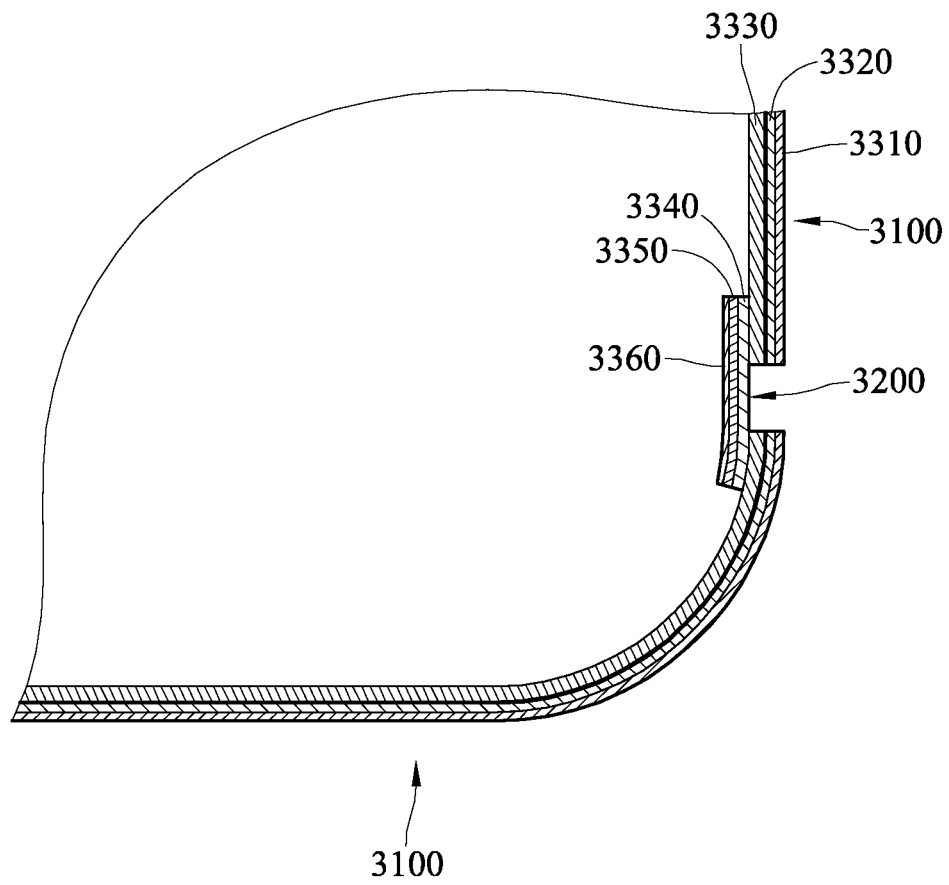


Fig 3

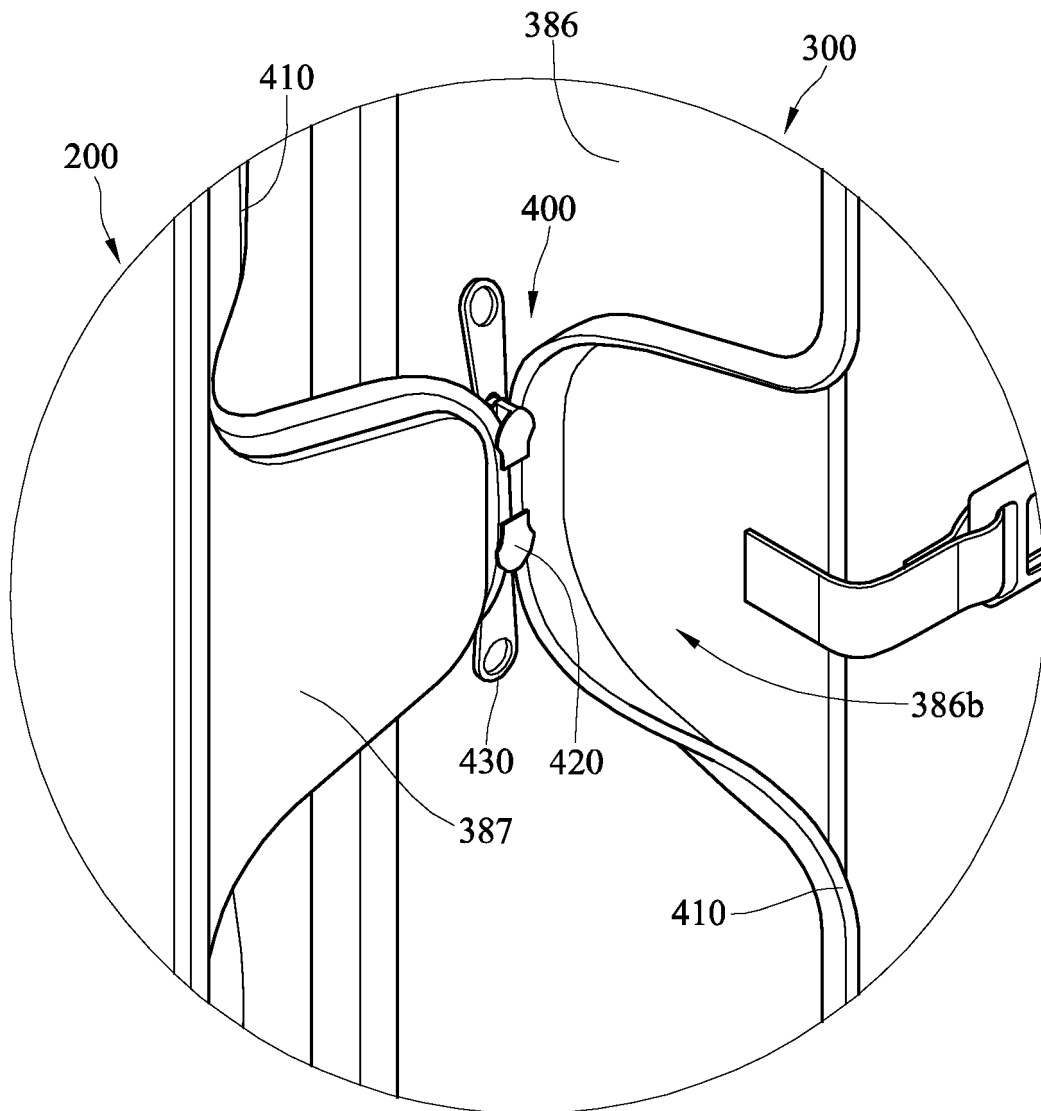
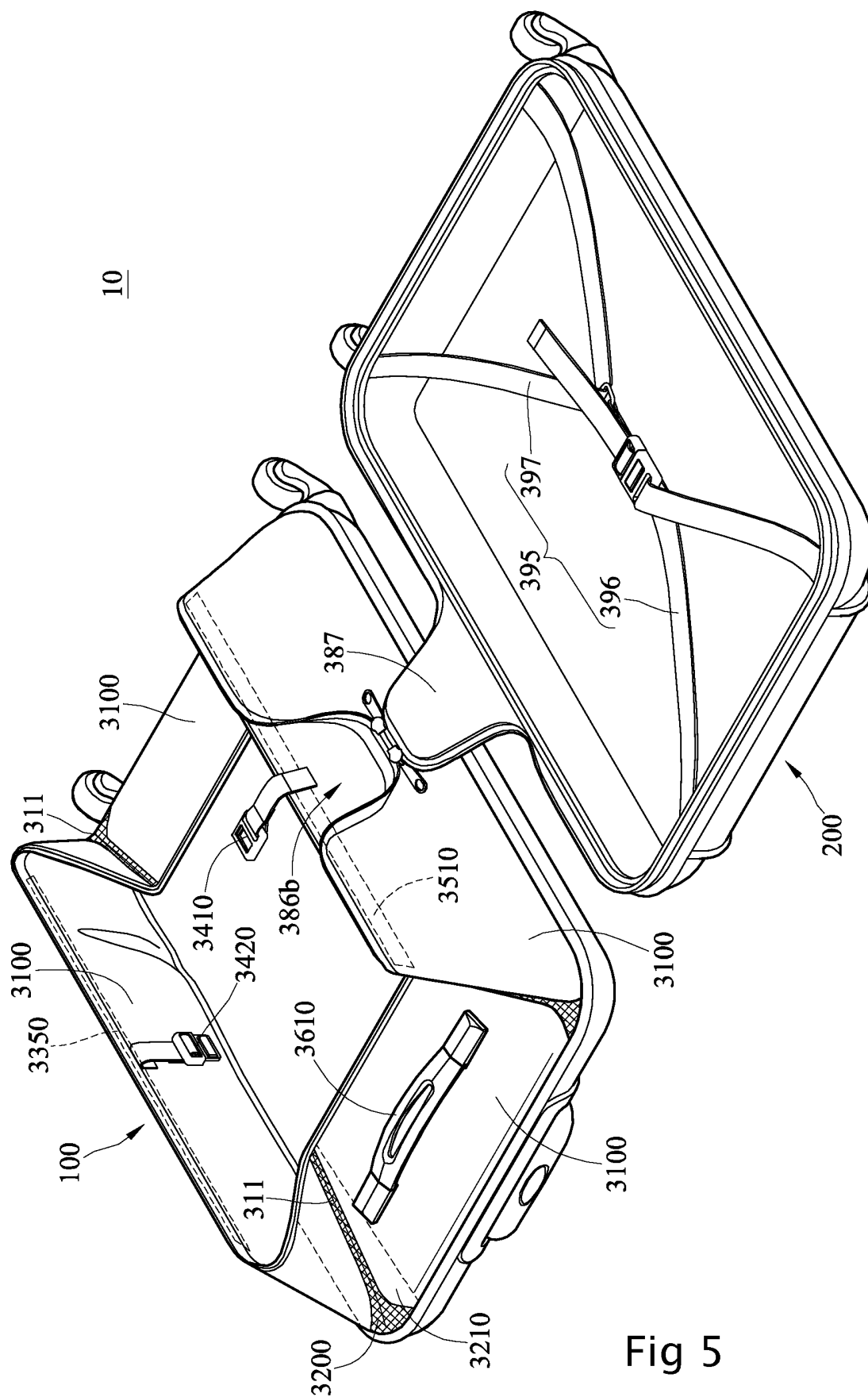
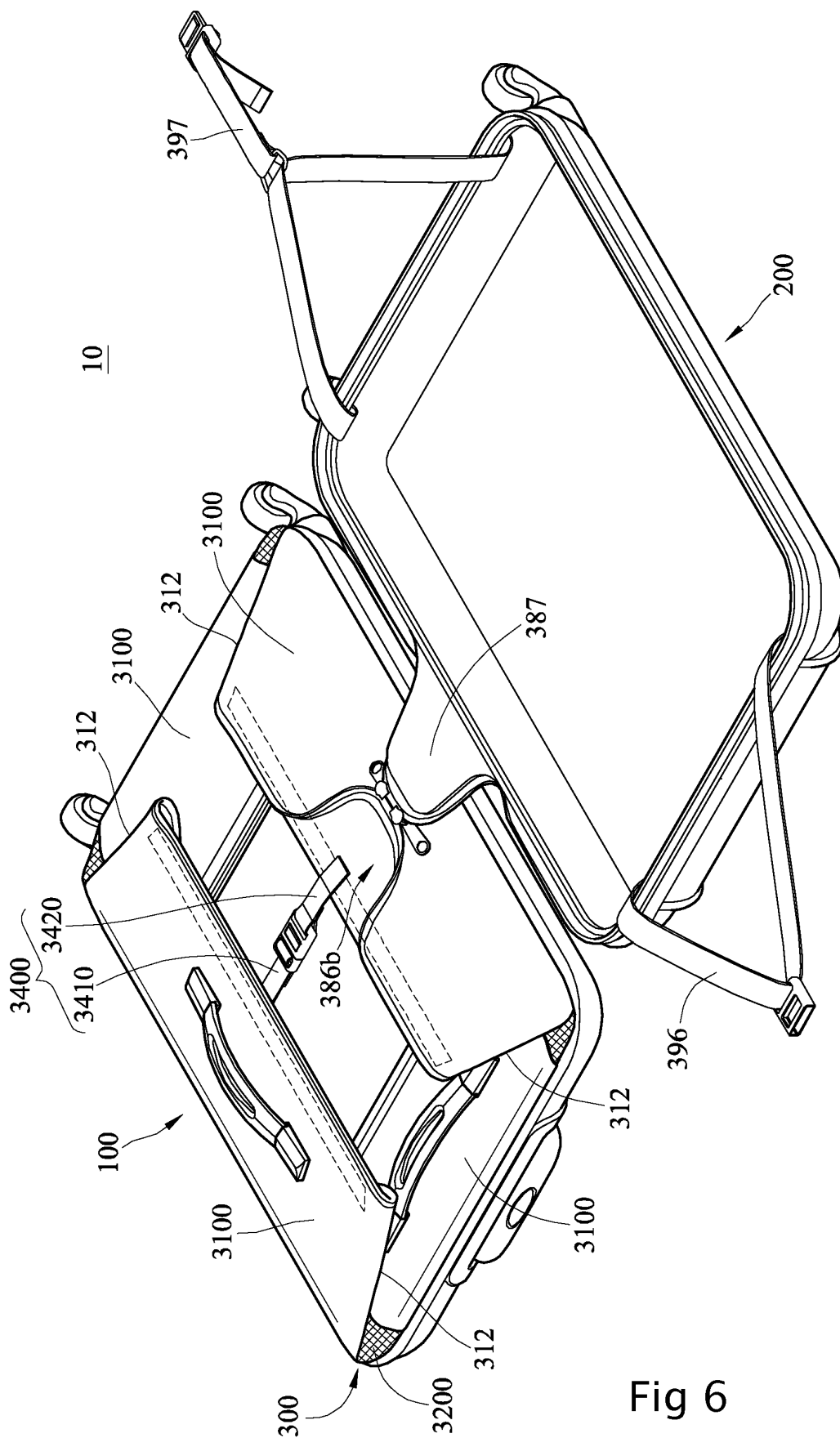


Fig 4





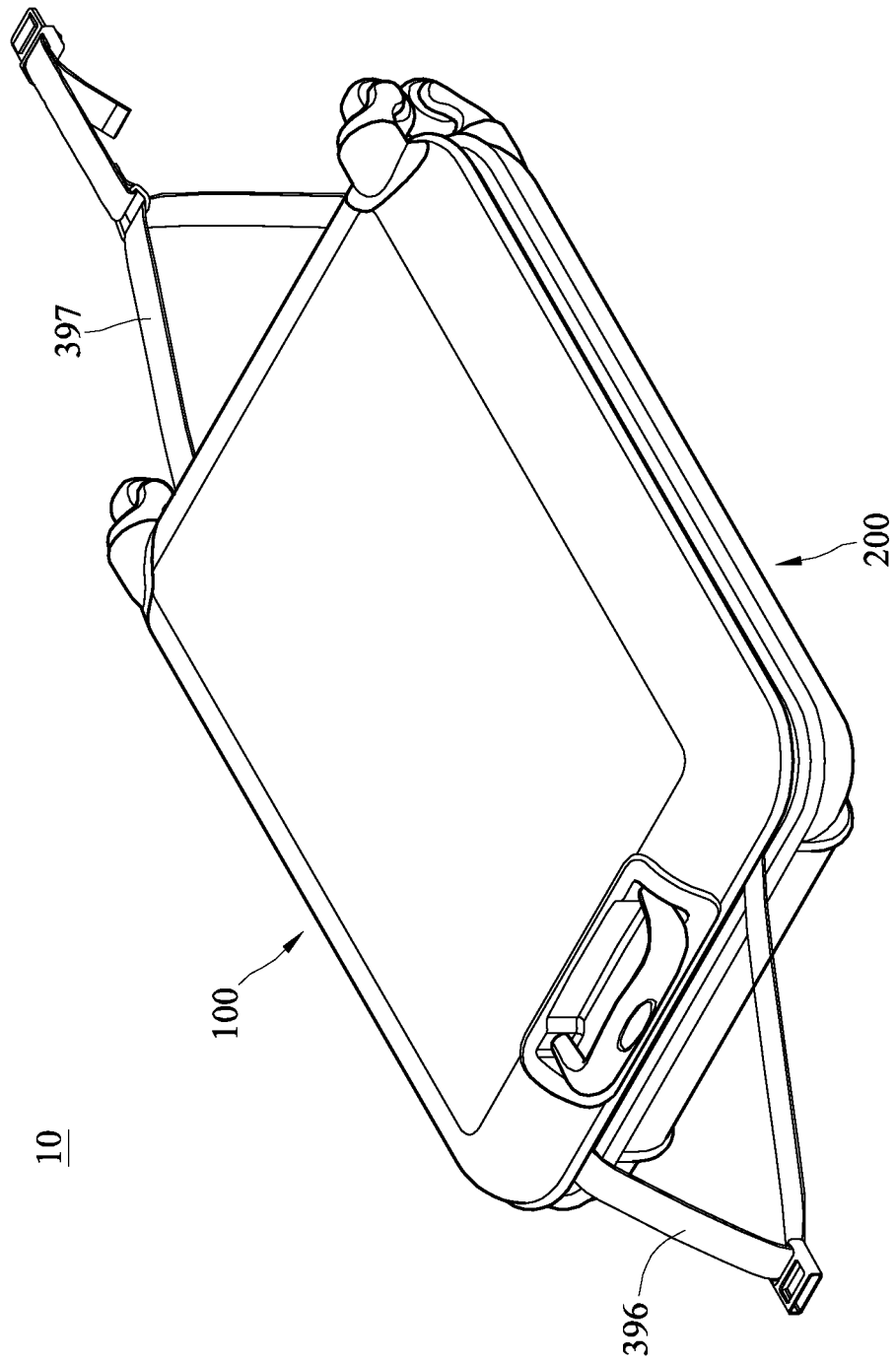


Fig 7

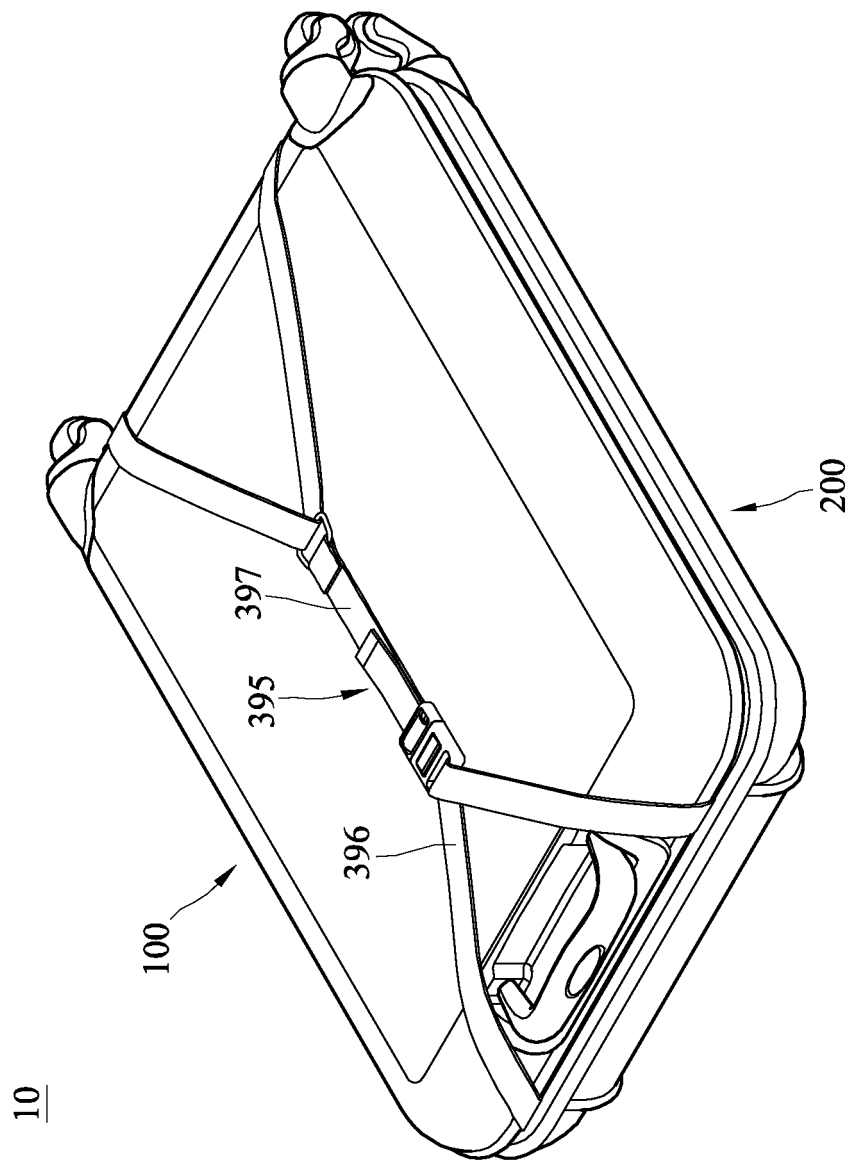


Fig 8

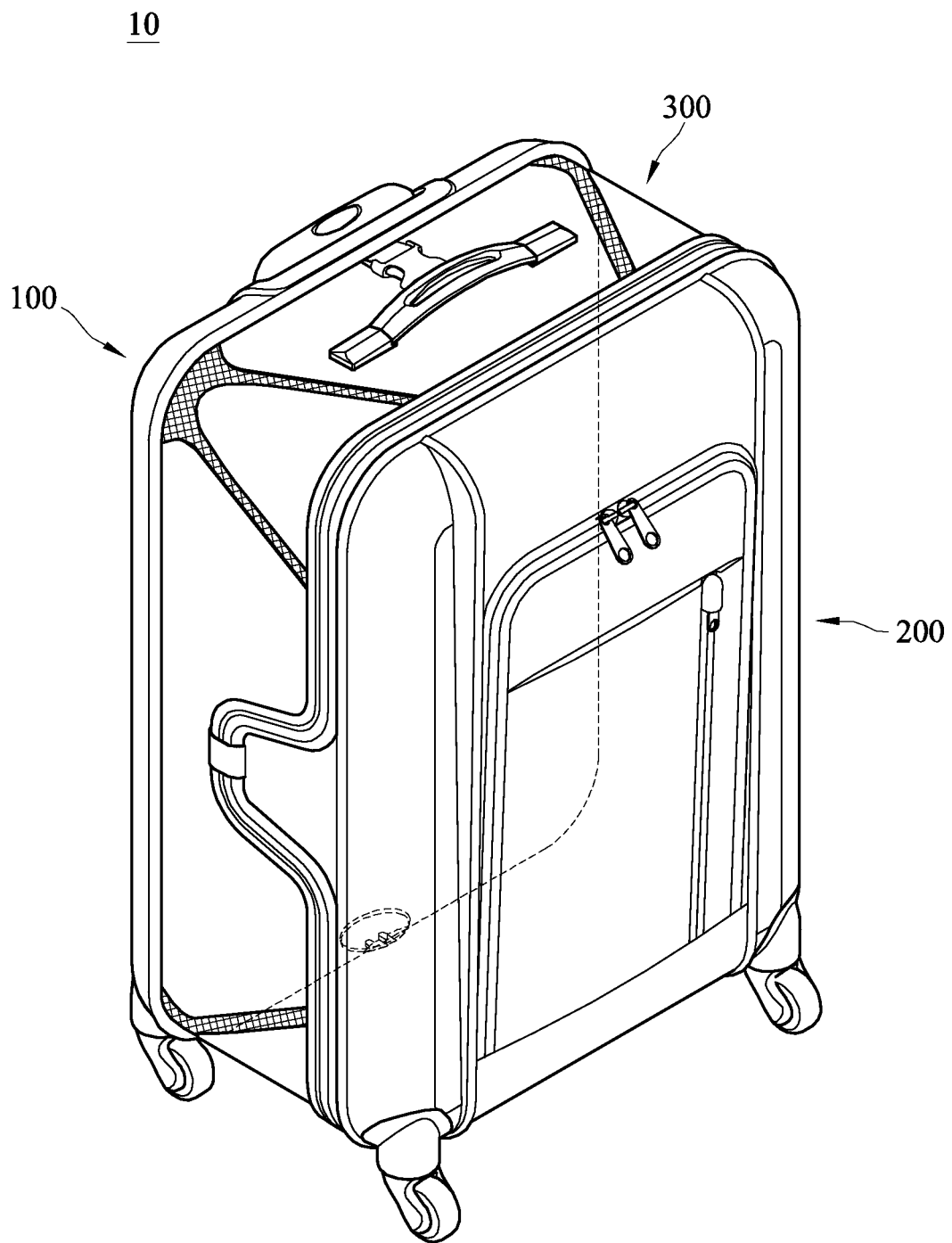


Fig 9

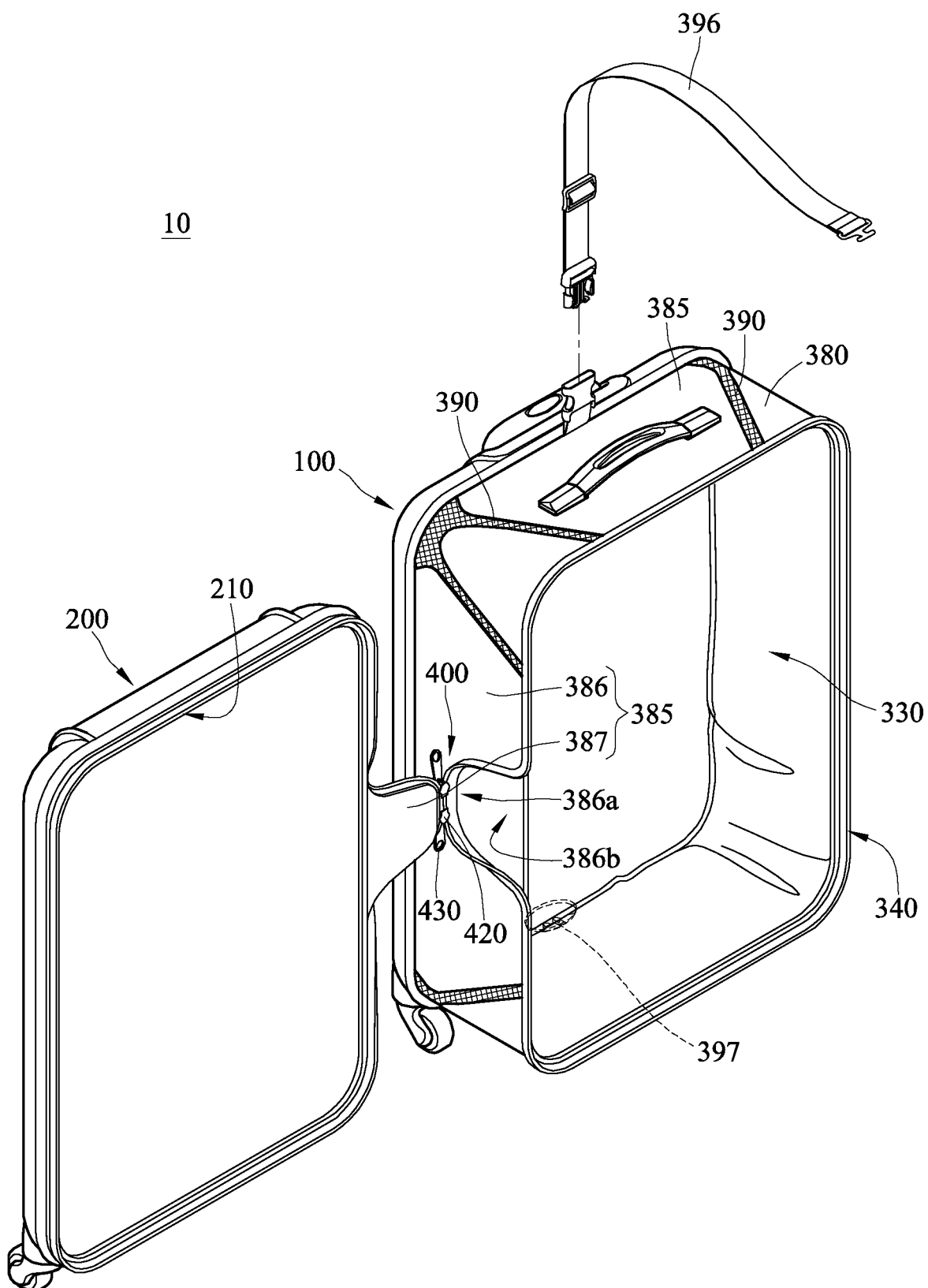


Fig 10

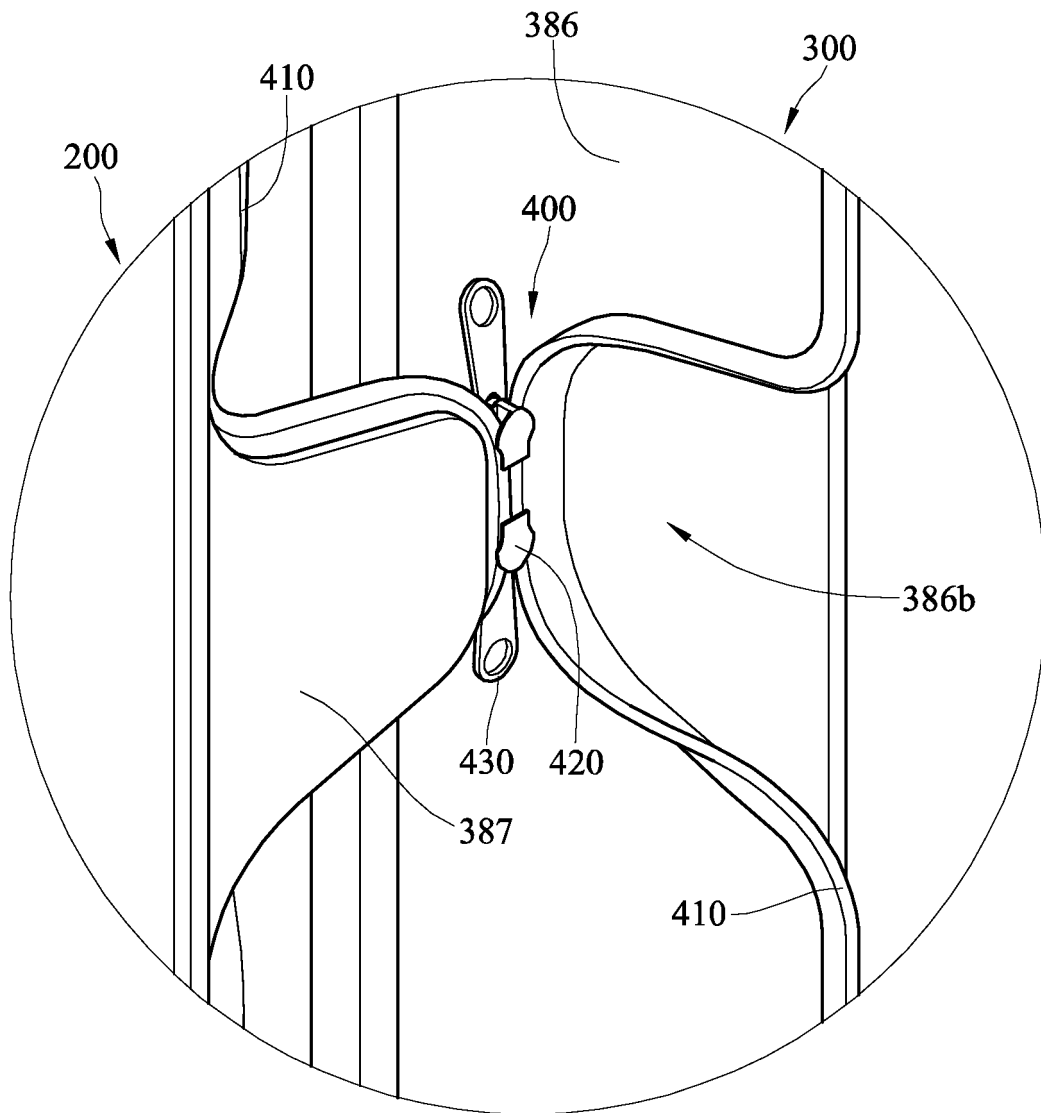


Fig 11

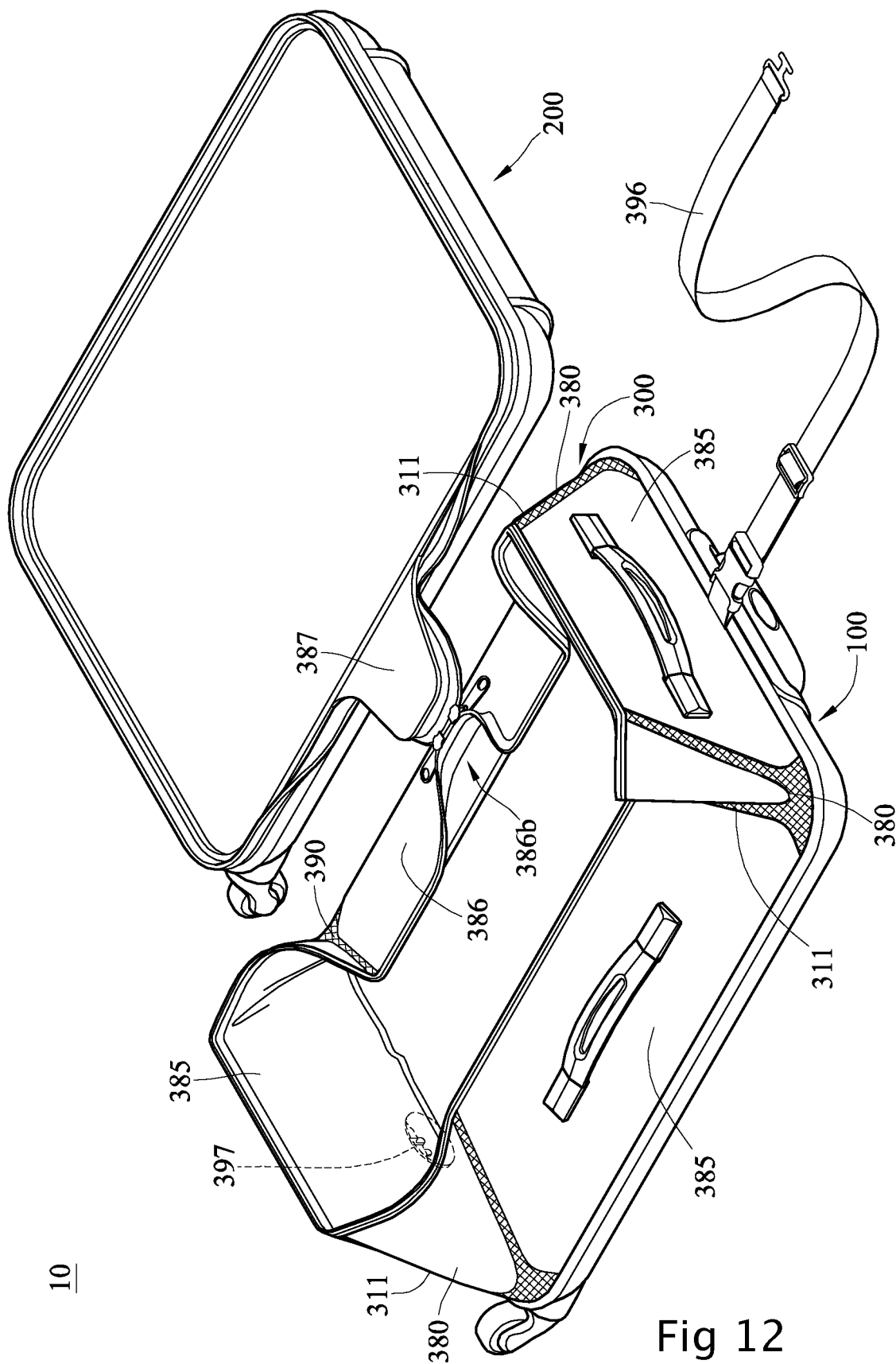


Fig 12

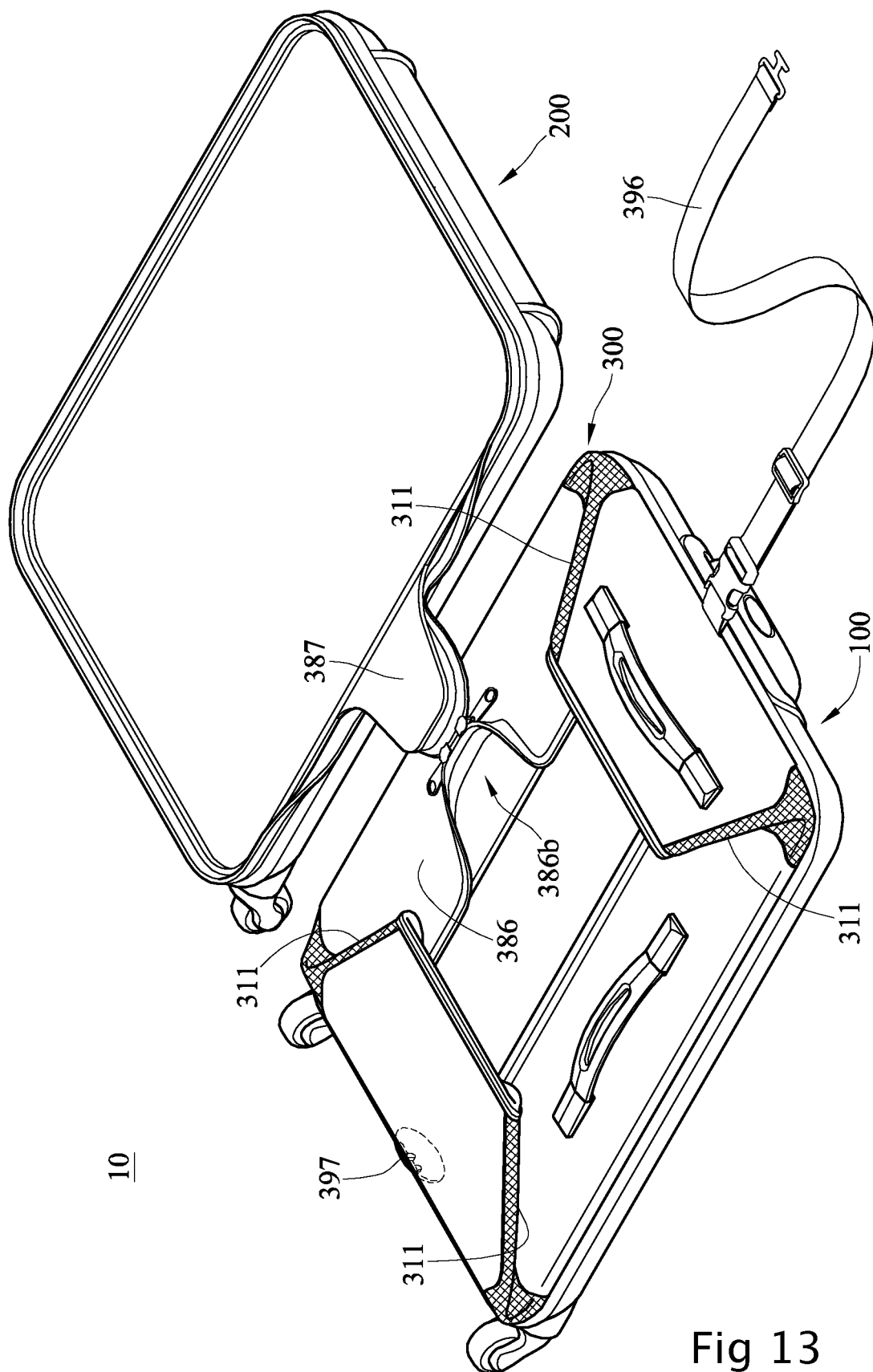


Fig 13

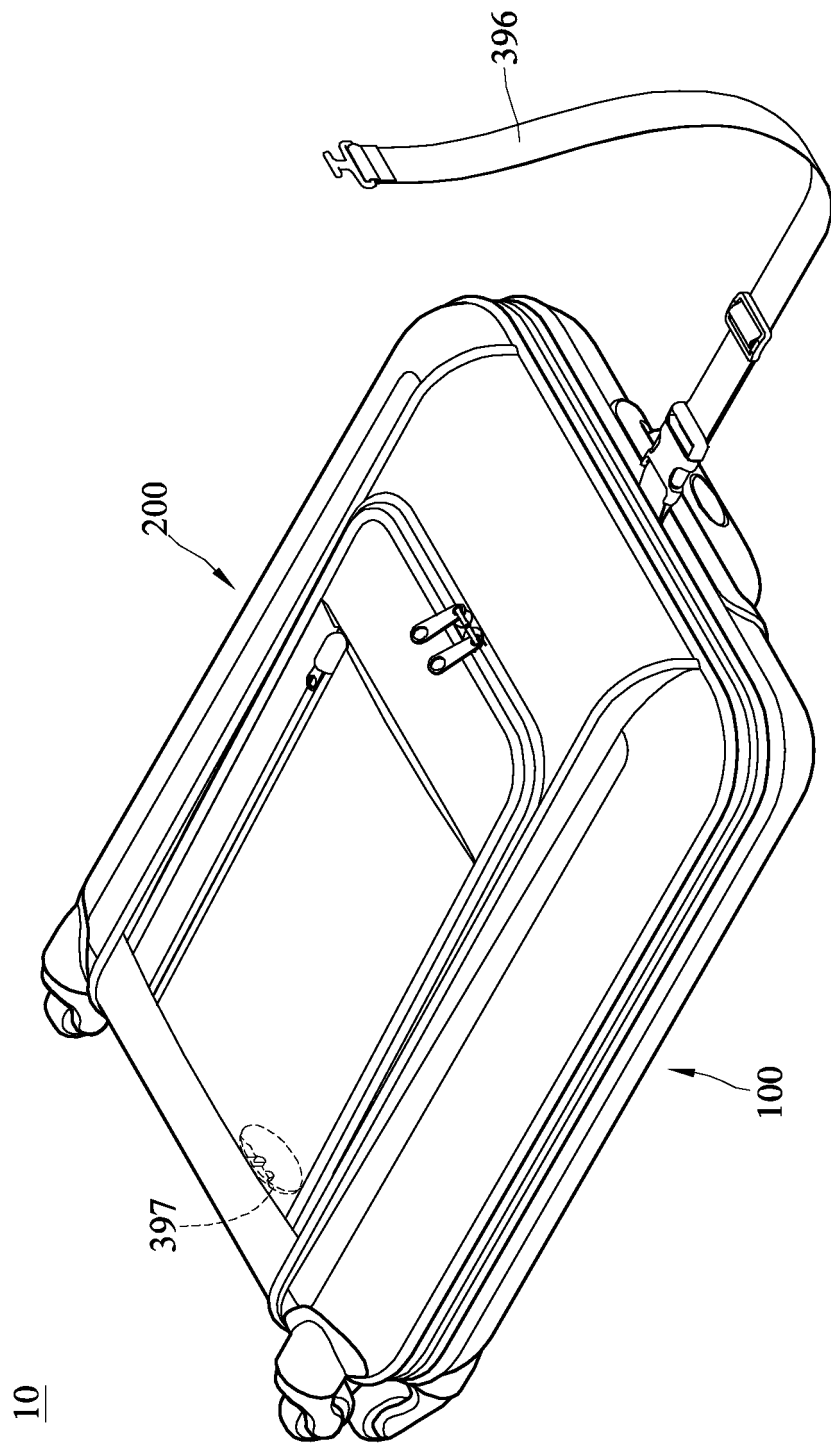


Fig 14

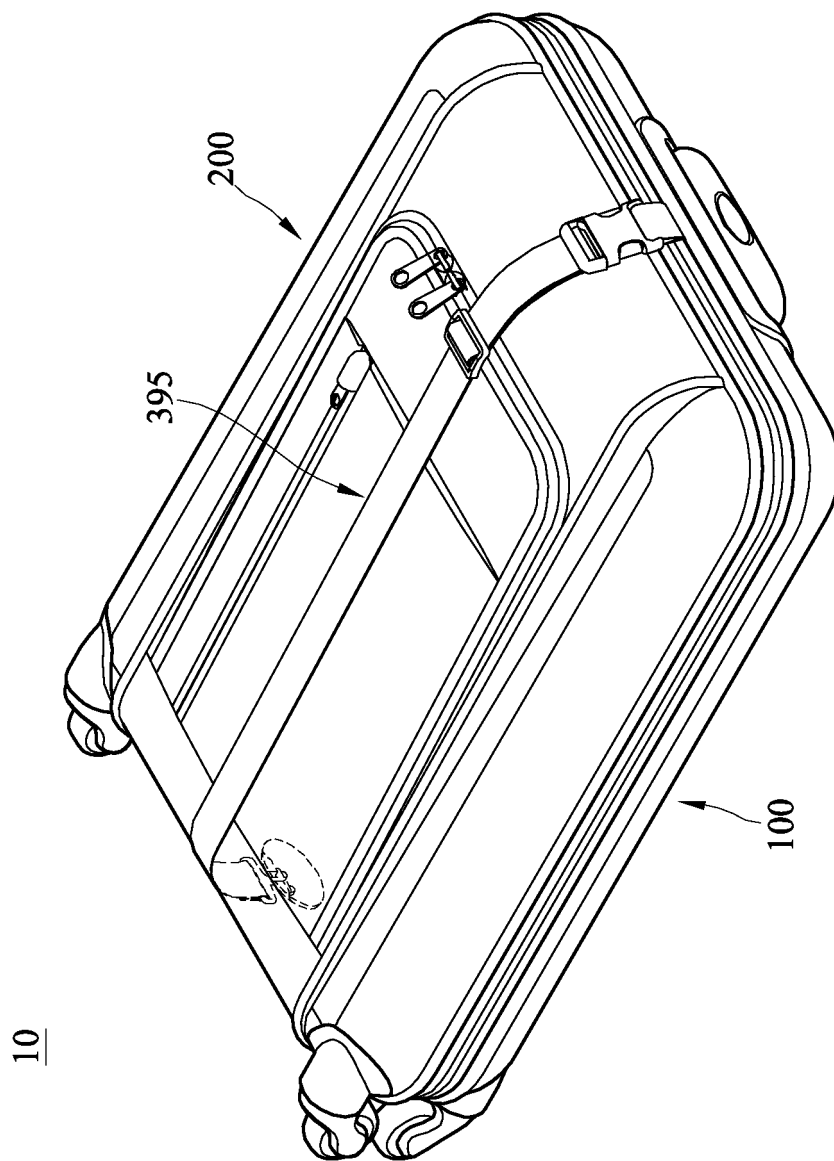


Fig 15

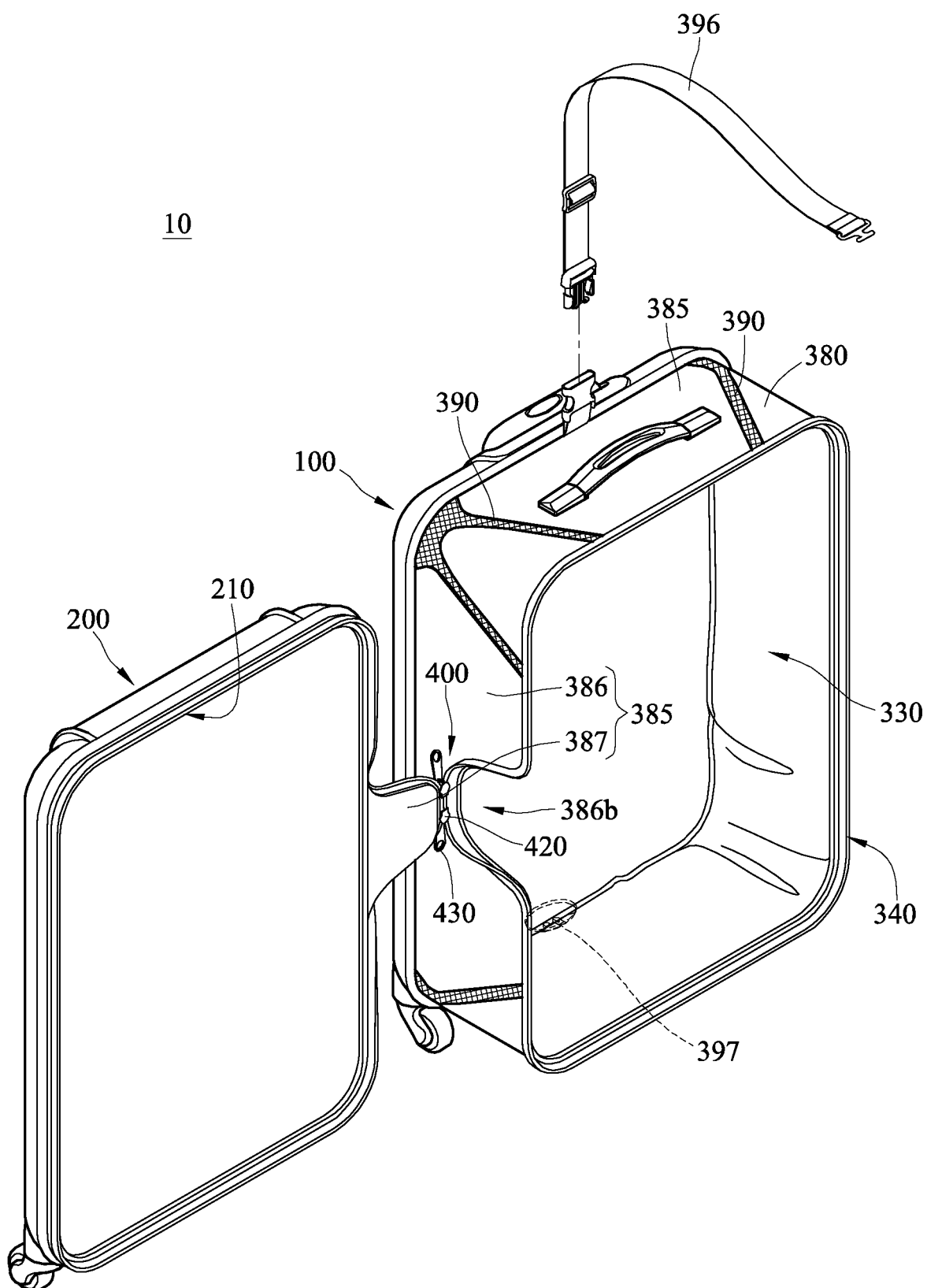


Fig 16

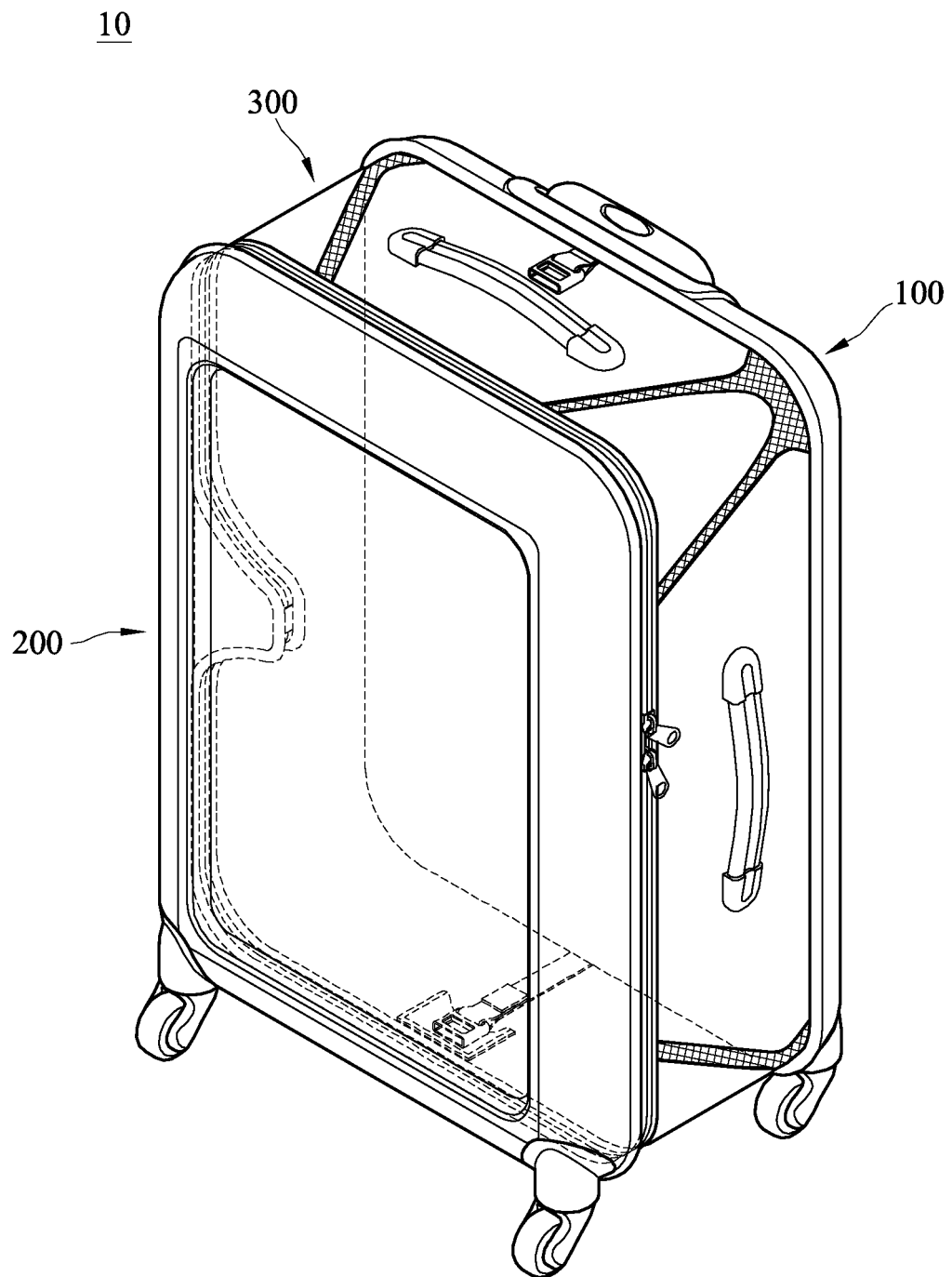


Fig 17

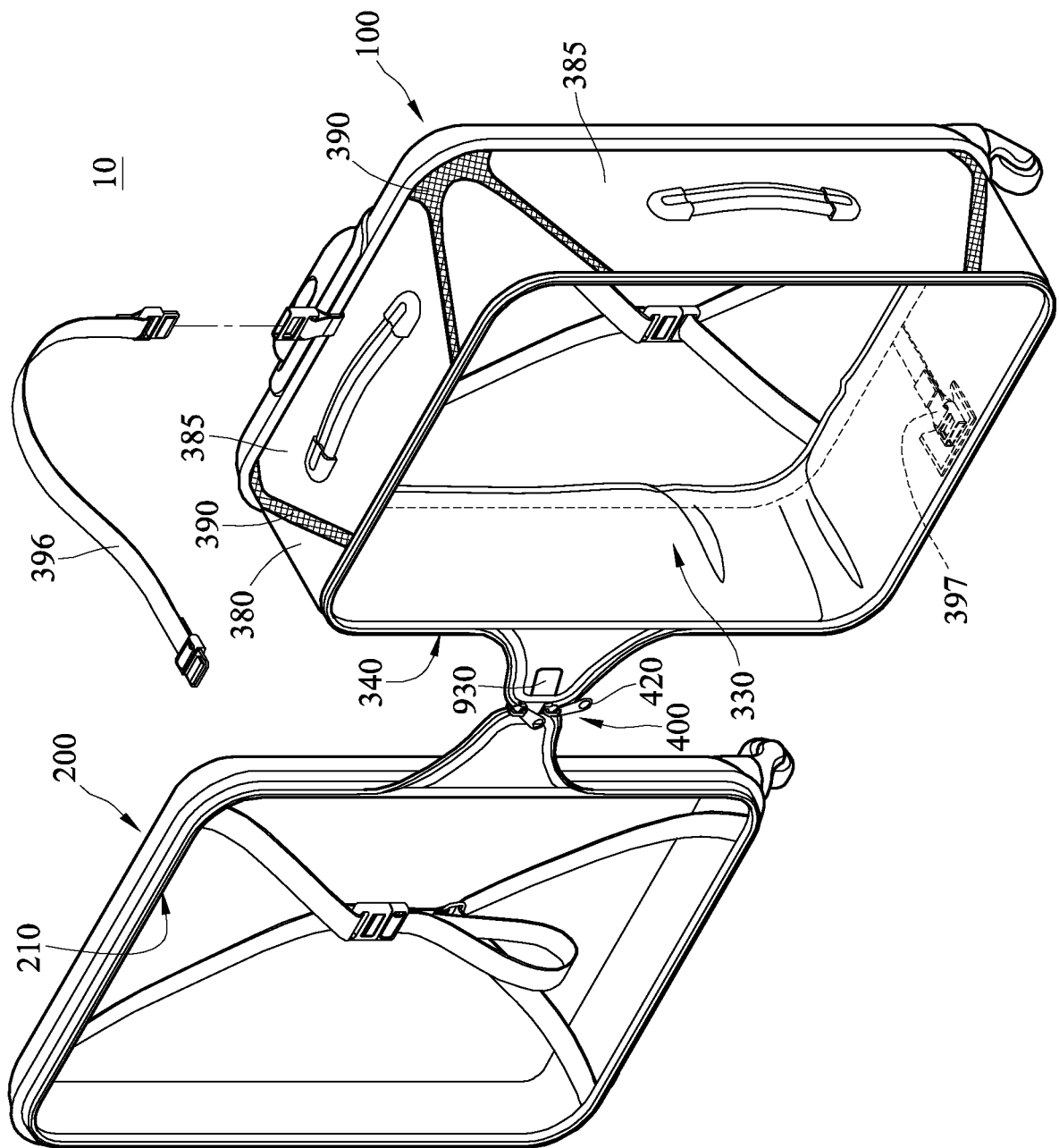


Fig 18

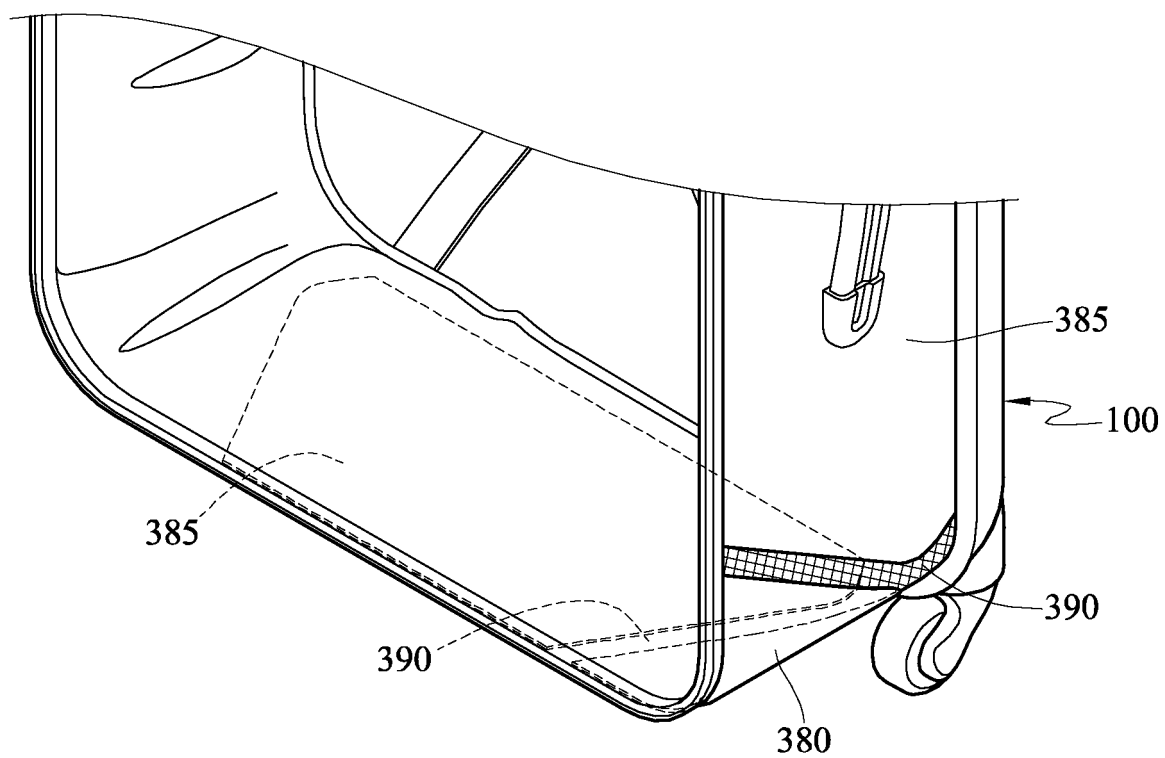


Fig 19A

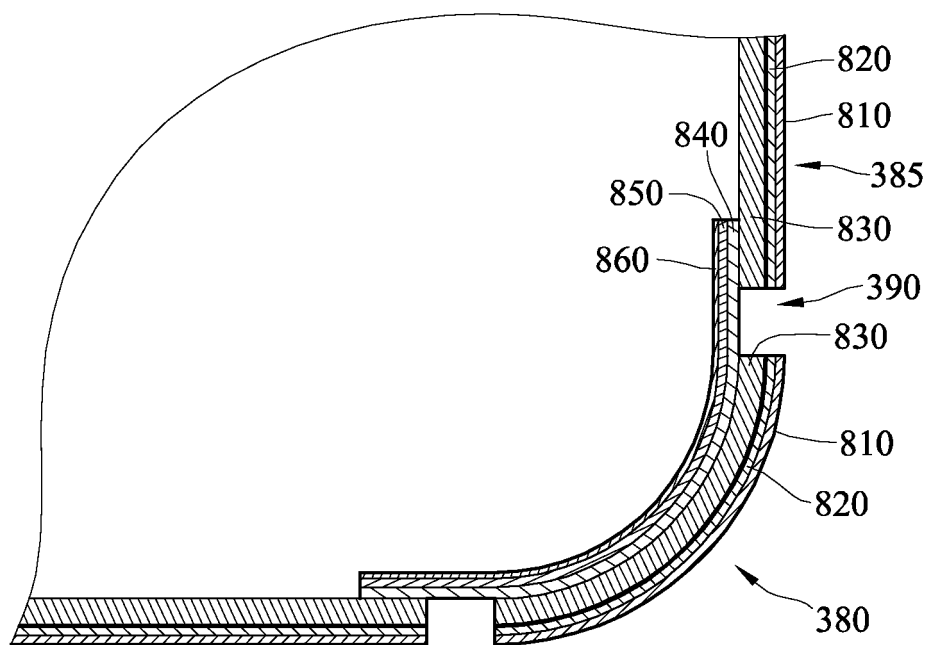


Fig 19B

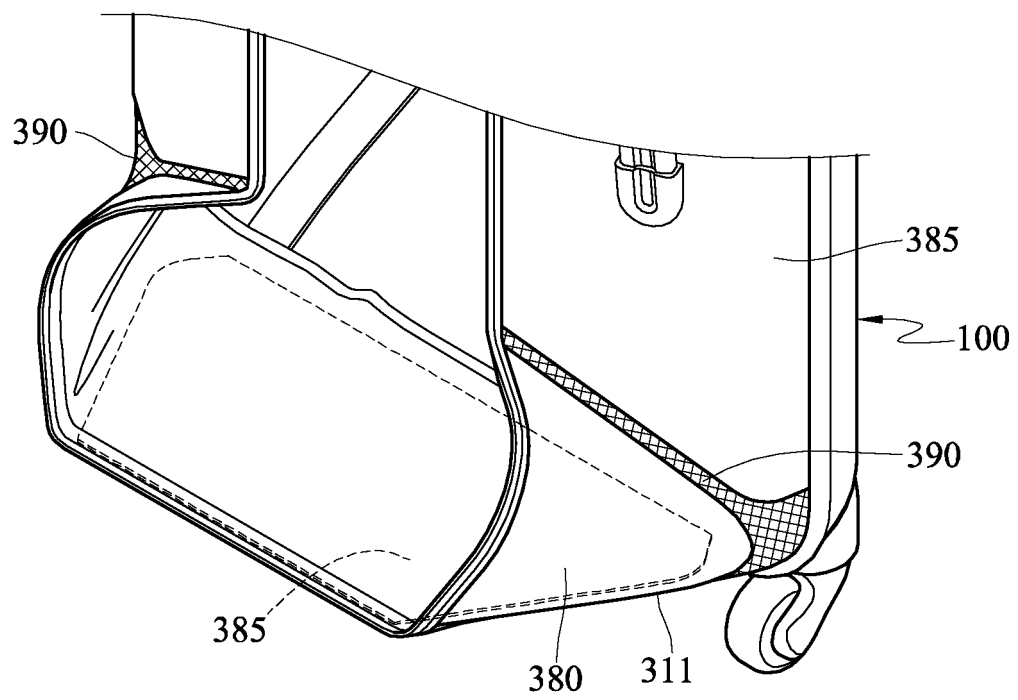


Fig 19C

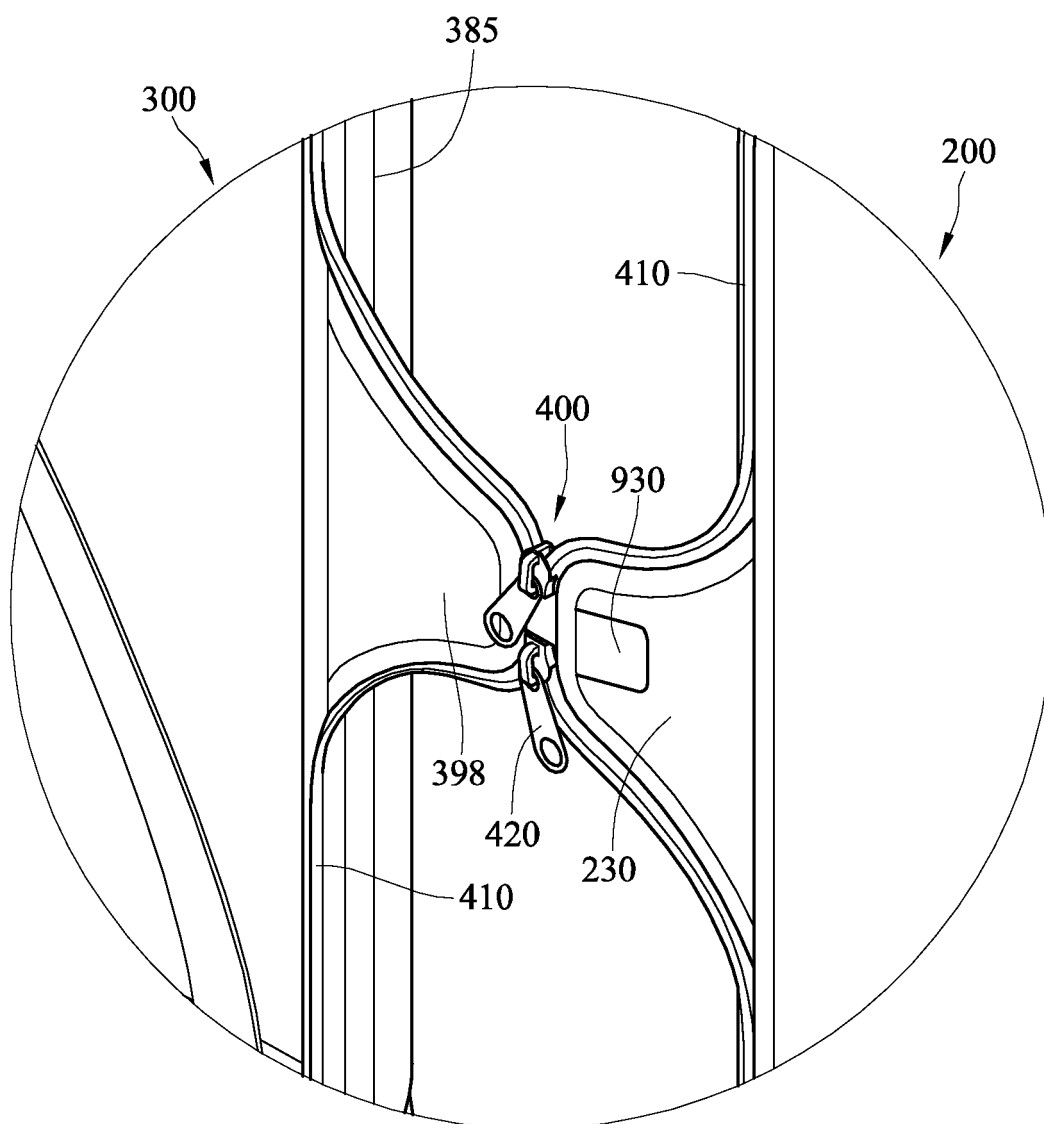
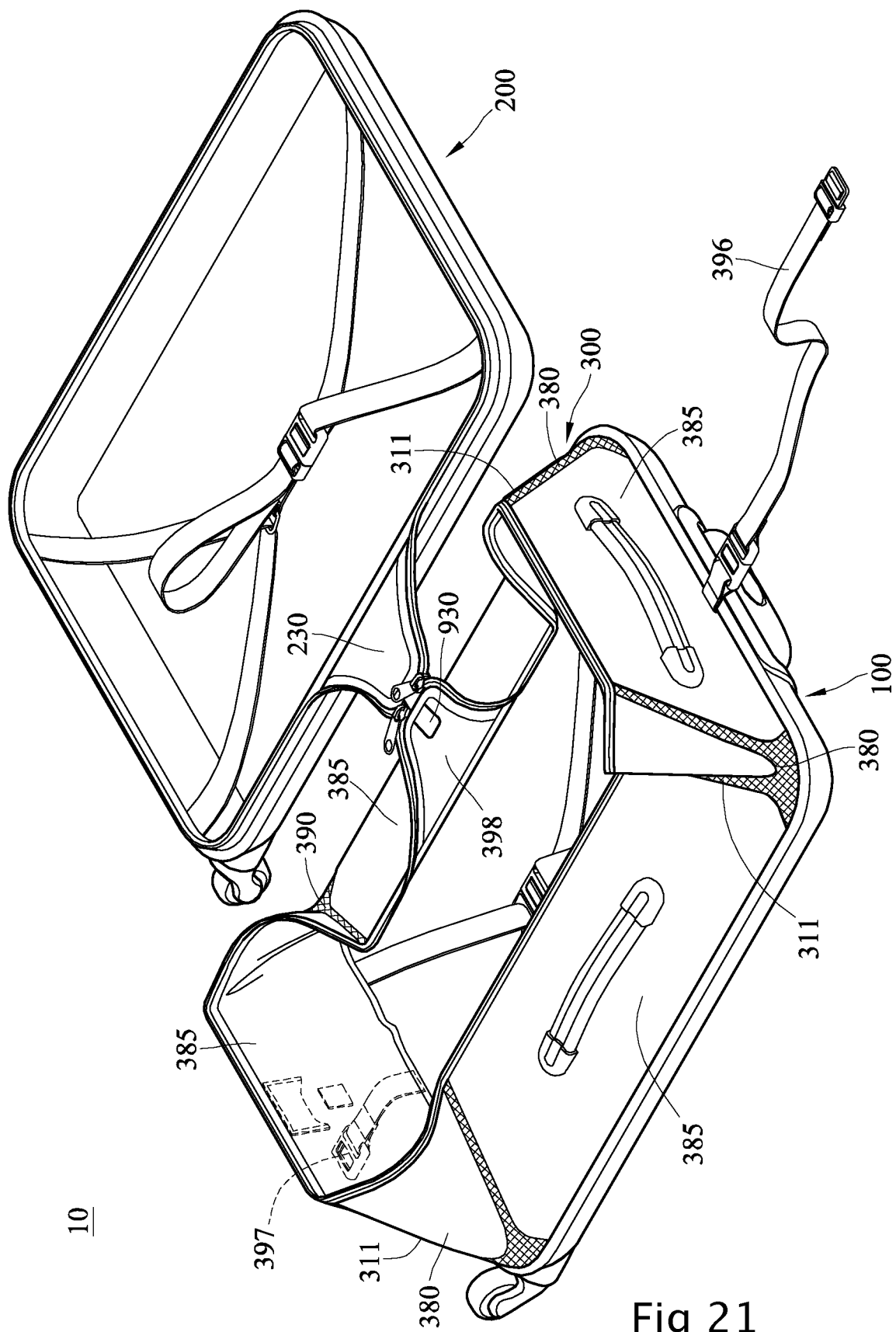


Fig 20



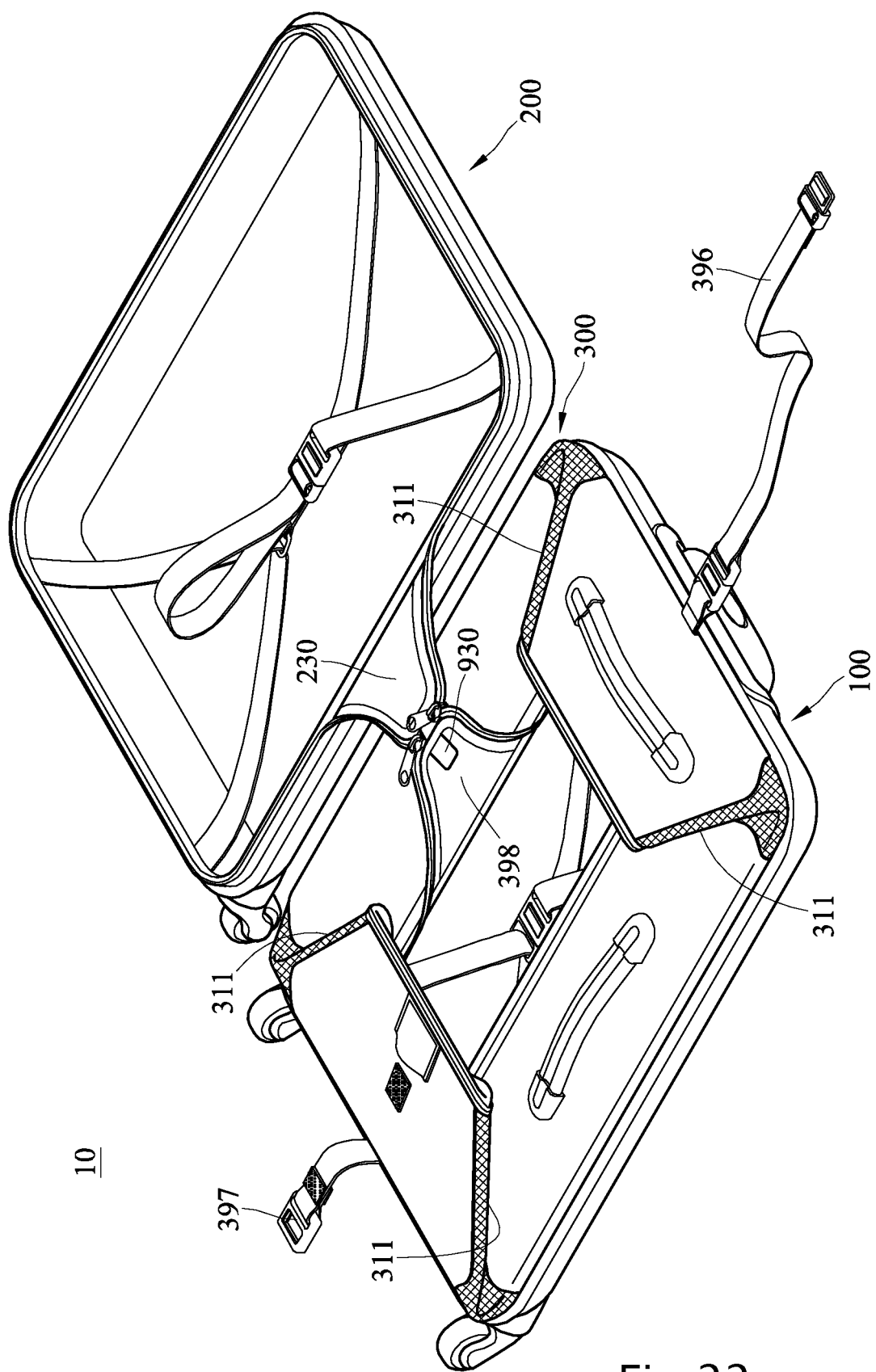


Fig 22

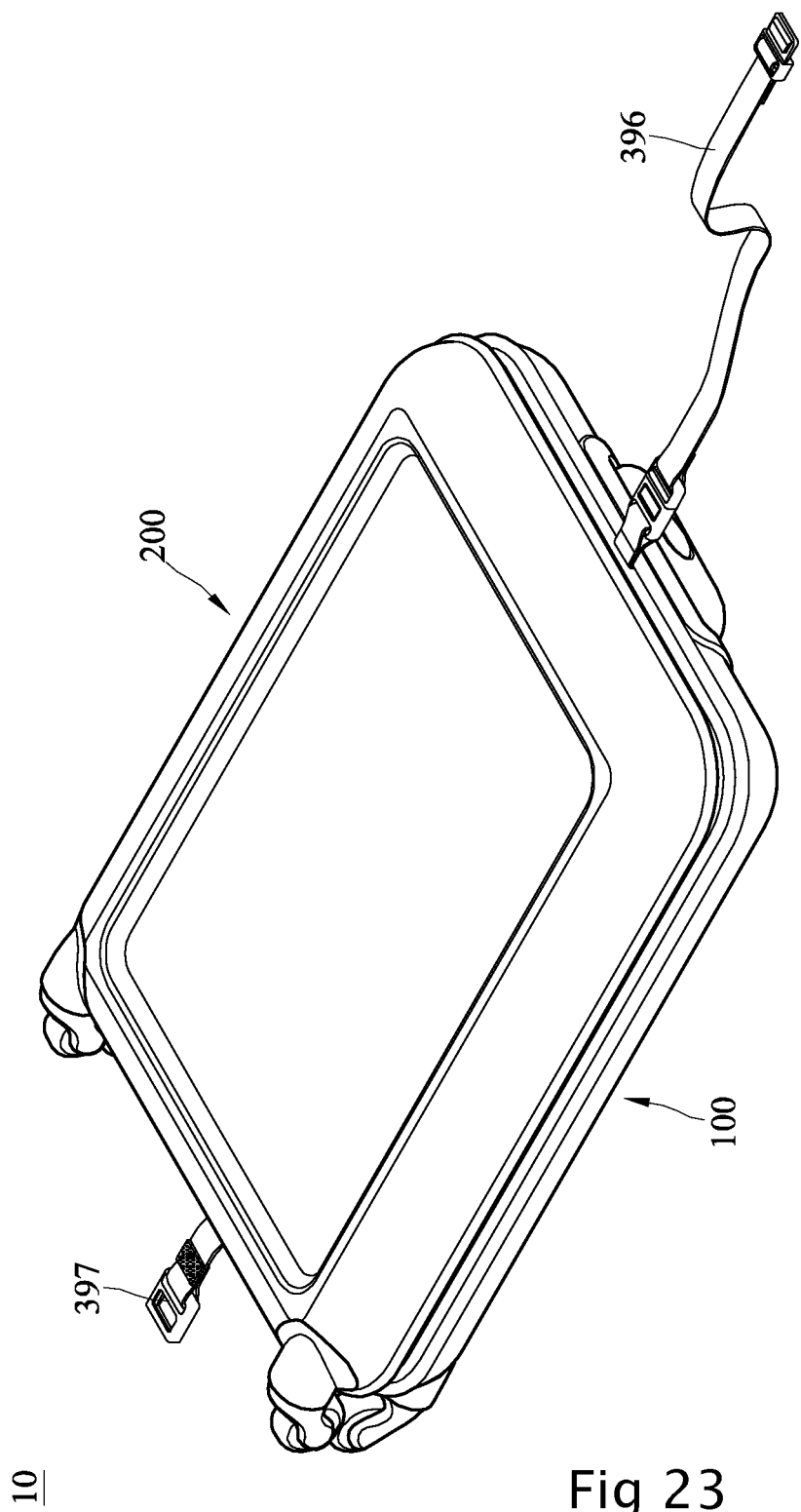


Fig 23

10

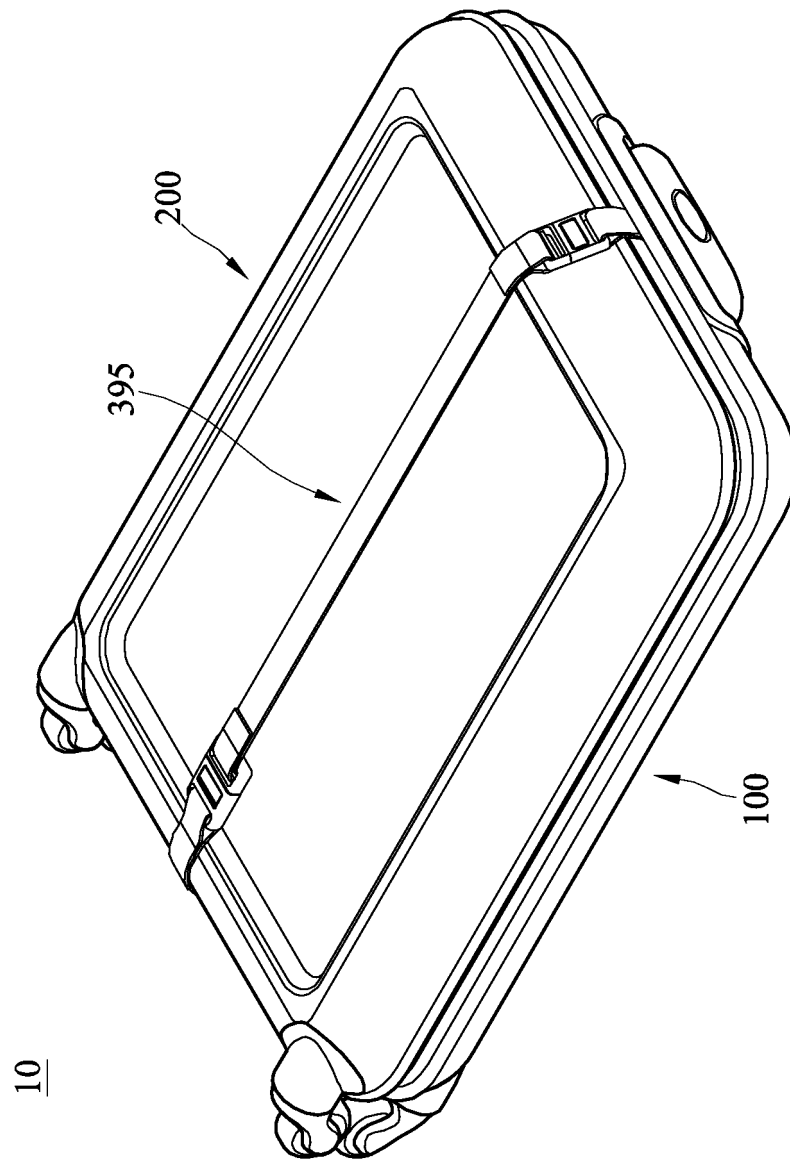


Fig 24

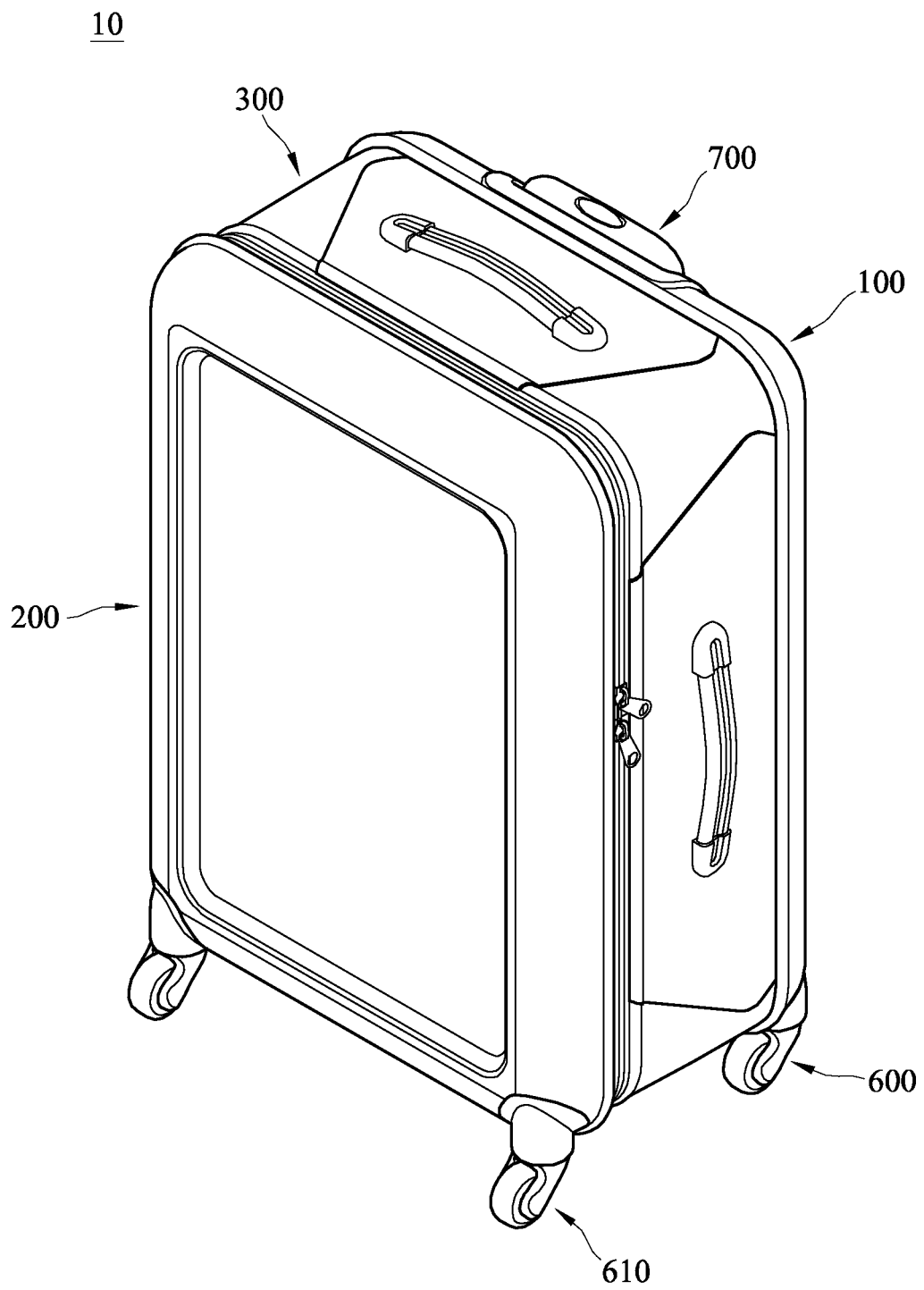


Fig 25

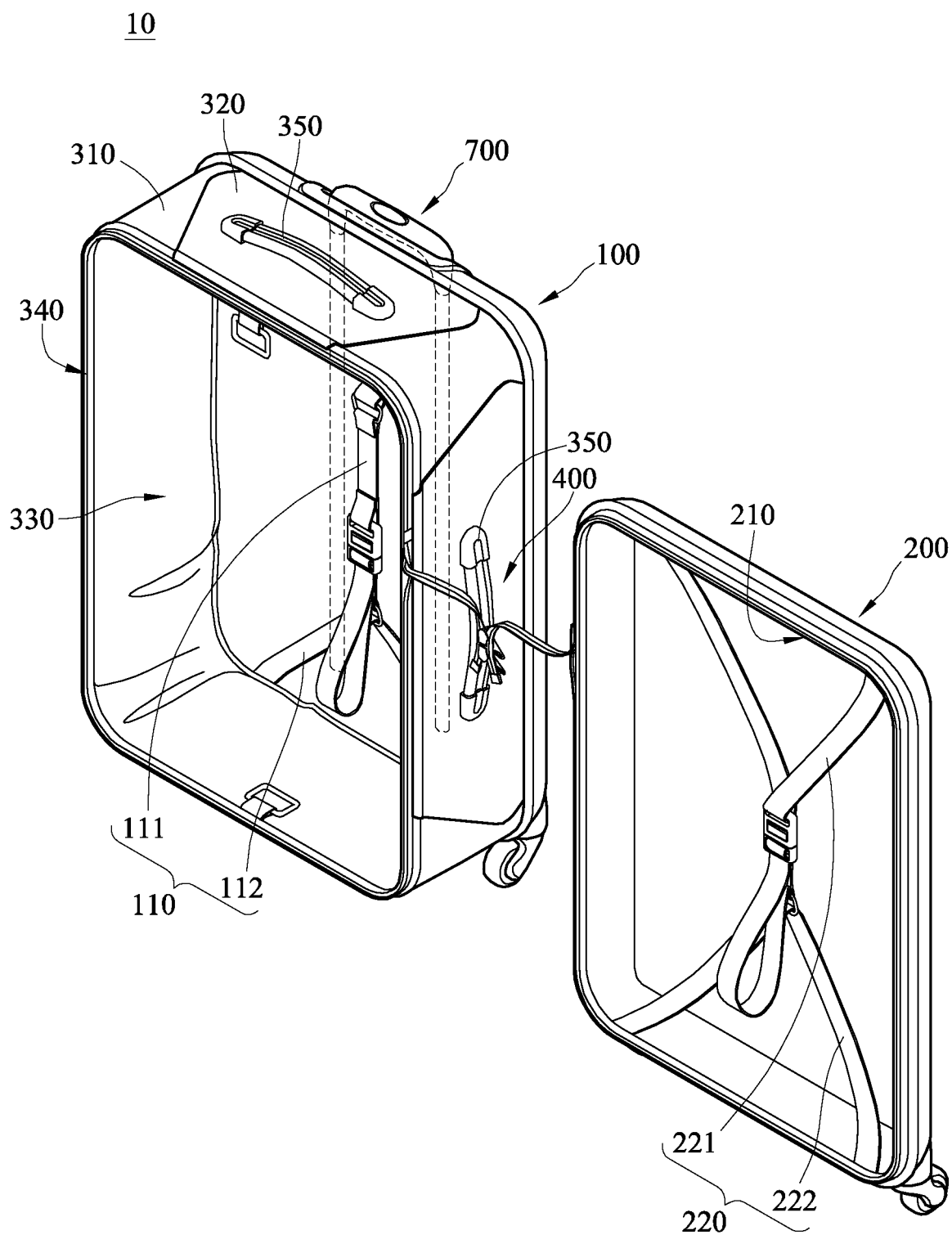


Fig 26

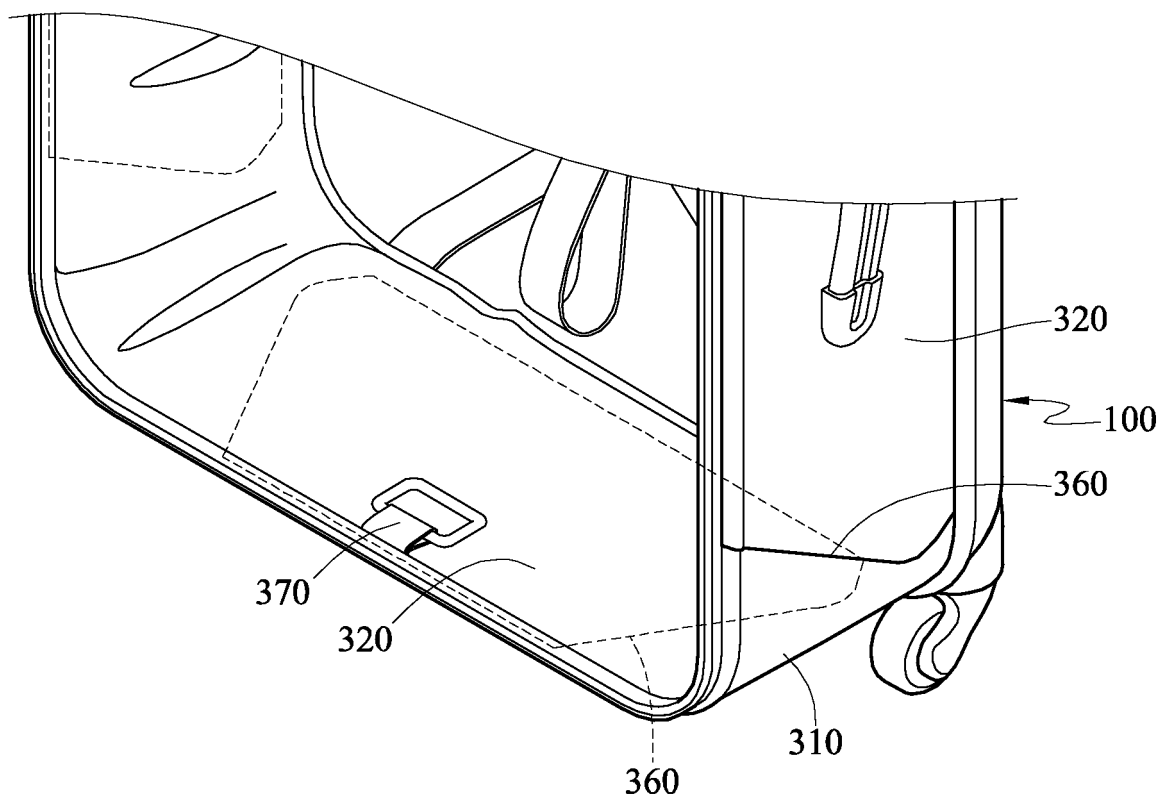


Fig 27A

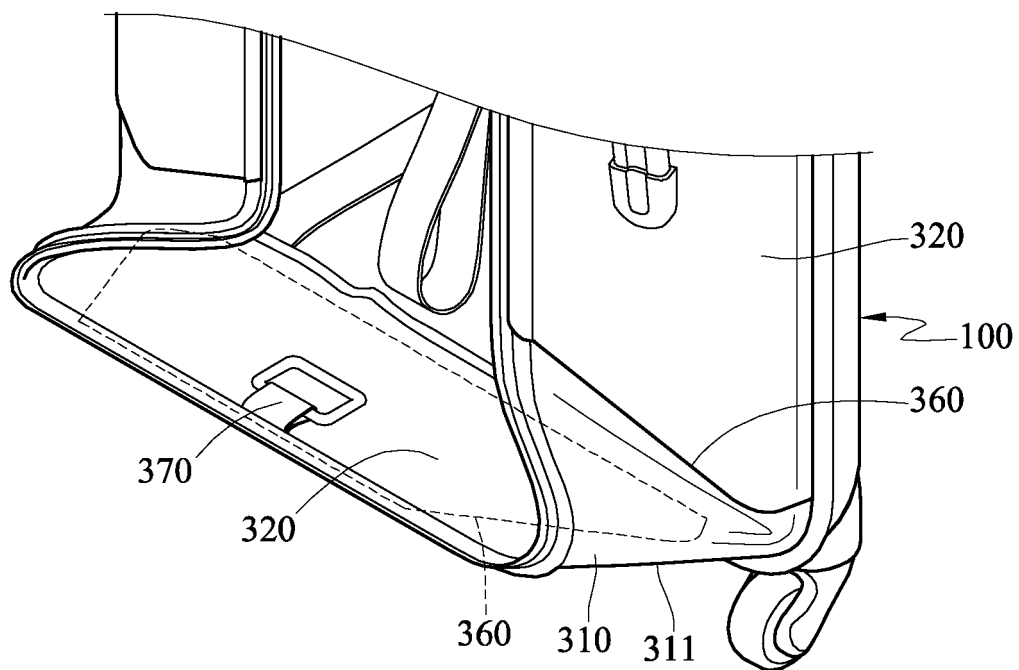


Fig 27B

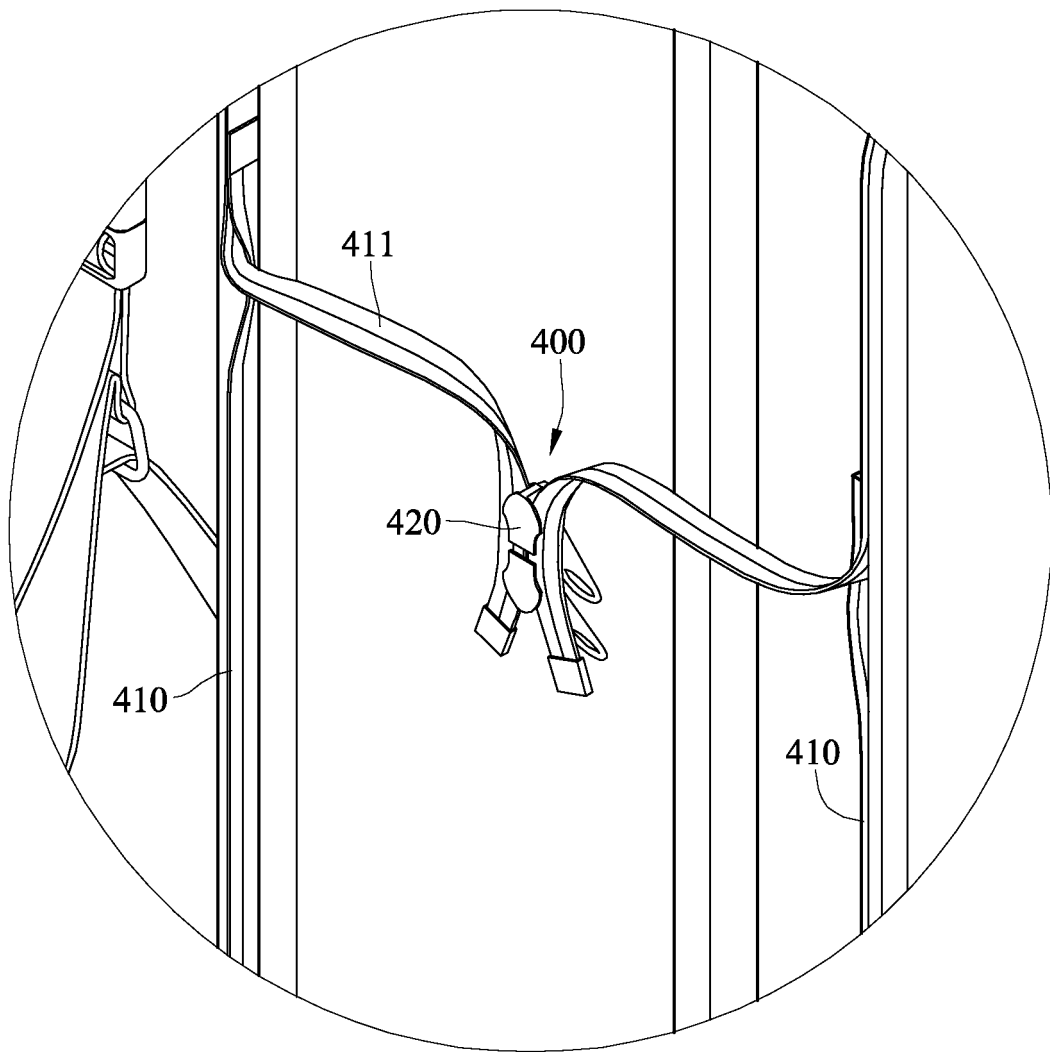


Fig 28

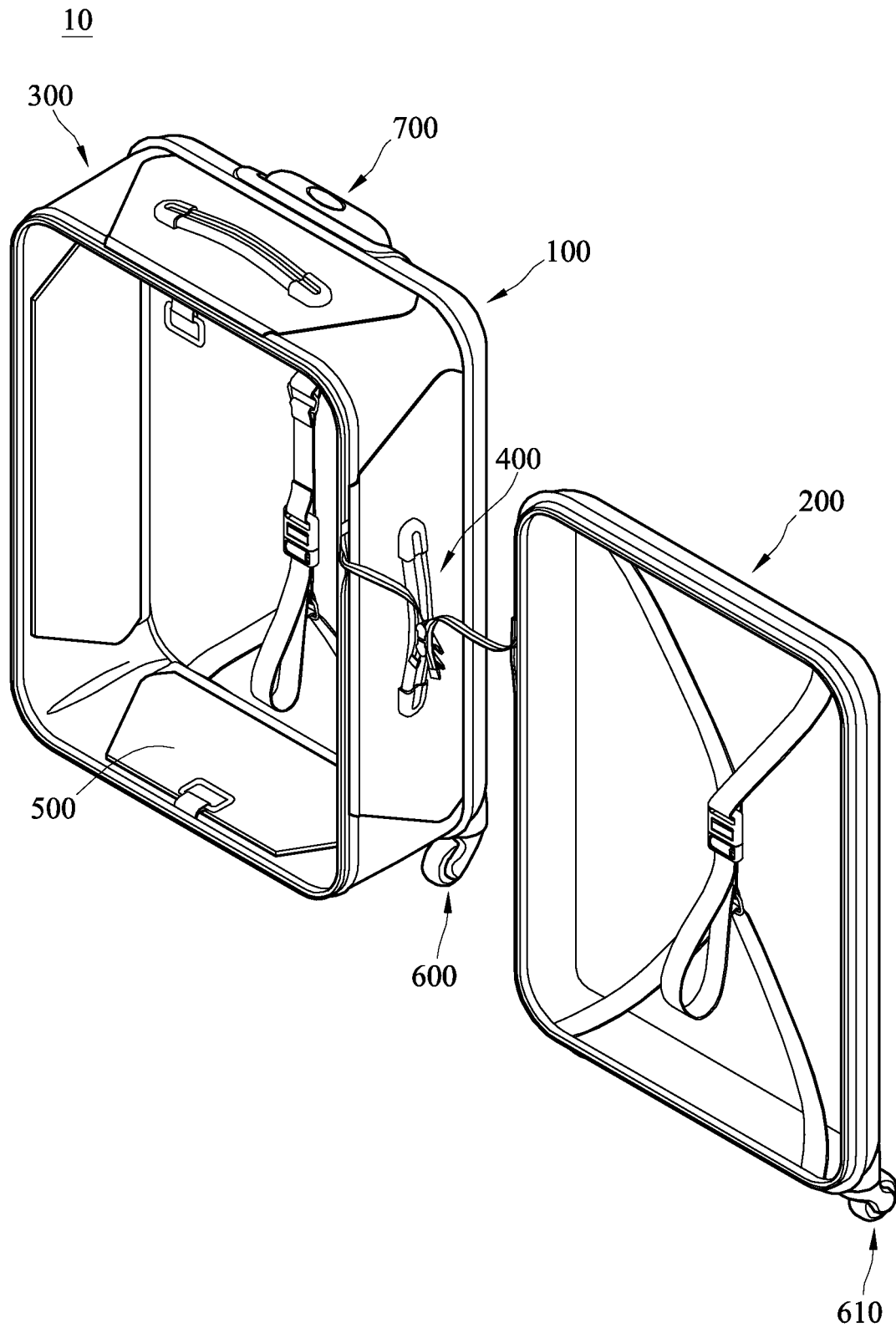


Fig 29

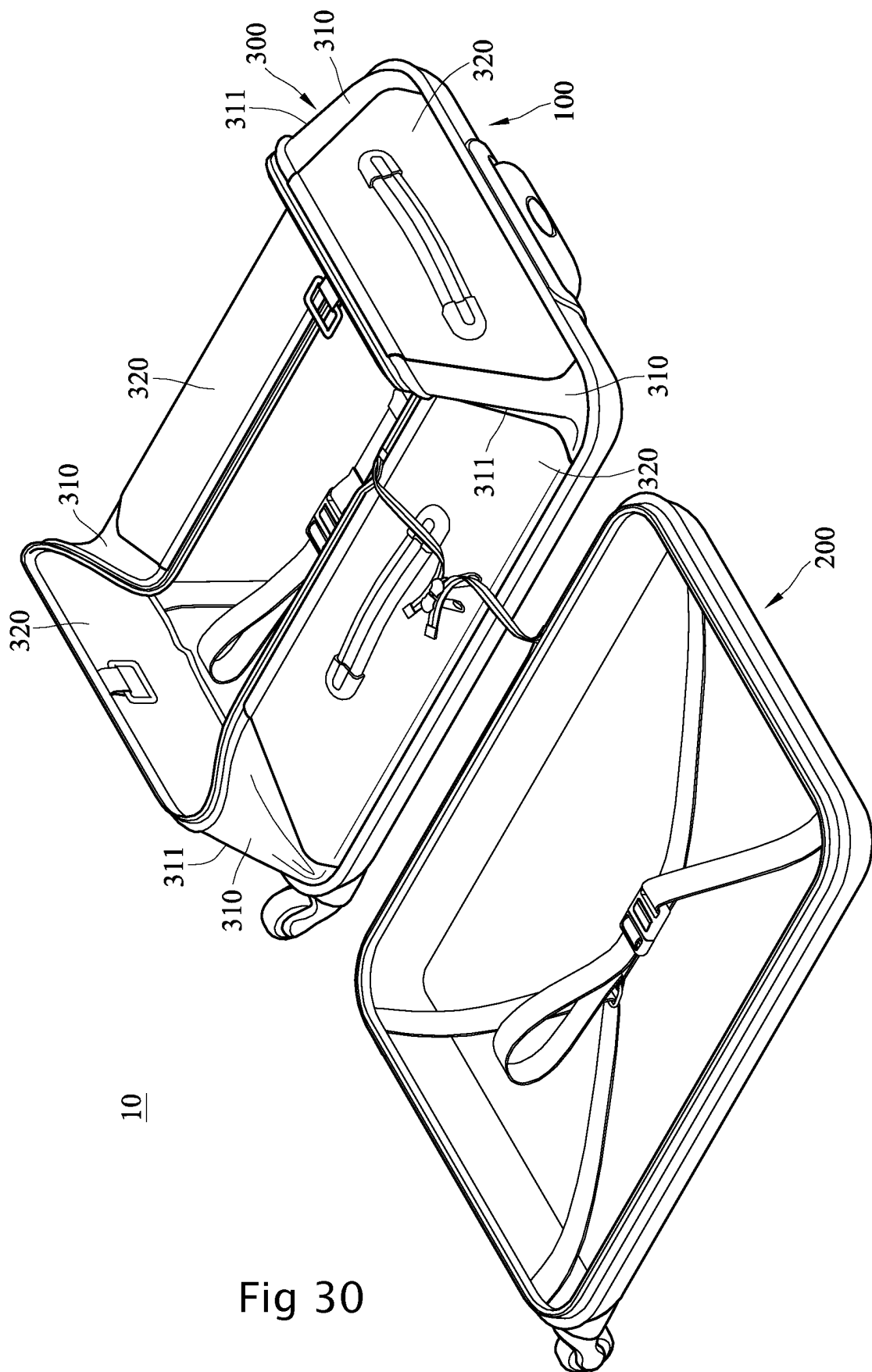


Fig 30

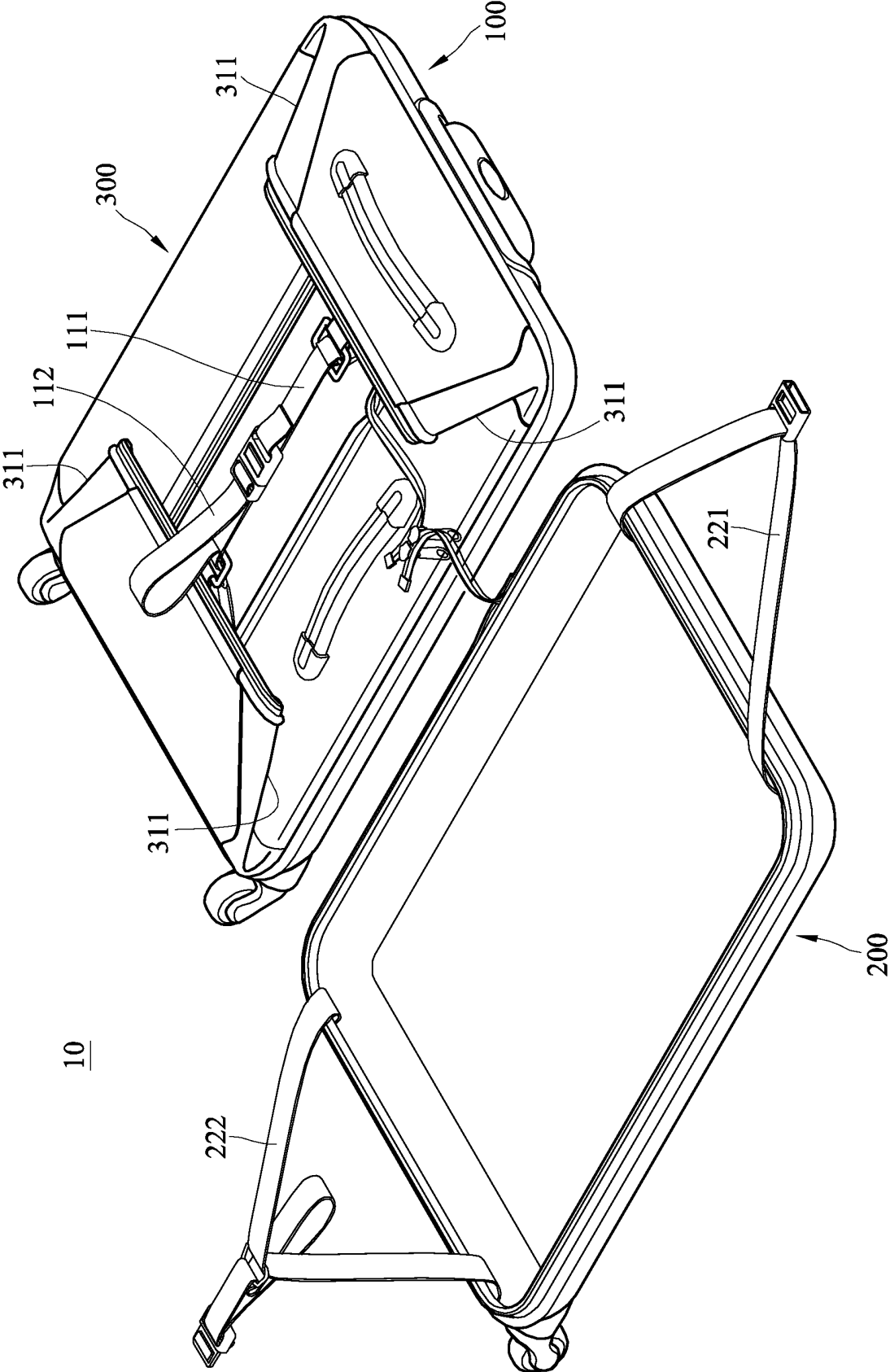


Fig 31

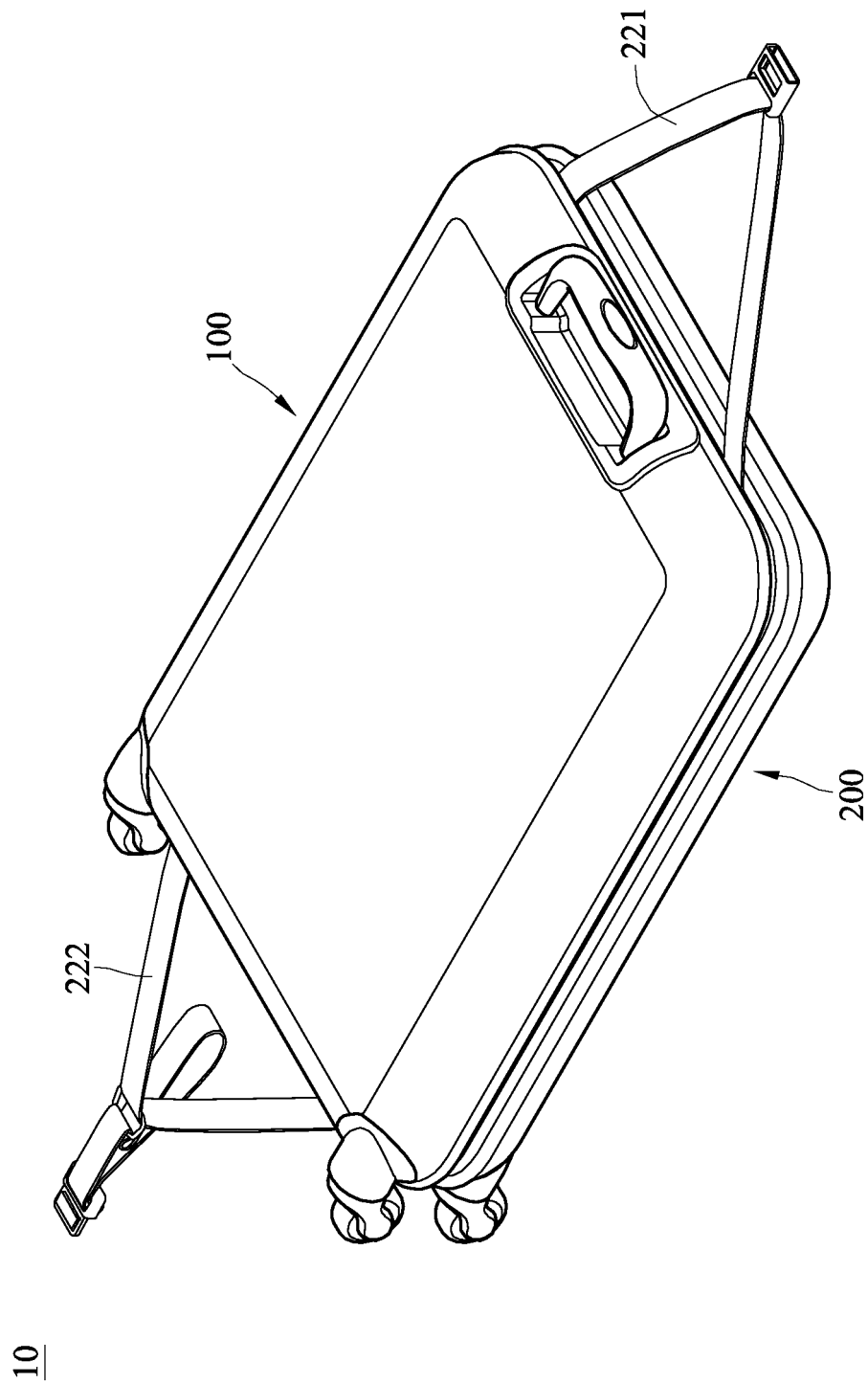


Fig 32

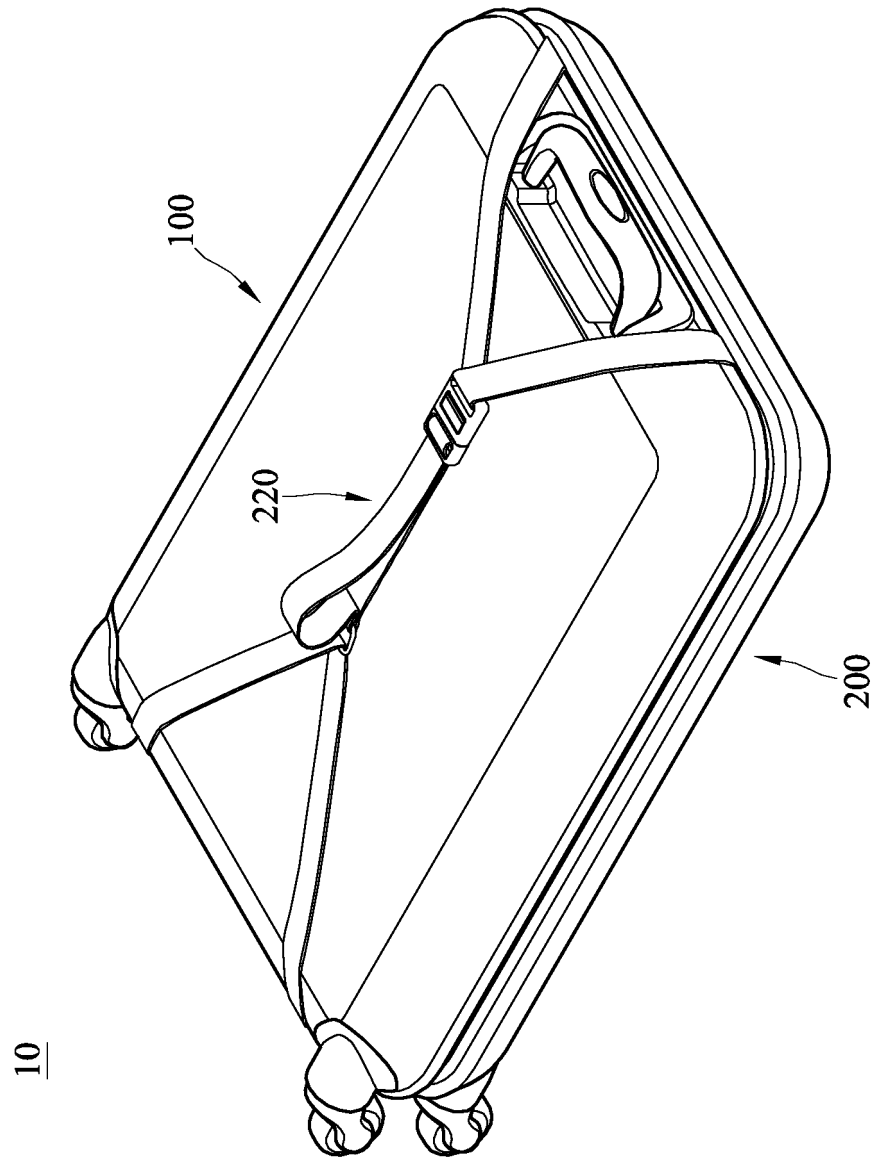


Fig 33

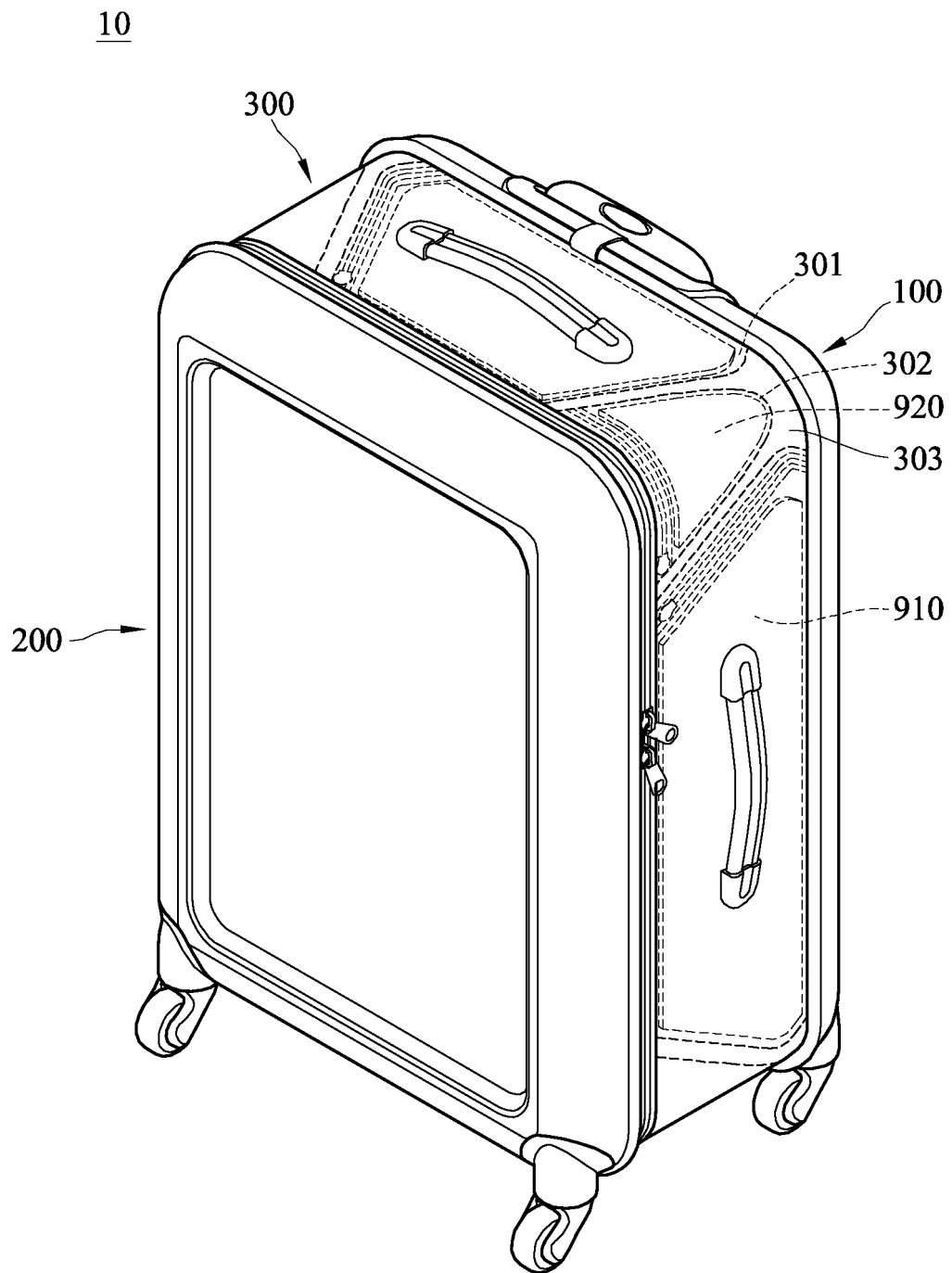


Fig 34

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 202222610 [0004]