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(54) Luggage wheel housing

(57) A luggage piece may include a main body (110) defining at least one compartment with a wheel housing joined to the main body (110). The wheel housing may include a first portion (125) and a second portion (130) with the first portion (125) and the second portion (130) defining an angle of greater than 90° and less or equal to approximately 140°. The angle may often be selected to be within the range of approximately 100° to approximately 120°. The first portion (125) and the second portion (130) may further be configured so that a wheel (120) joined to the wheel housing does not extend beyond a rear side of a main body (110) of the luggage piece. The wheel housing may further include a central portion (160) joined to the first and second portions (125, 130). The central portion (160) may define at least one axle hole (195) sized to receive a portion of a wheel axle (165) of the wheel (120) therein.

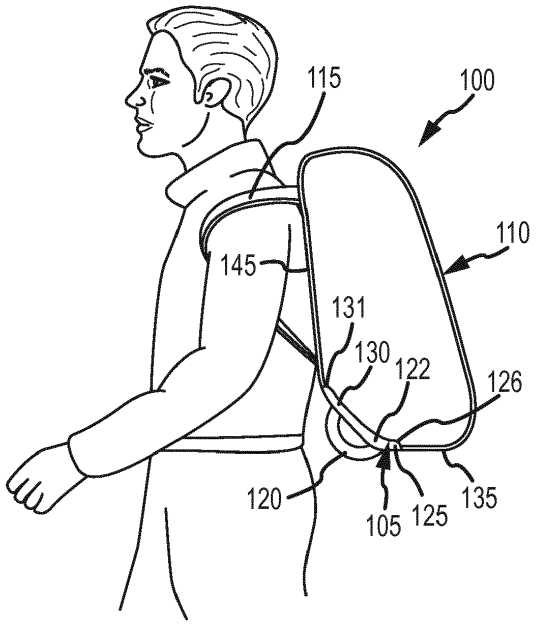

FIG.1

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit, under 35 U.S.C. § 119(e), of U.S. Provisional Application No. 61/486,086, entitled "Luggage Wheel Housing" and filed on May 13, 2011, the entire contents of which are hereby incorporated herein their entirety by reference.

TECHNOLOGICAL FIELD

[0002] The present disclosure generally relates to luggage, and more particularly to wheel housings for luggage.

BACKGROUND

[0003] Luggage pieces, such as suitcases, backpacks and duffel bags, are often used by travelers to transport items. When fully loaded, a luggage piece may be relatively heavy, thus making it difficult or undesirable to carry the luggage piece. To make a loaded luggage piece easier to transport, the luggage piece may include two or more wheels that allow a user to push or pull the luggage piece in a rolling manner along a support surface. For some wheeled luggage, the wheels extend beyond at least one outer surface of the luggage. Such an extension increases the luggage's dimensions, which can reduce the amount of space available for storing items in the luggage, especially for luggage subject to size restrictions such as carry-on luggage for airplanes.

SUMMARY

[0004] According to a first aspect of the present invention there is provided a wheel housing for a luggage piece, comprising:

a first portion joined to a second portion at a transition region, the first portion including a free end that is distal from the transition region, the second portion including a free end that is distal from the transition region, and the free end of the first portion is located at a different location than the free end of the second portion; and

the first portion extends away from the transition region to the free end of the first portion, the second portion extends away from the transition region to the free end of the second portion, and the first and second portions further extend away from the transition region in such a manner that the first and second portions define an angle of greater than 90° but less than approximately 140° where the angle is measured from a surface of the first portion that is proximate the free end of the first portion to a surface of the second portion that is proximate the free end of the second portion.

[0005] Preferably, the angle is equal to or greater than approximately 100° but less than or equal to approximately 120°.

[0006] Preferably, the angle is approximately 100°.

[0007] Preferably, the surface of the first portion is an inner facing surface, and the surface of the second portion is an inner facing surface.

[0008] Preferably, the surface of the first portion is substantially planar, and the surface of the second portion is substantially planar.

[0009] Preferably, the first portion and the second portion are integrally formed to define a single, continuous body.

[0010] Preferably, the first portion comprises a lower portion of the wheel housing or a lower leg of the wheel housing, and the second portion comprises an upper portion of the wheel housing or an upper leg of the wheel housing.

[0011] According to a further aspect of the invention, there is provided a luggage piece that includes a wheel housing according to any one of the first aspect of the invention.

[0012] Preferably, the luggage piece includes a main body defining at least one compartment; the main body includes a front outer surface, a rear outer surface that is spaced apart from the front outer surface, and a bottom outer surface that extends between the rear and front outer surfaces; the wheel housing is joined to the main body; and a wheel is operably joined to the wheel housing.

[0013] Preferably, the wheel housing further comprises a central portion joined to the first and second portions, the central portion including at least one axle hole sized to receive a portion of a wheel axle of the wheel therein.

[0014] Preferably, the central portion defines a recess configured to receive a portion of the wheel therein.

[0015] Preferably, the first portion and the second portion collectively define a slot configured to receive a portion of the wheel therethrough.

[0016] Preferably, the central portion comprises a pair of circular sector body portions that are spaced apart and joined together by an arched body portion.

[0017] Preferably, in the wheel housing, each of the circular sector body portions include a transition edge segment positioned between a first edge segment and a second edge segment, the first edge segment joined to the first portion, the second edge segment joined to the second portion, and an angle of each of the circular sector body portions is greater than 90° where the angle of each of the circular section body portions is measured from the first edge segment to the second edge segment.

[0018] Preferably, the first portion and the second portion are configured so that a rear edge of a wheel joined to the wheel housing aligns approximately with the rear outer surface of the main body of the luggage piece.

[0019] Preferably, the first portion and the second portion are configured so that a wheel joined to the wheel housing does not extend beyond the front outer surface

or the rear outer surface of the main body of the luggage piece.

[0020] Preferably, the luggage piece further comprising at least one shoulder strap joined to the main body.

[0021] Preferably, the wheel and the at least one shoulder strap are positioned on the same side of the main body of the luggage piece.

[0022] Preferably, the surface of the first portion abuts and substantially conforms to a portion of the bottom outer surface of the main body, and the surface of the second portion abuts and substantially conforms to a portion of the rear outer surface of the main body.

[0023] Preferably, the wheel housing further comprises a lip that extends generally transversely from at least one of the first portion and the second portion, and the lip covers a portion of a sidewall of the luggage piece where the sidewall extends between the front and rear outer surface of the luggage piece.

[0024] According to a further aspect of the invention, there is provided a wheel housing for a luggage piece, comprising:

a first portion joined to a second portion at a transition region, the first portion including a free end that is distal from the transition region, the second portion including a free end that is distal from the transition region, and the free end of the first portion is located at a different location than the free end of the second portion; and

the first portion extends away from the transition region to the free end of the first portion, the second portion extends away from the transition region to the free end of the second portion, the second portion includes a first segment that extends away from the first portion at an acute angle and a second segment that extends away from the first segment at an acute angle, and the first and second portions further extend away from the transition region in such a manner that the first and second portions define an angle of approximately 90° where the angle is measured from a surface of the first portion that is proximate the free end of the first portion to a surface of the second portion that is proximate the free end of the second portion.

[0025] Described herein are wheel housings for use on pieces of luggage, such as suitcases, backpacks, duffels, and so on. The luggage pieces may include a main body defining at least one compartment with the wheel housing joined to the main body.

[0026] In some embodiments, the wheel housing may include a first portion and a second portion. The first portion may be joined to the second portion at a transition region. The first portion including a free end that is distal from the transition region. The second portion may include a free end that is distal from the transition region. The free end of the first portion may be located at a different location than the free end of the second portion. The first portion may extend away from the transition region to the free end of the first portion. The second portion may extend away from the transition region to the free end of the second portion.

[0027] In some embodiments, the first and second portions may further extend away from the transition region in such a manner that the first and second portions define an angle of greater than 90° but less than 140°. The angle may be measured from a surface of the first portion that is proximate the free end of the first portion to a surface of the second portion that is proximate the free end of the second portion. In some embodiments, the angle may be equal to or greater than approximately 100° but less than or equal to approximately 120°. In yet other embodiments, the angle may be approximately 100°. In still other embodiments, the second portion may include a first segment that extends away from the first portion at an acute angle and a second segment that extends away from the first segment at an acute angle. In these embodiments, the first and second portions may further extend away from the transition region in such a manner that the first and second portions define an angle of approximately 90° where the angle is measured from a surface of the first portion that is proximate the free end of the first portion to a surface of the second portion that is proximate the free end of the second portion.

[0028] In some embodiments of the wheel housing, the surface of the first portion is an inner facing surface, and the surface of the second portion is an inner facing surface. In some embodiments of the wheel housing, the surface of the first portion may be substantially planar, and the surface of the second portion may be substantially planar. In yet further embodiments of the wheel housing, the first portion and the second portion may be integrally formed to define a single, continuous body. In still yet further embodiments, the first portion of the wheel housing may take the form of a lower portion or a lower leg of the wheel housing, and the second portion may take the form of an upper portion or an upper leg of the wheel housing.

[0029] In some embodiments, the wheel housing may further include a central portion joined to the first and second portions. The central portion may define at least one axle hole sized to receive a portion of a wheel axle of the wheel therein. In still further embodiments, the central portion may define a recess or cavity configured to receive a portion of the wheel therein. In yet further embodiments, the central portion may include a pair of circular sector body portions that are spaced apart and joined together by an arched body portion. Each of the circular sector body portions may include a transition edge segment positioned between a first edge segment and a second edge segment. The first edge segment may be joined to the first portion. The second edge segment may be joined to the second portion. An angle of each of the circular sector body portions may be greater than 90°. The angle of each of the circular section body portions may be measured from the first edge segment

to the second edge segment.

[0030] The luggage piece may include a main body defining at least one compartment. The main body may include a front outer surface, a rear outer surface that is spaced apart from the front outer surface, and a bottom outer surface that extends between the rear and front outer surfaces. The wheel housing may be joined to the main body, and a wheel may be operably joined to the wheel housing. In some embodiments, the first portion and the second portion of the wheel housing may collectively define a slot configured to receive a portion of the wheel therethrough.

[0031] In yet further embodiments, the first portion and the second portion of the wheel housing may be configured so that a rear edge of a wheel joined to the wheel housing aligns approximately with the rear outer surface of the main body of the luggage piece. In still further embodiments, the first portion and the second portion of the wheel housing may be configured so that a wheel joined to the wheel housing does not extend beyond the front outer surface or the rear outer surface of the main body of the luggage piece. In yet further embodiments, the surface of the first portion of the wheel housing may abut and substantially conform to a portion of the bottom outer surface of the main body of the luggage piece, and the surface of the second portion of the wheel housing may abut and substantially conform to a portion of the rear outer surface of the main body of the luggage piece. In still yet further embodiments, the wheel housing may also include a lip that extends generally transversely from at least one of the first portion and the second portion. The lip may cover a portion of a sidewall of the luggage piece where the sidewall extends between the front and rear outer surface of the luggage piece.

[0032] In yet further embodiments, the luggage piece may include at least one shoulder strap joined to the main body. In some of these embodiments, the wheel and the at least one shoulder strap may be positioned on the same side of the main body of the luggage piece.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] Fig. 1 shows a schematic side elevation view of a luggage piece, such as a backpack, carried by a user and incorporating an implementation of a wheel housing.

[0034] Fig. 2 shows a partial schematic side elevation view of a luggage piece with a conventional wheel housing.

[0035] Fig. 3 shows a partial schematic side elevation view of a luggage piece that incorporates an implementation of a wheel housing that is similar to the wheel housing shown in Fig. 1.

[0036] Fig. 4 shows a side elevation view of a conventional wheel housing.

[0037] Fig. 5 shows a side elevation view of a wheel housing that is similar to the wheel housings shown in Figs. 1 and 3.

[0038] Fig. 6 shows a bottom perspective view of the wheel housing shown in Fig. 5.

[0039] Fig. 7 shows a top perspective view of the wheel housing shown in Fig. 5.

[0040] Fig. 8 shows another top perspective view of the wheel housing shown in Fig. 5.

[0041] Fig. 9 shows a schematic side elevation view of a wheel housing with an angle greater than 90° joined to a portion of a main body of a luggage piece.

[0042] Fig 10 shows a schematic rear elevation view of the portion of the luggage piece shown in Fig. 9.

[0043] Fig. 11 shows a cross-section view of the portion of the luggage piece shown in Fig. 9, viewed along line 11-11 in Fig. 10.

[0044] Fig. 12 shows a schematic side elevation view of another version of a wheel housing.

[0045] Fig. 13 shows a schematic side elevation view of yet another version of a wheel housing.

[0046] Fig. 14 shows a schematic side elevation view of still yet another version of a wheel housing.

DETAILED DESCRIPTION

[0047] Described herein are wheel housings for use with a suitcase, a backpack, a duffel bag or other types of luggage. The wheel housing may include a lower portion, projection, or leg that extends from an upper portion, projection or leg. In some embodiments, the wheel housing may further include a central portion that is joined to the lower portion, projection, or leg and that may also be joined to the upper portion, projection or leg.

[0048] The lower portion, projection, or leg and the upper portion, projection, or leg may collectively define an angle of greater than 90°. This angle may be measured from an inner or an outer facing surface of the lower portion, projection, or leg that is proximate a free end of the lower portion, projection or leg to an inner or an outer facing surface of the upper portion, projection, or leg that is proximate a free end of the upper portion, projection, or leg. Further, an angle measured between these inner or outer facing surfaces may be greater than 90°. In some embodiments, the angle may be selected to be within a range of slightly greater than 90° up to 140° with the angle often selected from the 100° to 120° range.

[0049] The lower portion, projection, or leg and the upper portion, projection, or leg may be joined to each other proximate the central portion. In some implementations, the lower portion, projection, or leg and the upper portion, projection, or leg may be formed as a continuous body. The central portion of the wheel housing may be configured to receive at least a portion of the wheel within a space defined by the central portion. The central portion may further define one or more holes that receive an axle of the wheel, thereby allowing the wheel to rotate relative to the wheel housing about an axis defined by the axle. In some implementations, the central portion may be formed as a single continuous body with the lower portion, projection, or leg and the upper portion, projection, or leg.

[0050] The luggage pieces that incorporate the wheel housings described herein may have hard or soft sides and may be formed from any type of material or construction used to form luggage pieces, including, but not limited to, fabrics (e.g., nylon), plastics (e.g., acrylonitrile butadiene styrene ("ABS"), polycarbonate, polypropylene, polyethylene, etc.), natural materials (e.g., plywood), metals, or some combination thereof. The luggage pieces may further include structures, such as lining or internal panels, positioned within the main enclosed space that divide it into two or more compartments. The luggage pieces may also include any of the following: two or more wheels for moving the a luggage piece along a support surface, one or more carry handles to lift or otherwise move the luggage piece, a telescoping handle to facilitate moving the luggage piece along the support surface via the wheels, shoulder or other straps to facilitate supporting a luggage piece from one or more of a user's shoulders, edge piping to help protect the outer surface of a luggage piece from scuffs and abrasions, and at least one perimeter zipper to access the main enclosed space and any pockets or secondary or supplemental enclosed spaces.

[0051] Fig. 1 shows a schematic side elevation view of a luggage piece 100 that incorporates an implementation of a wheel housing 105. With reference to Fig. 1, the luggage piece 100 may take the form of a backpack or the like. The luggage piece 100 may include main body 110 that defines at least one compartment for receiving items to be carried in the luggage piece 100. The luggage piece 100 may further include a pair of shoulder or other straps 115 joined to the main body 110 to allow a user to support the luggage piece 100 on the user's shoulders. The luggage piece 100 may further include at least two wheels 120. At least two of these wheels 120 may be positioned on the same side of the luggage piece 100 as the shoulder straps 115, thus resulting in the wheels 120 being positioned proximate the user when the user supports the luggage piece 100 on the user's shoulders via the shoulder straps 115. Each wheel 120 may be joined to the main body 110 of the luggage piece via a respective wheel housing 105.

[0052] Each wheel housing 105 may include a lower or first portion 125, which may also be referred to as a lower projection or a lower leg, and an upper or second portion 130, which may also be referred to as an upper projection or an upper leg. The lower portion 125 of the wheel housing 105 may extend generally parallel to a lower or bottom surface 135 of the main body 110 of the luggage piece 100, and the upper portion 130 of the wheel housing 105 may extend in a generally upward or vertical direction relative to the lower portion 125 of the wheel housing 105 and may generally be conformed to match an outer surface of a rear side 145 of the luggage piece 100. The lower portion 125 may be joined to the upper portion 130 at a transition region 122. The lower portion 125 and the upper portion 130 may be integrally formed to define a single, continuous body, with the lower portion 125 differentiated from the upper portion 130 based on the direction that such portion generally extends relative to the main body 110 of the luggage piece 100 (i.e., the lower portion 125 generally extends parallel to the bottom side 135 of the main body 110 while the upper portion 130 extends generally upwardly or vertically relative to the bottom side 135 of the main body 110).

[0053] The lower portion 125 and the upper portion 130 of the wheel housing 105 may each include a free end 126, 131 that is distal the end of each portion 125, 130 that is adjacent the other portion 125, 130. In other words, the lower portion 125 may include a free end 126 that is distal from the transition region 122, and the upper portion 130 may include a free end 131 that is distal from the transition region 122. The free end 126 of the lower portion 125 may be located at a different location than the free end 131 of the upper portion 130. The lower portion 125 may extend away from the transition region 122 to the free end 126 of the lower portion 125. The upper portion 130 may extend away from the transition region 122 to the free end 131 of the upper portion 130. When extending away from the transition region 122, the lower portion 125 may extend in generally a first direction away from the transition region 122, and the upper portion 130 may extend in a second direction away from the transition region 122. The first direction may be different than the second direction. For example, the first direction may be generally horizontal relative to the transition region 122, and the second direction may be upright upward relative to the transition region 122.

[0054] The lower portion 125 and the upper portion 130 may be configured such that an angle defined by the lower and upper portions 125, 130 is greater than 90° but less than or equal to approximately 140°, with the angle often falling within a range that equal to or greater than approximately 100° and less than or equal to approximately 120°. The angle defined by the lower and upper portions 125, 130 is measured between inner facing surfaces, or outer facing surfaces, of each portion 125, 130 that are proximate their respective free ends 126, 131. In some embodiments, the first and second directions that the lower and upper portions 125, 130 of the wheel housing 105 extend away from the transition region 122 may also be used to identify the angle formed by the lower and upper portions 125, 130 of the wheel housing 105. Such a configuration where the angle formed by the lower and upper portions 125, 130 is greater than 90° may advantageously position the wheels 120 to not extend beyond the rear side 145 of the luggage piece 100. By not extending the wheels 120 beyond the rear side 145 of the luggage piece 100, the amount of storage space in the luggage piece 100 may be greater than the space available in a comparable luggage piece in which the wheels extend beyond the rear surface. Further, when the luggage piece 100 takes the form of a backpack or the like and the wheels 120 are located on the same side of the backpack as the shoulder or other straps 115, such positioning of the wheels 120 may result

in the wheels 120 positioned away from a user's clothing and/or body when the user carries the backpack on the user's shoulders via the shoulder straps 115.

[0055] Figs. 2 and 3 show schematic representations of how the storage space of the luggage piece may be increased when the wheels 120 do not extend beyond the rear side 145 of the main body 110 of the luggage piece. Specifically, Fig. 2 shows a luggage piece 200 that uses a conventional wheel housing 205, while Fig. 3 shows a comparable luggage piece 300 that uses a wheel housing 105 similar to the wheel housing 105 shown in Fig. 1. For elements of Figs. 2 and 3 that have components similar to those in Fig. 1, like reference numbers may be used in the description and figures for those components.

[0056] With reference to Fig. 2, an angle as measured from inner facing surfaces of the lower and upper portions 125, 130 of the conventional wheel housing 205 that are proximate the free ends 126, 131 of these portions 125, 130 of the conventional wheel housing 205 is generally 90°. As such, the wheel 120 joined to the conventional wheel housing 205 extends beyond the rear side 145 of the luggage piece 200. This effectively reduces the depth of the main body 110 of the luggage piece 200 by the distance the wheel 120 extends beyond the rear side 145 since luggage depth dimensions for compliance with regulations, such as airline carry-on bag size regulations, are measured based on the distance from the furthest apart features on the rear and front sides 145, 150 of the luggage piece. In the case of the luggage piece 200 shown in Fig. 2, the furthest point of the rear side 145 of the luggage piece 200 is the rear edge 155 of the wheel 120, which effectively reduces the maximum permissible depth of main body 110 of the luggage piece 200 by the distance Δ that the wheel 120 extends beyond the rear side 145 of the luggage piece 200.

[0057] Turning to Fig. 3, the luggage piece 300 incorporates a wheel housing 105 in which an angle is greater than 90° where the angle is measured from the inner facing surfaces of the lower and upper portions 125, 130 that are proximate the free ends 126, 131 of these portions 125, 130. In this configuration, the wheel 120 can be positioned so that its rear edge 155 generally aligns with the rear side (i.e., the rear outer surface) 145 of the main body 110 of the luggage piece 300. In other words, the wheel 120 does not extend, or minimally extends, beyond the rear side 145 of the main body 110 of the luggage piece 300. Also, the wheel 120 does not extend beyond the front side (i.e., the front outer surface) 150 of the luggage piece 300. This, in turn, allows for the depth of the main body 110 above the wheel housing 105 to be maximized, thus increasing the storage capacity of the main body 110 of the luggage piece 300 compared to the luggage piece 200 shown in Fig. 2 by approximately the distance Δ that the wheel 120 extends beyond the rear side 145 of the luggage piece 200 in Fig. 2. For example, in Fig. 2 the wheel 120 extends beyond the rear side 145 of the main body 110 of the luggage piece 200 by about 2 cm. Thus, the main body 110 of the luggage piece 300 shown in Fig. 3 has a depth dimension that is approximately 2 cm greater than the luggage piece 200 shown in Fig. 2. In a typical luggage piece, a 2 cm greater depth may translate into an approximately 11 % volume increase of storage capacity for the luggage piece.

[0058] The size of the angle defined by the lower portion 125 and the upper portion 130 of the wheel housing 105 may be a function of one or more than the following: the diameter of the wheel, position of the wheel axle relative to the rear outer edge 145 of the main body 110, and the distance that the upper portion 130 extends above the wheel 120. Generally, as the wheel diameter decreases, the position of the wheel axle from the rear side 145 of the main body 110 increases, or the distance that the upper portion 130 extends above the wheel 120 increases, the size of the angle may be closer to 90°. Similarly, as the wheel diameter increases, the position of the wheel axle from the rear side 145 of the main body 110 decreases, or the distance that the upper portion 130 extends above the wheel 120 decreases, the size of the angle may generally be further away from, and greater than, 90°. In many embodiments, the angle will fall within a range of approximately 100° to approximately 120°, with 100° being commonly used when the wheel has a diameter of approximately 70 mm. While 100° to 120° represents a common range for the size of the angle, the angle may fall anywhere within a range from greater than 90° to less than or equal to approximately 140°.

[0059] Figs. 4 and 5 show side elevation views of wheel housings 405, 505 similar to those shown in Fig. 2 and 3, respectively. For elements of Figs. 4 and 5 that have components similar to those in Figs. 1-3, like reference numbers may be used in the description and figures for these components.

[0060] Like the wheel housings 205, 105 in Figs. 2 and 3, the wheel housings 405, 505 shown in Figs. 4 and 5 each include lower or first portions 125, which may also be referred to as lower projections or legs, and upper or second portions 130, which may also be referred to as upper projections or legs. Further, for the wheel housing 505 shown in Fig. 5, the lower and upper portions 125, 130 may define an angle that is greater than 90° as measured between substantially planar inner facing surfaces of each of the lower and upper portions 125, 130 that are located proximate the free ends 126, 131 of their respective lower and upper portions 125, 130. Yet further, the wheel 120 joined to this wheel housing 505 does not extend beyond the rear side 145 or rear outer surface of a main body 110 of a luggage piece when the wheel housing 505 with the wheel 120 is joined to the luggage piece. The wheel 120 also does not extend beyond a front side 150 or a front outer surface of the main body 110 of a luggage piece.

[0061] With continued reference to Figs. 4 and 5, the conventional wheel housing 405 (Fig. 4) and the wheel housing 505 (Fig. 5) used on the luggage pieces 200, 300 shown in Figs. 2 and 3 may each further include a

central portion 160 joined to the lower and upper portions 125, 130. In some implementations, the central portion 160, the upper portion 130 and the lower portion 125 may define a single continuous body. In other implementations, the central, upper and/or lower portions 160, 130, 125 may be separate components that are joined by a suitable connection method, such as by welds, adhesives, or fasteners.

[0062] With reference to Figs. 5, 7 and 8, the central portion 160 may generally include a pair of generally circular sector planar body portions 162 that are spaced apart from each other and joined by a generally arched body portion 164 that extends between circumferential outer edge portions of the circular section planar body portions 162. The arched body portion 164 may further generally extend from the lower portion 125 of the wheel housing 505 to the upper portion 130 of the wheel housing 505 with a first end joined to the lower portion 125 and a second end, which is distal the first end, joined to the upper portion 130.

[0063] Each circular sector planar body portion 162 may include first and second edge segments 166, 168 that are joined by a transition edge segment 172. The first and second edge segments 166, 168 may be generally linear to match generally planar sections of the lower and upper portions 125, 130, and the transition edge segment 172 may generally be curved to match curved transition sections 128, 133 of the lower and upper portions 125, 130. Each circular sector planar body portion 162 may be joined to the lower portion 125 of the wheel housing and the upper portion 130 of the wheel housing at these first, second, and transition edge segments 166, 168, 172, with the circular sector planar body portion 162 joined to the lower portion 125 at the first edge segment 166 and a portion of the transition edge segment 172 and joined to the upper portion 130 at the second edge segment 168 and the remaining portion of the transition edge segment 172.

[0064] For the conventional wheel housing 405 shown in Fig. 4, the circular sector planar body portions 162 may be approximately 90° as measured from the first edge segment 166 of the circular sector planar body portion 162 to the second edge segment 168 of the circular sector planar body portion 162. For the wheel housing 505 shown in Fig. 5, the circular sector planar body portions 162 may be greater than 90° as measured from the first edge segment 166 of the circular sector planar body portion 162 to the second edge segment 168 of the circular sector planar body portion 162. As with the angle defined by the lower and upper portions 125, 130 of the wheel housing 505, the circular sector planar body portions 162 may range in size from 90° to 140°, with the size often falling within the range of 100° to 120°.

[0065] With reference to Fig. 6, the central portion 160 may further define a circular sector recess or cavity 175 sized to receive a circular sector portion of the wheel 120 therein. A circular sector recess or cavity 175 sized to receive a circular sector portion of the wheel 120 allows the wheel to freely rotate about a rotation axis defined by an axle 165 that joins the wheel 120 to the wheel housing 505.

[0066] While the recess or cavity 175 defined by the central portion 160 of the wheel housing 505 is identified as circular sector in shape, any shaped recess may be used so long as at least a portion of the wheel 120 can be received within the recess or cavity 175, and the wheel 120 is not inhibited from rotating about its rotation axis. Similarly, while the central portion 160 is shown and described as a pair of circular sector planar body portions 162 joined by a generally arch shaped body portion 164, other shapes may be used so long as the central portion 160 is sufficiently large to define a recess or cavity 175 that can receive a portion of the wheel 120 therein and allow the wheel 120 to rotate about its rotation axis.

[0067] With continued reference to Fig. 6, the lower and upper portions 125, 130 of the wheel housing 505 may collectively define an arc-shaped slot 180 proximate the circular sector recess or cavity 175 defined by the central portion 160. The slot 180 may be sized to have a sufficient length and width to allow a portion of the wheel 120 to pass through the slot 180 and into the circular sector recess or cavity 175 and also allow the wheel 120 to rotate freely about its rotation axis.

[0068] The lower and upper portions 125, 130 of the wheel housing 505 may each include at least one section 127, 132 that has a substantially planar outer facing surface. Each of these sections 127, 132 may be positioned at or near a respective free end 126, 131 of the lower and upper portions 125, 130 and may extend towards the transition region 122 of the wheel housing 505. Each of these sections 127, 132 may further span between the right and left edge of the wheel housing 505 as these sections 127, 132 extend from near or at the free end 126, 131 of their respective lower and upper portions 125, 130 to the transition region 122 of the wheel housing 505.

[0069] The substantially planar section 127 of the outer facing surface for the lower portion 125 may be configured to parallel a lower or bottom outer surface 135 of the luggage piece when the wheel housing 505 is joined to the luggage piece. Similarly, the substantially planar section 132 of the outward facing surface for the upper portion 130 may be generally configured to parallel or otherwise conformingly match a rear outer surface 145 of the luggage piece when the wheel housing 505 is joined to the luggage piece. However, the substantially planar sections 127, 132 of the outward facing surfaces of the lower and upper portions 125, 130 of the wheel housing 505 do not need to parallel or otherwise conformingly match corresponding outer surfaces 135, 145 of the luggage piece. Yet further, the outer facing surfaces of the lower and upper portions 125, 130 of the wheel housing 505 may take any desired shape, including, but not limited to, omitting any substantially planar sections.

[0070] Transition sections 128, 133 for each of the lower and upper portions 125, 130 may define the transition

region 122 for the wheel housing 505 and may be located proximate that slot 180. The transition section 128 for the lower portion 125 may end at the transition section 133 for the upper portion 130. At least some of the outer facing surfaces of each transition section 128, 133 may be curved. Further, these curved outer facing surfaces may collectively define a curved outer facing surface for the wheel housing 505 as the lower portion 125 of the wheel housing 505 transitions into the upper portion 130 of the wheel housing 505.

[0071] Turning to Figs. 7 and 8, inner facing surfaces of the lower and upper portions 125, 130 of the wheel housing 505 may generally conform to or otherwise match the portions of the outer surface of the luggage piece that abut the inner facing surfaces of the lower and upper portions 125, 130 for the wheel housing 505. Further, the lower and upper portions 125, 130 of the wheel housing 505 may each include at least one section 129, 134 that has a substantially planar inner facing surface. Each of these sections 129, 134 may be positioned at or near a respective free end 126, 131 of the lower and upper portions 125, 130 and may extend towards the transition region 122 of wheel housing 505. Each of these sections 129, 134 may further span between the right and left edges of the wheel housing 505 as these sections 129 ,134 extend from near or at the free ends 126, 131 of their respective lower and upper portions 125, 130 to the transition region 122 of wheel housing 505. In some embodiments, the inner facing surface of the lower portion 125 may be substantially planar for a significant amount (e.g., greater than 50%) of the total inner facing surface of the lower portion 125, and the inner facing surface of the upper portion 130 may be substantially planar for a significant amount (e.g., greater than 50%) of the total inner facing surface of the upper portion 130. In other embodiments, the inner facing surface of the lower portion 125 may be substantially planar for 50% or less of the total inner facing surface of the lower portion 125, and the inner facing surface of the upper portion 130 may be substantially planar for 50% or less of the total inner facing surface of the lower portion 125.

[0072] The substantially planar section of the inner facing surface for the lower portion 125 may be configured to parallel or otherwise conformingly match a lower or bottom outer surface 135 of the luggage piece when the wheel housing 505 is joined to the luggage piece. Similarly, the substantially planar section of the inner facing surface for the upper portion 130 may be generally configured to parallel or otherwise conformingly match a rear outer surface 145 of the luggage piece when the wheel housing 505 is joined to the luggage piece.

[0073] The angle between the lower and upper portions 125, 130 may be measured from the substantially planar section 129 of the inner facing surface of the lower portion 125 of the wheel housing 505 to the substantially planar section 134 of the inner facing surface of the upper portion 130. Further, as described above, the lower and upper portions 125, 130 may be configured so that this angle is greater than 90° but less than or equal to approximately 140°, with the angle often falling within a range of 100° to 120°. Yet further, the angle may often be approximately 100°, especially when the wheel diameter is approximately 70 mm.

[0074] At least some of the inner facing surfaces of each transition section 128, 133 may be curved. Further, these curved inner facing surfaces may collectively define a curved inner facing surface for the wheel housing 505 as the lower portion 125 of the wheel housing 505 transitions into the upper portion 130 of the wheel housing 505.

[0075] In some embodiments, the inner facing surfaces of the lower and upper portions 125, 130 of the wheel housing 505 may generally parallel their corresponding outer facing surfaces. In such embodiments, the thickness of the wheel housing 505 as measured from the outer facing surface to the inner facing surface of the wheel housing 505 may be generally constant in the lower and upper portions 125, 130 of the wheel housing 505. However, in other embodiments, the inward facing surfaces of the lower and upper portions 125, 130 may not parallel their respective outer facing surfaces. In these embodiments, the thickness of the wheel housing 505 as measured from the outer facing surface to the inner facing surface of the wheel housing 505 may vary in the lower portion 125, the upper portions 130, or both portions of the wheel housing 505.

[0076] The lower portion 125 and the upper portion 130 may each include a lip 185, 190. The lip 185, 190 may be positioned on either the left or the right side of the wheel housing 505. Further, the lip 185, 190 may extend generally at an angle or transversely from the substantially planar sections 129, 134 of the inner facing surfaces of the lower and upper portions 125, 130. The lip 185, 190 may further be configured to cover at least a portion of the right or left sidewall, which extend between the front and rear sides or outer surfaces, of the main body 110 of the luggage piece when the wheel housing 505 is joined to the luggage piece. In these embodiments of the wheel housing 505 that include a lip 185, 190, the wheel housing 505 may thus effectively cover portions of the bottom, rear, and left or right outer surfaces of the main body 110 of the luggage piece when the wheel housing 505 is joined to the luggage piece.

[0077] With continued reference to Figs. 7 and 8, the central portion 160 of the wheel housing 505 may further define a pair of axle holes 195. One of the axle holes 195 may be defined in one of the circular sector planar body portions 162, and the other axle hole 195 may be defined in the other circular sector planar body portion 162. The axle holes 195 may generally be co-axially aligned and configured to receive the wheel axle 165 therethrough. The wheel axle 165 may support the wheel 120. The wheel axle 165 may be configured to allow the wheel 120 to rotate relative to the wheel housing 505 about a rotational axis defined by the axle 165. In some embodiments, the wheel 120 may be fixed to the axle 165. In

such embodiments, the axle 165 and the wheel 120 may simultaneously rotate relative to the wheel housing 505. In these embodiments, bearings or other such elements may be positioned within the axle holes 195 between the axle 165 and the central portion 160 of the wheel housing 505 to allow the axle 165 to rotate smoothly relative to the wheel housing 505. In other embodiments, the wheel axle 165 may be fixedly joined to the wheel housing 505, and the wheel 120 may rotate about the wheel axle 165. In these embodiments, bearings or other such elements may be positioned between the wheel 120 and the wheel axle 165 to allow the wheel 120 to rotate smoothly about the wheel axle 165.

[0078] The wheel housing 505 may further include one or more projections 170. Each projection 170 may extend from the lower portion 125 or the upper portion 130 of the wheel housing 505. Each projection 170 may further be cylindrical shaped or any other desired shape and may define a hole sized to receive a fastener, such as a screw, bolt or the like. The hole may be threaded or unthreaded. Each fastener 615 (see Fig. 11) may be used to join one or more plates 610 or other rigid structures (see Fig. 11) to the wheel housing 505. Materials that form the main body 110 of the luggage piece, such as fabric, polypropylene ("PP"), polyethylene ("PE"), or other rigid or semi-rigid boards, or formed plastic or other rigid materials, may be sandwiched, or otherwise positioned, between the wheel housing 505 and the one or more plates or other rigid structures to join the wheel housing to the main body 110 of the luggage piece. Other methods may also used to join the wheel housing 505 to the main body 110 of the luggage, including, but not limited to, welding, adhering, or stitching the wheel housing 505 to the main body 110.

[0079] Figs. 9-11 show one example of the main body 110 of a luggage piece 600 joined to a wheel housing 605, which may be similar to any of the wheel housings shown in Figs. 1, 3 and 5 or any other wheel housing described herein that positions the wheel 120 so that it does not extend beyond the rear edge 145 of the luggage piece. The main body 110 may include a front side or front outer surface 150, a rear side or rear outer surface 145 that is spaced apart from the front side or front outer surface 150, and a bottom side or bottom outer surface 135 that extends between the front side or front outer surface 150, and the rear side or rear outer surface 145. Further, the front, rear, and bottom sides may define at least a portion of the a main compartment or enclosed space of the luggage piece.

[0080] With reference to Figs. 9-11, the central portion 160 of the wheel housing 605 may be received through a hole defined by the main body 110 so that the central portion 160of the wheel housing is positioned within an enclosed space, such as the main compartment, defined by the main body 110 of the luggage piece 600. With continued reference to Fig. 9, the wheel 120 that is operably joined to the wheel housing 605 does not extend beyond the furthest rear edge or rear outer surface 145 of the main body 110. Further, in this implementation, the rear edge 155 of the wheel 120 does not align with the furthest rear edge or rear outer surface 145 of the main body 110. Further, the axle hole location in the wheel housing 605, for receiving the axle 165 of the wheel 120, is positioned away from the perimeter or outer edge or rim of the wheel housing 605 such that less of the wheel perimeter is exposed outside the wheel housing 605 to further reduce the profile of the wheel 120 relative to the wheel housing 605, while allowing a generally larger diameter wheel to be utilized.

[0081] With reference to Fig. 11, a plate 610 with a shape that generally conforms to the shape of the inner facing surface of the lower and upper portions 125, 130 of the wheel housing 605 may be joined to the wheel housing 605. To join the plate 610 to the wheel housing 605, the plate 610 may include slotted holes that may be aligned with the holes formed in the projections 170 of the wheel housing 605. Fasteners 615, such as screws, bolts, or the like, may then be passed through the aligned slotted holes in the plate 610 and the holes in the projections 170 of the wheel housing 605 to join the plate 610 to the wheel housing 605. The plate 610 may further include a central portion slot that is sufficiently long and wide to allow the central portion 160 of the wheel housing 605 to pass therethrough when the plate 610 is joined to the wheel housing 605.

[0082] When joined to the wheel housing 605, the plate 610 may be positioned within an enclosed space, such as the main compartment, defined by the main body 110 of the luggage piece 600. Further, holes may be formed in the main body 110 of the luggage piece 600 to receive the projections 170 of the wheel housing 605 therethrough so that the projections 170 of the wheel housing 605 can extend from an outer surface of the main body 110 of the luggage piece 600 to the enclosed space of the luggage piece 600 that contains the plate 610. Structural support elements 620, such as PP, PE, or other plastic sheets or honeycomb boards, liners 625, and outer materials 630, such as fabrics or the like, for the luggage piece 600 may be sandwiched between the joined wheel housing 605 and the plate 610.

[0083] Figs. 12-14 shows schematic side elevation views of various other possible wheel housings that result in a wheel not extending beyond an outer rear surface 145 of a luggage piece when the wheel housing is joined to the luggage piece.

[0084] With reference to Fig. 12, this version of the wheel housing 705 is generally similar to the previously described wheel housings except an upper or second portion 130 of the wheel housing includes two distinct segments 710, 715 and a central portion 160 of the wheel housing 705 may be omitted if desired. Thus, in this version of the wheel housing 705, axle holes 195 are formed in the transition region 122 of the wheel housing 705 where the lower and upper portions 125, 130 of the wheel housing 705 are joined together in order to receive the axle 165 for a wheel 120 that is joined to the wheel hous-

ing 705. With respect to the upper portion 130, the first segment 710 extends away from the transition region 122 of the wheel housing 705 at an acute angle (e.g., at approximately 45°) relative to a lower or first portion 125 of the wheel housing 705, and the second segment 715 extends away from the first segment 710 at an acute angle (e.g., at approximately 45°) relative to the first segment 710. In this version of the wheel housing 705, an angle between the lower portion 125 and the upper portion 130 may be approximately 90° where the angle is measured from a surface of lower portion 125 of the wheel housing 705 that is proximate a free end 126 of the lower portion 125 to a surface of the upper portion 130 that is proximate the free end 131 of the second segment 715 of the upper portion 130. In this version of the wheel housing 705, the surfaces that are used to measure the angle may be substantially planar inner or outer facing surfaces of the lower and upper portions 125. 130. In other significant respects, this version of the wheel housing 705 may be substantially similar to the previously described wheel housings.

[0085] Figs. 13 and 14 show yet other potential versions of the wheel housing 805, 905. These versions are generally similar to the version of the wheel housing shown in Fig. 5 except the central portion 160 is omitted. Thus, in these versions of the wheel housing 805, 905, axle holes 195 are formed in the transition region 122 of the wheel housing 805, 905 where the lower and upper portions 125, 130 of the wheel housing 805, 905 are joined together in order to receive the axle 165 for a wheel 120 that is joined to the wheel housing 805, 905. These two versions also schematically illustrate how the lengths of the lower and upper portions 125, 130 and the angle between the lower and upper portions 125, 130 can be selectively varied to accommodate wheels 120 of different diameters so that the wheel 120 will not extend beyond an outermost rear surface of the luggage piece when the wheel housing 805, 905 is joined to the luggage piece.

[0086] Any of the wheel housings described herein may be made from plastic, metal, composites, or any other suitable material. The associated wheels may be any suitable wheel used on luggage pieces. For example, a wheel may include a hub and a tire joined to the hub. The hub may further include spokes and may define a hole for receiving a wheel axle therethrough. The hub may be formed from plastic, metal, composites, or any other suitable material. The tire may be formed from rubber, plastics, metals, composites, or any suitable material.

[0087] All directional references (e.g., upper, lower, upward, downward, left, right, leftward, rightward, top, bottom, above, below, front, back, rear, forward, backward, rearward, inner, outer, vertical, horizontal, clockwise, and counterclockwise) are only used for identification purposes to aid the reader's understanding of the implementations of the present invention, and do not create limitations, particularly as to the position, orientation, or use of the invention unless specifically set forth in the claims. Further, throughout the specification, the terms "lower portion" and "upper portion" are generally used to describe the various major portions of the wheel housings. These terms (i.e., "lower portion" and "upper portion") are used to help make it easier to reading and understand the specification. However, the terms "first portion", "lower projection", or "lower leg" could be substituted for "lower portion", and the terms "second portion", "upper projection", or "upper leg" could be substituted for the term "upper portion". Thus, any use of the terms "lower portion" or "upper portion" to refer to the wheel housing should be understood to encompass any of the other possible language that could be substituted for these two terms.

[0088] Connection references (e.g., attached, coupled, connected, joined, and the like) are to be construed broadly and may include intermediate members between a connection of elements and relative movement between elements. As such, connection references do not necessarily infer that two elements are directly connected and in fixed relation to each other.

[0089] In some instances, components are described with reference to "ends" having a particular characteristic and/or being connected with another part. However, those skilled in the art will recognize that the present invention is not limited to components which terminate immediately beyond their points of connection with other parts. Thus, the term "end" should be interpreted broadly, in a manner that includes areas adjacent, rearward, forward of, or otherwise near the terminus of a particular element, link, component, part, member or the like. In methodologies directly or indirectly set forth herein, various steps and operations are described in one possible order of operation, but those skilled in the art will recognize that steps and operations may be rearranged, replaced, or eliminated without necessarily departing from the spirit and scope of the present invention. It is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative only and not limiting. Changes in detail or structure may be made that are within the scope of the appended claims.

Claims

1. A wheel housing for a luggage piece, comprising:

a first portion joined to a second portion at a transition region, the first portion including a free end that is distal from the transition region, the second portion including a free end that is distal from the transition region, and the free end of the first portion is located at a different location than the free end of the second portion; and

the first portion extends away from the transition region to the free end of the first portion, the

second portion extends away from the transition region to the free end of the second portion, and the first and second portions further extend away from the transition region in such a manner that the first and second portions define an angle of greater than 90° but less than approximately 140° where the angle is measured from a surface of the first portion that is proximate the free end of the first portion to a surface of the second portion that is proximate the free end of the second portion.

2. The wheel housing of claim 1, wherein the angle is equal to or greater than approximately 100° but less than or equal to approximately 120°, or wherein the angle is approximately 100°.

3. The wheel housing of any one of claims 1-2, wherein the surface of the first portion is an inner facing surface, and the surface of the second portion is an inner facing surface and/or wherein the surface of the first portion is substantially planar, and the surface of the second portion is substantially planar and/or wherein the first portion and the second portion are integrally formed to define a single, continuous body.

4. The wheel housing of any one of claims 1-3, wherein the first portion comprises a lower portion of the wheel housing or a lower leg of the wheel housing, and the second portion comprises an upper portion of the wheel housing or an upper leg of the wheel housing.

5. A luggage piece that includes a wheel housing according to any one of claims 1-4.

6. The luggage piece of claim 5, wherein the luggage piece includes a main body defining at least one compartment; the main body includes a front outer surface, a rear outer surface that is spaced apart from the front outer surface, and a bottom outer surface that extends between the rear and front outer surfaces; the wheel housing is joined to the main body; and a wheel is operably joined to the wheel housing.

7. The luggage piece of claim 6, wherein the wheel housing further comprises a central portion joined to the first and second portions, the central portion including at least one axle hole sized to receive a portion of a wheel axle of the wheel therein.

8. The luggage piece of claim 7, wherein the central portion defines a recess configured to receive a portion of the wheel therein and/or wherein the first portion and the second portion collectively define a slot configured to receive a portion of the wheel therethrough.

9. The luggage piece of any one of claims 6-8, wherein the central portion comprises a pair of circular sector body portions that are spaced apart and joined together by an arched body portion.

10. The wheel housing of claim 9, wherein each of the circular sector body portions include a transition edge segment positioned between a first edge segment and a second edge segment, the first edge segment joined to the first portion, the second edge segment joined to the second portion, and an angle of each of the circular sector body portions is greater than 90° where the angle of each of the circular section body portions is measured from the first edge segment to the second edge segment.

11. The luggage piece of any one of claims 6-10, wherein the first portion and the second portion are configured so that a rear edge of a wheel joined to the wheel housing aligns approximately with the rear outer surface of the main body of the luggage piece or wherein the first portion and the second portion are configured so that a wheel joined to the wheel housing does not extend beyond the front outer surface or the rear outer surface of the main body of the luggage piece.

12. The luggage piece of any one of claims 6-11, further comprising at least one shoulder strap joined to the main body.

13. The luggage piece of claim 12, wherein the wheel and the at least one shoulder strap are positioned on the same side of the main body of the luggage piece.

14. The luggage piece of any one of claims 6-13, wherein the surface of the first portion abuts and substantially conforms to a portion of the bottom outer surface of the main body, and the surface of the second portion abuts and substantially conforms to a portion of the rear outer surface of the main body or
wherein the wheel housing further comprises a lip that extends generally transversely from at least one of the first portion and the second portion, and the lip covers a portion of a sidewall of the luggage piece where the sidewall extends between the front and rear outer surface of the luggage piece.

15. A wheel housing for a luggage piece, comprising:

a first portion joined to a second portion at a transition region, the first portion including a free end that is distal from the transition region, the second portion including a free end that is distal from the transition region, and the free end of the first portion is located at a different location than the free end of the second portion; and

the first portion extends away from the transition region to the free end of the first portion, the second portion extends away from the transition region to the free end of the second portion, the second portion includes a first segment that extends away from the first portion at an acute angle and a second segment that extends away from the first segment at an acute angle, and the first and second portions further extend away from the transition region in such a manner that the first and second portions define an angle of approximately 90° where the angle is measured from a surface of the first portion that is proximate the free end of the first portion to a surface of the second portion that is proximate the free end of the second portion.

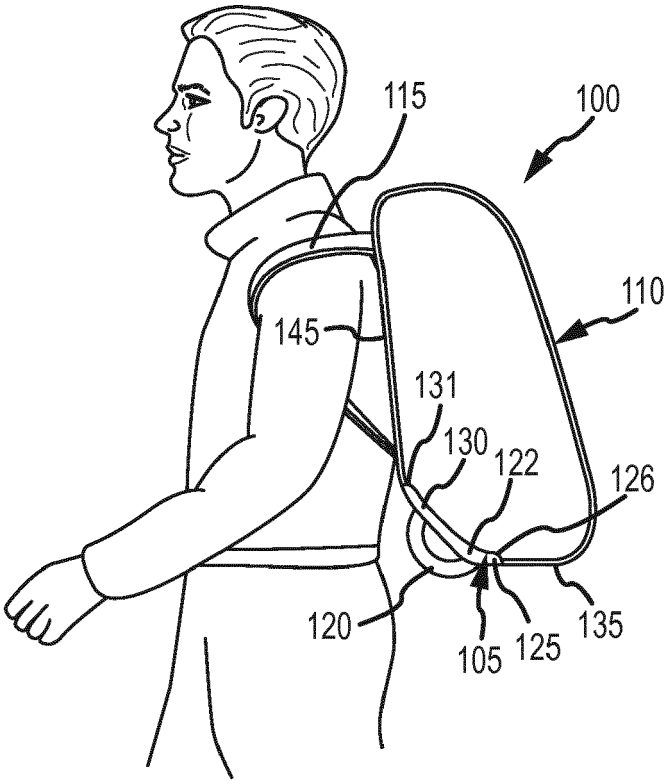

FIG.1

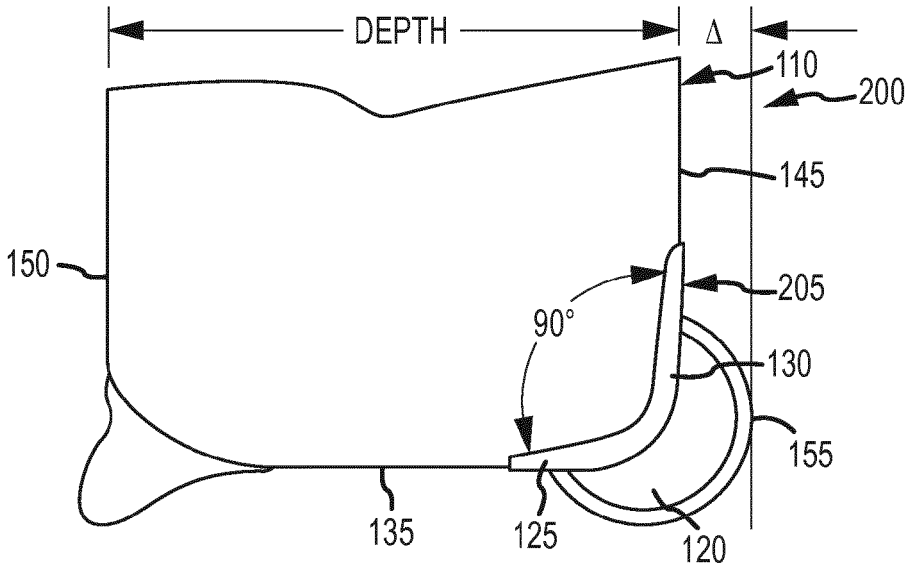

FIG.2
CONVENTIONAL

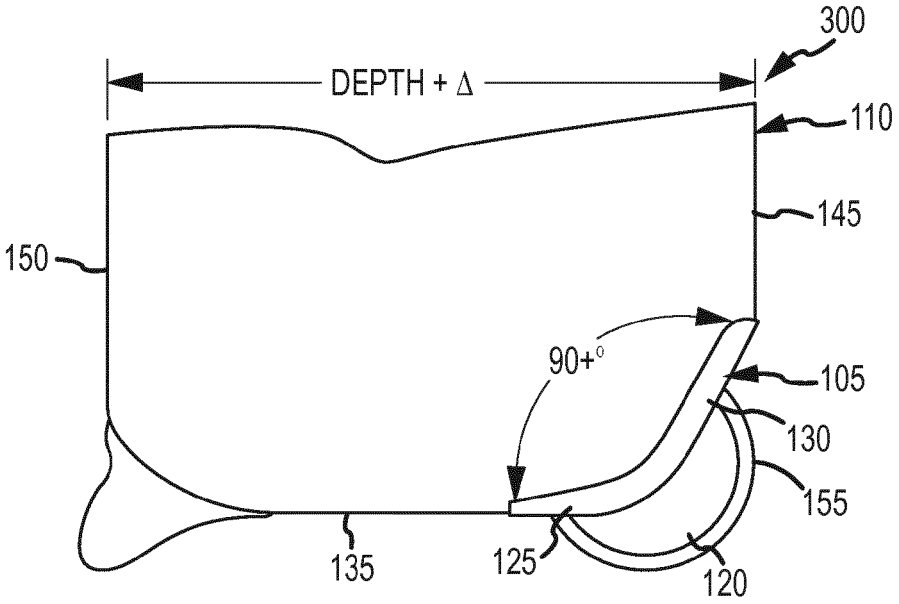

FIG.3

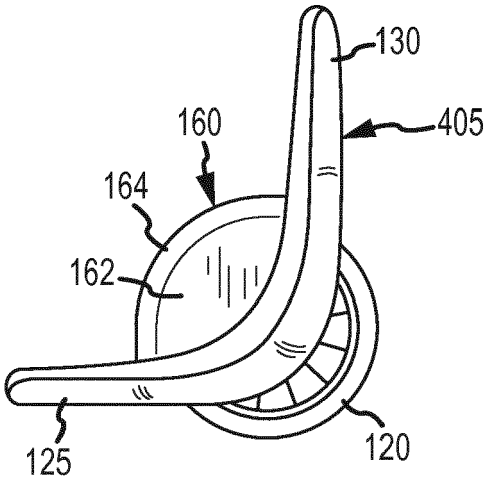

FIG.4
CONVENTIONAL

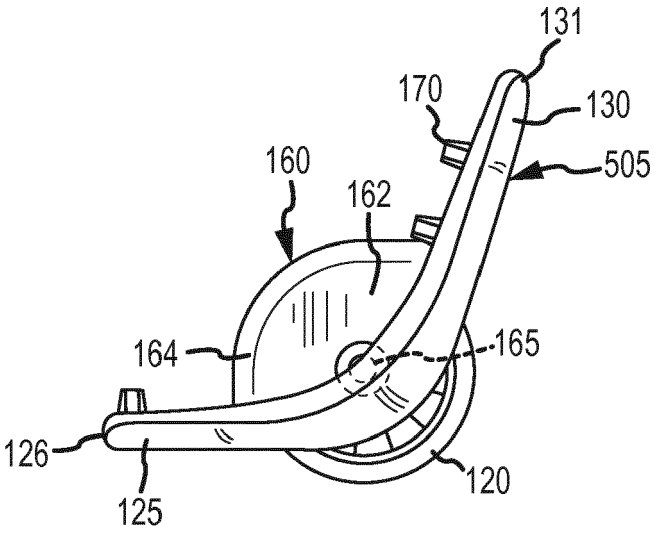

FIG.5

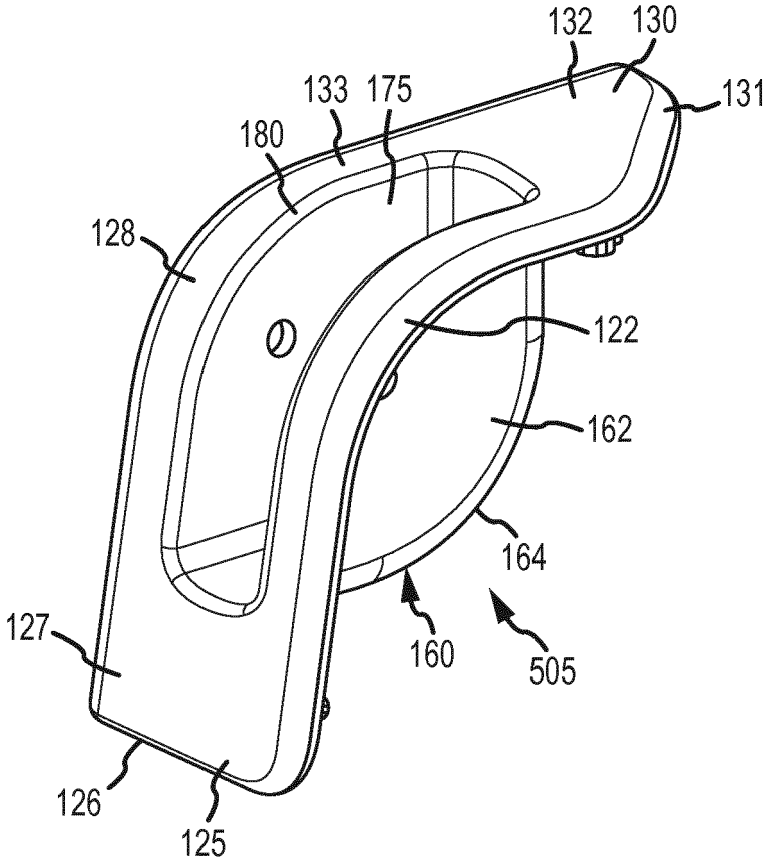

FIG.6

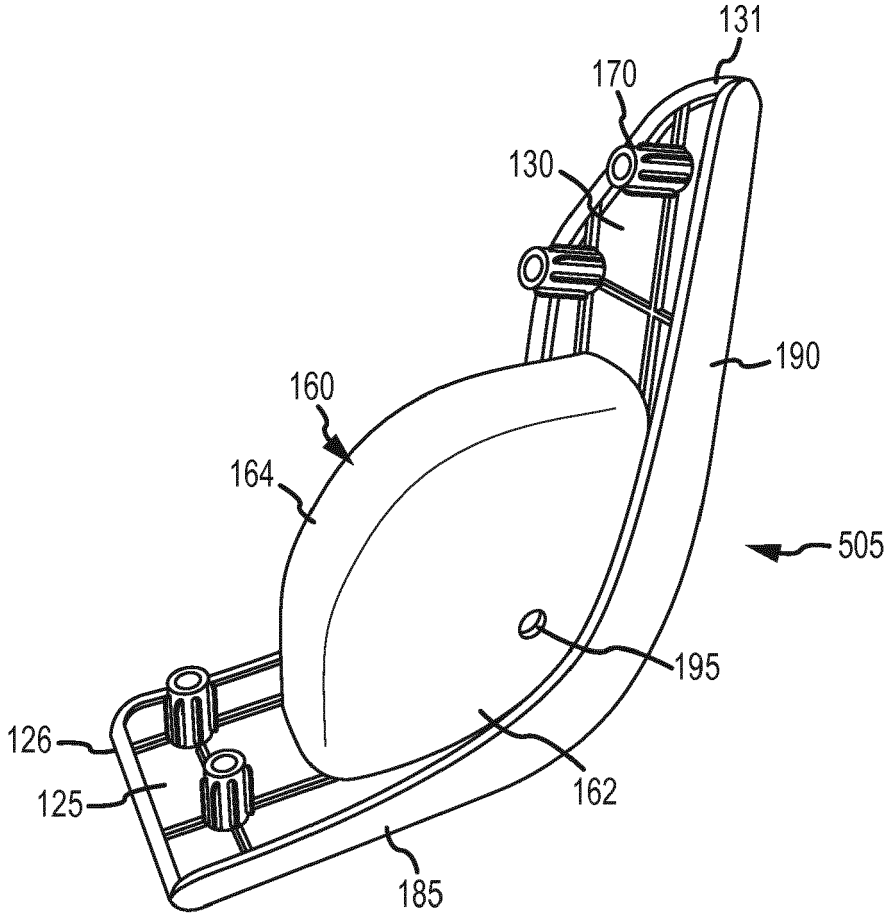

FIG.7

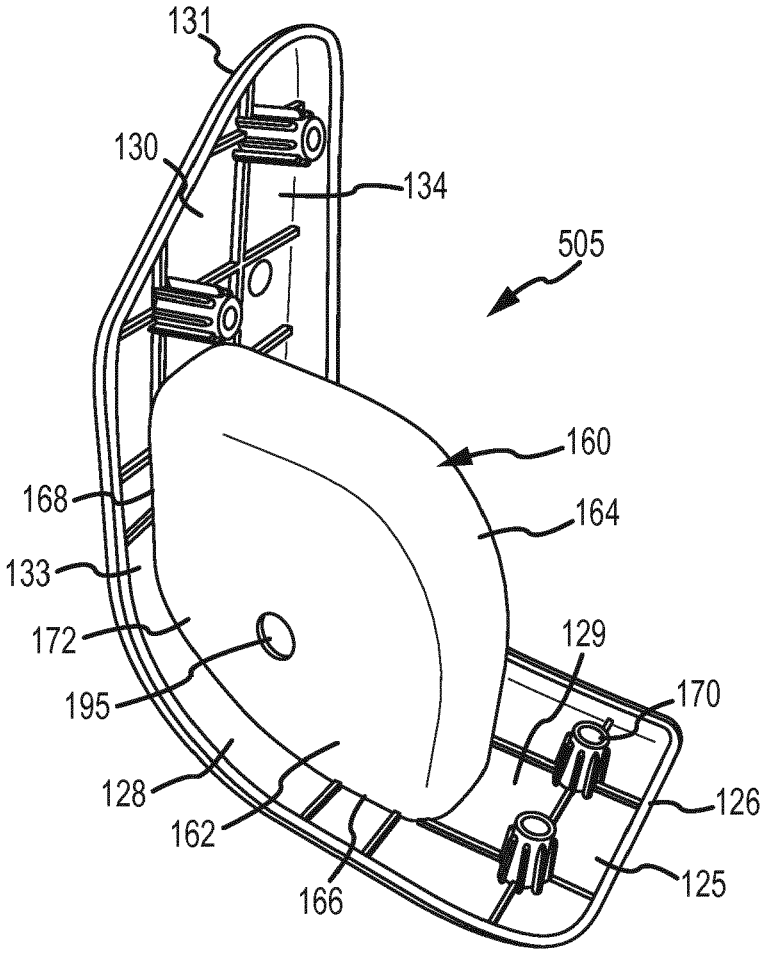
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FIG.8

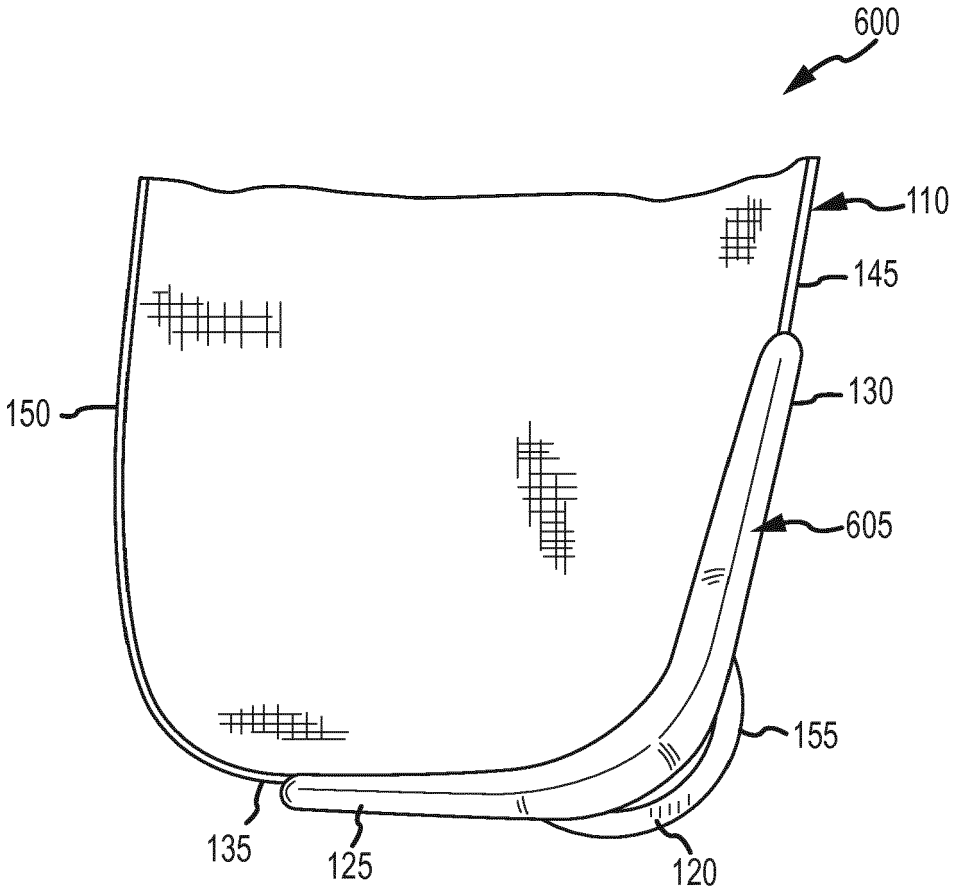

FIG.9

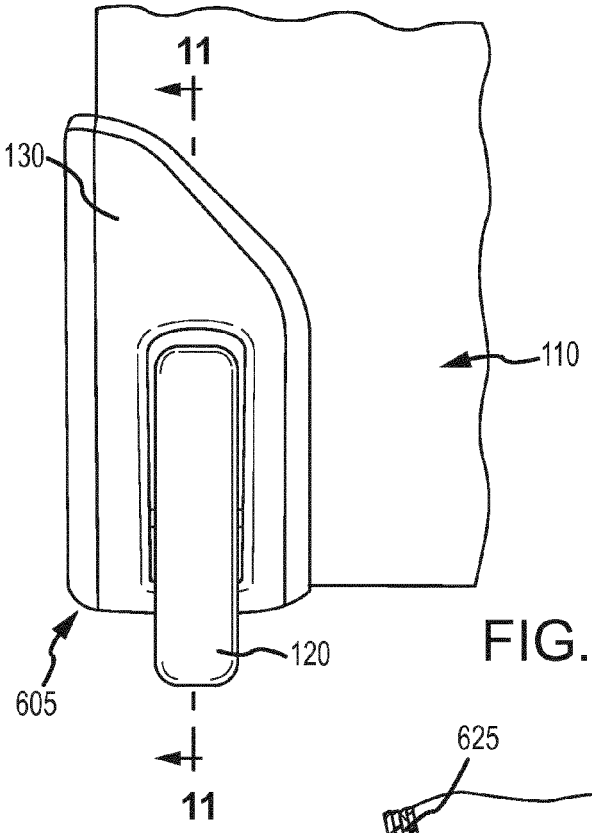

FIG.10

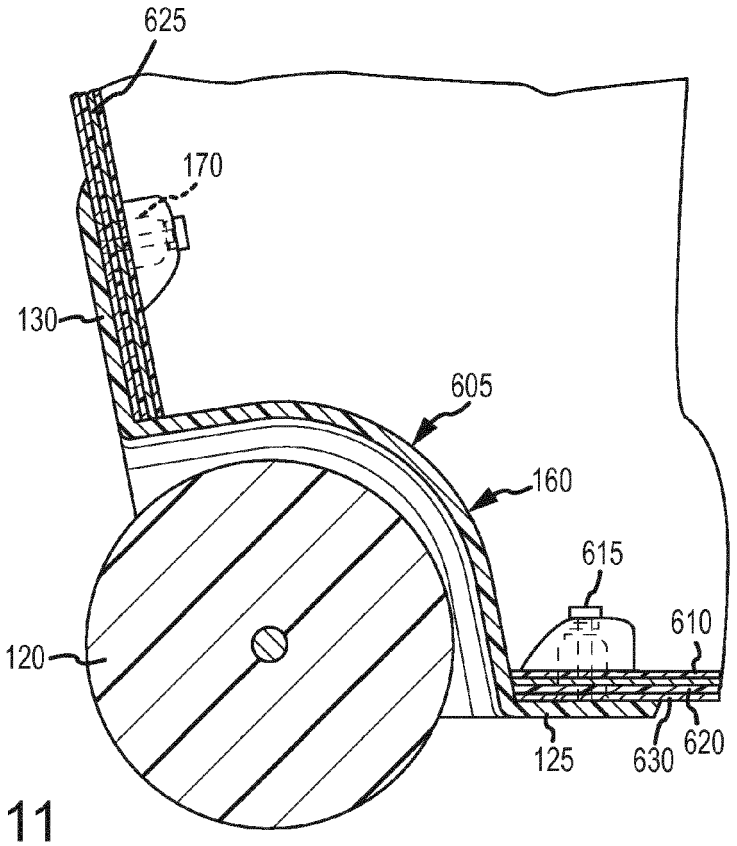

FIG.11

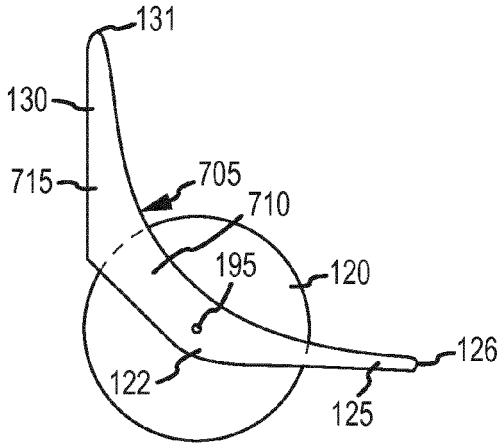

FIG.12

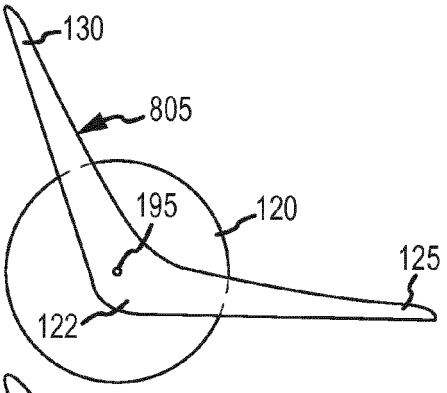

FIG.13

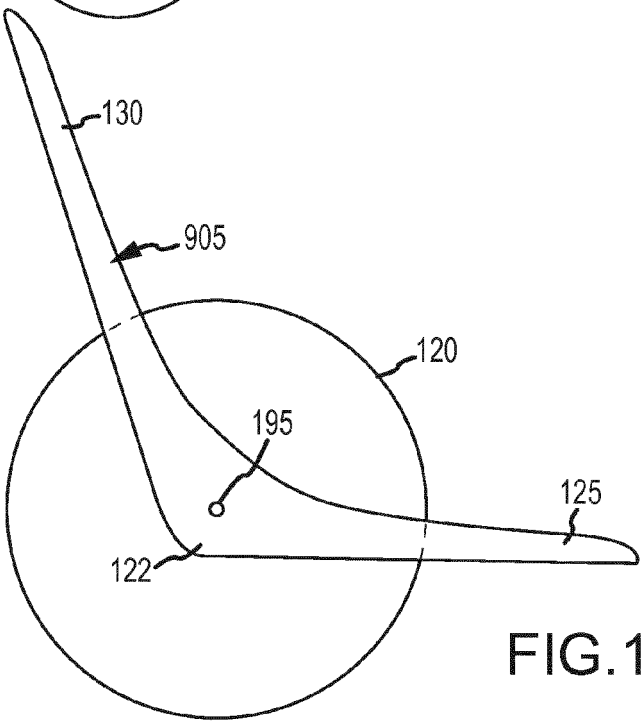

FIG.14

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EUROPEAN SEARCH REPORT

Application Number
EP 12 16 7782

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	GB 2 438 189 A (CP CASES LTD [GB]) 21 November 2007 (2007-11-21) * page 4, line 19 - page 5, line 2; figures 5,6 *	1-11 12-14	INV. A45F3/04 A45C5/14
Y	US 6 279 706 B1 (MAO CHEN SHOU [TW]) 28 August 2001 (2001-08-28) * the whole document *	12-14	
X	US 5 984 064 A (BYINGTON GERALD A [US]) 16 November 1999 (1999-11-16) * column 4, lines 19-30; figures 1,2 *	15	
X	US 2008/078637 A1 (SU SHU-LING [TW]) 3 April 2008 (2008-04-03) * paragraph [0014] *	15	

TECHNICAL FIELDS SEARCHED (IPC)

A45F
A45C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 August 2012	Nicolás, Carlos

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 16 7782

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08-08-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 2008078637 A1	03-04-2008	NONE	

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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