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(54) **SHEET-LIKE COMPOSITE MATERIAL FOR MANUFACTURING A PACKAGE, PACKAGE SLEEVE AND PACKAGE**

(57) Sheet-like composite material (1) for manufacturing a package (15) and package sleeve (13) made of a composite material (1) for manufacturing a package (15) comprising:

- a sleeve surface (3), wherein the sleeve surface (3) comprises a front surface and a rear surface,
- base surfaces (5), wherein the base surfaces (5) comprise triangular base surfaces (5T) and quadrangular base surfaces (5Q), and
- gable surfaces (6), wherein the gable surfaces (6) comprise triangular gable surfaces (6T) and quadrangular gable surfaces (6Q, 6CQ),
- two secondary fold lines (7), which run parallel to one another through the sleeve surface (3), and
- a longitudinal seam (14), which connects two edge regions of the composite material (1) to form a circumferential package sleeve (13), which is open both in the region of the base surfaces (5) and in the region of the gable surfaces (6),
- wherein the base surfaces (5) and the gable surfaces (6) are arranged on opposite sides of the sleeve surface (3),
- wherein the package sleeve (3) is folded along both secondary fold lines (7),
- wherein central quadrangular gable surface (6CQ) has a front edge (9) which adjoins the sleeve surface (3) and which is curved at least in sections, and
- wherein the central quadrangular gable surface (6CQ) has a straight front axis (10) that connects the two front corner points (GF) of the central quadrangular gable surface (6CQ),
- wherein the maximum perpendicular distance (12) between the straight front axis (10) and the curved front

edge (9) is 5 mm or less, preferably 4 mm or less, more preferably 3,5 mm or less.

Package (15) made of a composite material (1) wherein the package (15) is manufactured from the above sheet-like composite material (1) or package sleeve (13).

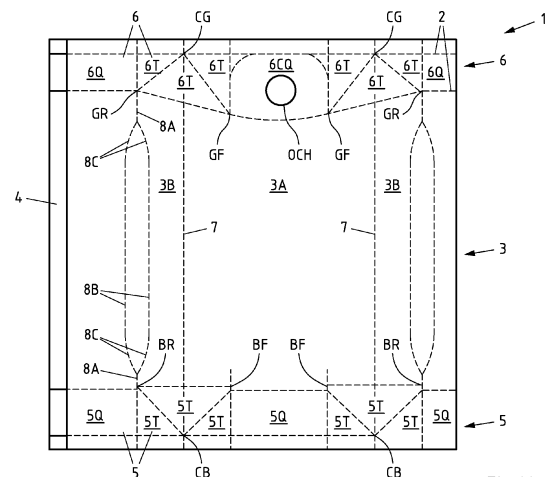


Fig.1A

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Description

[0001] The invention relates to a sheet-like composite material for manufacturing a package, comprising: a polymer outer layer, a polymer inner layer, a fibrous support layer, which is arranged between the polymer outer layer and the polymer inner layer, wherein the sheet-like composite material has a plurality of fold lines, which are arranged and designed such that a closed package can be manufactured by folding the sheet-like composite material along the fold lines and by connecting sealing surfaces of the sheet-like composite material, a sleeve surface, base surfaces, wherein the base surfaces comprise triangular base surfaces and quadrangular base surfaces, and gable surfaces, wherein the gable surfaces comprise triangular gable surfaces and quadrangular gable surfaces, wherein the base surfaces and the gable surfaces are arranged on opposite sides of the sleeve surface, wherein central quadrangular gable surface has a front edge which adjoins the sleeve surface and which is curved at least in sections, and wherein the central quadrangular gable surface has a straight front axis that connects the two front corner points of the central quadrangular gable surface.

[0002] The invention further relates to a package sleeve made of a composite material for manufacturing a package, comprising: a sleeve surface, wherein the sleeve surface comprises a front surface and a rear surface, base surfaces, wherein the base surfaces comprise triangular base surfaces and quadrangular base surfaces, and gable surfaces, wherein the gable surfaces comprise triangular gable surfaces and quadrangular gable surfaces, two secondary fold lines, which run parallel to one another through the sleeve surface, and a longitudinal seam, which connects two edge regions of the composite material to form a circumferential package sleeve, which is open both in the region of the base surfaces and in the region of the gable surfaces, wherein the base surfaces and the gable surfaces are arranged on opposite sides of the sleeve surface, wherein the package sleeve is folded along both secondary fold lines, wherein central quadrangular gable surface has a front edge which adjoins the sleeve surface and which is curved at least in sections, and wherein the central quadrangular gable surface has a straight front axis that connects the two front corner points of the central quadrangular gable surface.

[0003] The invention lastly relates to a package made of a composite material, wherein the package is manufactured from a sheet-like composite material according to the preamble of claim 1, or wherein the package is manufactured from a package sleeve according to the preamble of claim 8, and wherein the package is sealed in the region of the base surfaces and in the region of the gable surfaces.

[0004] Packages can be manufactured in different ways and from an extremely wide range of materials. A widely used possibility for their manufacture consists of manufacturing a blank from a sheet-like composite material by cutting from which, through folding and further steps, first a package sleeve and finally a package is created. Alternatively, it is also possible to manufacture a package directly from the sheet-like composite material, i.e. without the intermediate step of the package sleeve. This type of manufacture has the advantage, among others, that the sheet-like composite material and package sleeves are very flat and can thus be stacked, saving space. In this way, the composite material and the package sleeves can be manufactured in a different location than the folding and filling of the package. Composite materials are frequently used as material; for example, a flat sheet-like composite consisting of a plurality of thin layers of paper, cardboard, plastic and/or metal, in particular aluminium. Such packages are widely used in the foodstuffs industry in particular.

[0005] A first manufacturing step frequently consists of manufacturing a blank from a sheet-like composite material by cutting and from the blank producing a circumferential package sleeve through folding and sealing or adhering a seam. The folding usually takes place along stamped fold lines. The location of the fold lines thereby often corresponds to the location of the edges of the package which is to be manufactured from the package sleeve. Although many edges that are produced by folding along fold lines are straight, it is also possible and known to create curved edges by folding a composite material along curved fold lines. As an example, a package with edges that are at least partly curved is known from EP 3 228 552 B1.

[0006] Packages with curved edges can be visually appealing but curved edges can also have technical functions and advantages. If, for example, the front edge of the central (usually quadrangular) gable surface has a front edge which is curved outwards, the gable surface becomes larger and is therefore able to carry a larger closure element. This makes it possible that even packages with a rather small volume can have a rather large closure element that facilitates drinking or pouring out the liquid content of the package.

[0007] While a gable surface with a curved front edge has the above-mentioned advantages, it has been found that a gable surface with a front edge that extends to far outwards can cause problems. One major problem is that these gable surfaces show wrinkles or kinks quite often. As a result, the gable surface becomes uneven which makes it difficult to apply the spout and the closure element to the gable surface. The spout is usually applied to the gable surface by adhesives which can lead to poor results if the gable surface is uneven or wavy.

[0008] Against this background, the object underlying the invention is to design and further develop the sheet-like composite material described at the outset and explained in more detail above in such manner that a reliable connection between the gable surface and the spout can also be achieved with gable surfaces with a curved front edge.

[0009] This object is achieved in the case of the flat-shaped composite material according to the preamble of claims 1 in

that the maximum perpendicular distance between the straight front axis and the curved front edge is 5 mm or less, preferably 4 mm or less, more preferably 3,5 mm or less.

[0010] The sheet-like composite material according to the invention is used to manufacture a package. The sheet-like composite material can be cut to a defined size, wherein the size can be sufficient to manufacture a plurality of packages or is only sufficient to manufacture a single package. A composite material cut to a defined size, in particular to the size of an individual package, is therefore also referred to as a "blank". The sheet-like composite material has a plurality of overlapping and interconnected layers and thus forms a flat-shaped composite.

[0011] The sheet-like composite material comprises a polymer outer layer, a polymer inner layer and a fibrous support layer, which is arranged between the polymer outer layer and the polymer inner layer. The polymer inner layer and the polymer outer layer give the composite material liquid-tight properties as they are manufactured from plastic. The fibrous support layer (preferably: paper or cardboard), on the other hand, primarily serves to give the composite material improved mechanical properties, in particular improved rigidity. Optionally, a barrier layer can also be provided, which is also arranged between the polymer outer layer and the polymer inner layer (preferably between the fibrous support layer and the polymer inner layer). The barrier layer can, for example, be manufactured from aluminium and is intended to prevent light and/or oxygen from passing through. The barrier layer can, for example, be made of a polymer, e.g. polyamide, EVOH, PVOH or similar. The polymer can be coated by vapour deposition coating.

[0012] The sheet-like composite material also has a plurality of fold lines, which are arranged and designed such that a closed package can be manufactured by folding the sheet-like composite material along the fold lines and by connecting sealing surfaces of the sheet-like composite material. The fold lines (in particular before folding also called: "crease lines") should therefore facilitate the folding of the sheet-like composite material; they can be produced by material weakenings. Since the packages to be manufactured from the composite material are to be liquid-tight, material weakenings do not use perforations, but rather (usually linear) material displacements, which are embossed into the composite material with pressing tools.

[0013] The sheet-like composite material has a sleeve surface which preferably comprises an inner partial region (front side of the flat package sleeve) and two outer partial regions (back side of the flat package sleeve). The sheet-like composite material also has base surfaces which comprise triangular base surfaces and quadrangular base surfaces. The sheet-like composite material also has gable surfaces which comprise triangular gable surfaces and quadrangular gable surfaces. Preferably, the base surfaces and the gable surfaces each have two or three quadrangular surfaces and six triangular surfaces. The quadrangular surfaces serve the purpose of folding the base and the gable of the package. The triangular surfaces serve to fold the excess composite material into projecting "ears" which are then laid against the package. The base surfaces and the gable surfaces are arranged on opposite sides of the sleeve surface. Preferably, the gable surfaces are, in a standing package, arranged above the sleeve surface and the base surfaces are arranged beneath the sleeve surface. The term "quadrangular" does not only include a square shape, a rectangular shape or a trapezoid shape but includes any shape with four corners, even shapes with an angle sum deviating from 360° which can, for example, be achieved by one or a plurality of sides of the quadrangular gable surface not running straight, but curved.

[0014] The central quadrangular gable surface (to which the spout will be applied) has a front edge which adjoins the sleeve surface and which is curved at least in sections. Preferably, the front edge is curved outwards (convex) in order to enlarge the gable surface. The front edge may be curved in one or more sections (e.g. a straight middle section and two curved outer sections) or may be completely curved. The central quadrangular gable surface has a straight front axis that connects the two front corner points of the central quadrangular gable surface. The straight front axis is an imaginary axis that does not have to correspond with one of the edges of the package.

[0015] According to the invention, the maximum perpendicular distance between the straight front axis and the curved front edge is 5 mm or less, preferably 4 mm or less, more preferably 3,5 mm or less. By limiting the maximum distance between the straight front axis (corresponding to the front edge of a cuboid package) and the curved front edge, stresses in the gable area were reduced significantly and, as a result, wrinkles in the gable area were significantly less likely. The term "perpendicular" is relating to the straight front axis, the "maximum perpendicular distance" is therefore the greatest length of a straight line that is perpendicular to the straight front axis and that connects the straight front axis with the curved front edge. This line may or may not (also) be perpendicular to the curved front edge.

[0016] In order to evaluate the new modification, 10.000 new packages were compared to 10.000 standard packages as shown in table 1 below:

Table 1

Package	max. perpendicular distance of curved front edge	Evaluated packages	Visual evaluation (packages with wrinkles)	[%]	Functional evaluation (leaking packages)	[%]
Standard	5,28 mm	10.000	1807	18,07 %	84	0,84 %

(continued)

Package	max. perpendicular distance of curved front edge	Evaluated packages	Visual evaluation (packages with wrinkles)	[%]	Functional evaluation (leaking packages)	[%]
New	3,28 mm	10.000	437	4,37 %	4	0,04 %

[0017] Table 1 clearly indicates that packages with the new design have significantly improved properties: only 4,37 % of the new packages have a wrinkle in the gable area (vs. 18,07 % of the standard packages) and only 4 leaking packages were found (vs. 84 leaking standard packages). In contrast, modifications to the sheet-like composite material (in particular to the stiffness of the material) did only achieve a slightly better result compared to the standard material.

[0018] According to a further embodiment, the minimum perpendicular distance between the straight front axis and the curved front edge is at least 0,5 mm, preferably at least 1,0 mm. By defining a minimum distance between the straight front axis and the curved front edge, it is ensured that the curved front edge extends sufficiently far outwards so that the gable surface is still large enough for bigger spouts / closures.

[0019] According to a further embodiment, the front edge of the central quadrangular gable surface is continuously curved. In contrast to a front edge that is curved only in sections (e.g. a straight middle section and two curved outer sections), a continuously curved front edge has the advantage of a very smooth shape that further decreases the stresses in the gable sections and the likelihood of wrinkles. Preferably, the front edge has a constant radius of curvature.

[0020] According to a further embodiment, the front edge of the central quadrangular gable surface has a radius of curvature of at least 40 mm, preferably at least 60 mm, more preferably at least 80 mm. By defining a minimum radius of curvature, it is ensured that the composite material is only slightly curved and has no "sharp" curvatures. This further decreases the likelihood of wrinkles in the gable section. Preferably, the front edge has a constant radius of curvature.

[0021] According to a further embodiment, the composite material has two secondary fold lines, which run parallel to one another through the sleeve surface. Secondary fold lines are understood as fold lines which, in contrast to conventional fold lines, do not later form edges of the package, but are arranged between the edges of the package; for example, in the side surfaces. Secondary fold lines are used to generate a package sleeve from the composite material, which is preferably folded flat along two secondary fold lines in order to be stacked and transported in the most space-saving manner possible.

[0022] According to a further embodiment, the composite material has two rear edge fold lines, which run through the outer partial region of the sleeve surface and which preferably comprise single straight sections, double straight sections and curved transitional sections. The rear edge fold lines determine the shape of the rear edges. The rear edge fold lines preferably have a single straight section at the bottom (next to the base surfaces) and at the top (next to the gable surfaces) which makes it easier to form the base and the gable of the surface because the geometry of the tools can be simplified. Between these single straight sections, the rear edge fold lines preferably have double straight sections (two parallel straight sections) which serves to create a smooth transition between the side surfaces and the rear surface of the package because the composite material needs to be folded or kinked less compared to a 90° edge of a cuboid package, since the transition. This leads to less stresses in the composite material and in particular to a lower risk of cracked or broken fibres in the fibrous support layer (paper or cardboard layer) of the composite material. Another advantage of a smooth transition between the side surfaces and the rear surface is that the package can be gripped more easily. In addition, air circulation between adjacent packages (e.g. in a shelf) is improved compared to cuboid packages as a result of the gap that is caused between adjacent packages by the shape of the rear edges. The rear edge fold lines preferably have curved transitional sections between the two single straight sections and the double straight sections.

[0023] According to a further embodiment, the fibrous support layer of the composite material has a main fibre direction, which runs approximately parallel to the straight front axis of the central quadrangular gable surface. Paper and cardboard are materials made from pulp fibres. While the fibres are evenly distributed in all directions in traditional (manual) paper production, a targeted alignment of the fibres can be achieved in mechanical paper production. Since the paper has different mechanical properties in the direction of the fibres than transverse to the fibre direction (anisotropy), the orientation of the fibres can be used to obtain the optimal material properties for the respective application. The main fibre direction should be approximately parallel to the straight front axis of the central quadrangular gable surface. This means that the main fibre direction in the case of the package runs in the circumferential direction of the package, i.e. around the sleeve surface. This has the advantage that the package stability is improved. In particular, in the case of a compression stress on the packages (e.g. in the case of multi-layer stacking on a pallet), there is a significant increase in stability compared to packages with fibres aligned in the vertical, since the packages only buckle at higher compression stresses.

[0024] The object described at the outset is also achieved through a package sleeve made of a composite material for

manufacturing a package, comprising: a sleeve surface, wherein the sleeve surface comprises a front surface and a rear surface, base surfaces, wherein the base surfaces comprise triangular base surfaces and quadrangular base surfaces, and gable surfaces, wherein the gable surfaces comprise triangular gable surfaces and quadrangular gable surfaces, two secondary fold lines, which run parallel to one another through the sleeve surface, and a longitudinal seam, which connects two edge regions of the composite material to form a circumferential package sleeve, which is open both in the region of the base surfaces and in the region of the gable surfaces, wherein the base surfaces and the gable surfaces are arranged on opposite sides of the sleeve surface, wherein the package sleeve is folded along both secondary fold lines, wherein central quadrangular gable surface has a front edge which adjoins the sleeve surface and which is curved at least in sections, and wherein the central quadrangular gable surface has a straight front axis that connects the two front corner points of the central quadrangular gable surface. According to the invention, the package sleeve is characterized in that the maximum perpendicular distance between the straight front axis and the curved front edge is 5 mm or less, preferably 4 mm or less, more preferably 3,5 mm or less. The associated properties and advantages have already been explained in connection with claim 1 and can be transferred from the sheet-like composite material to the package sleeve in a corresponding manner (because the package sleeve is made from the sheet-like composite material).

[0025] Preferably, the package sleeve is manufactured from a sheet-like composite material according to any one of claims 1 to 7. Since the package sleeve is manufactured from one of the sheet-like composite materials described above, many properties and advantages of the sheet-like composite material also apply to the package sleeve, such that reference is made to the corresponding embodiments.

[0026] The object described at the outset is also achieved by a package made of a composite material, wherein the package is manufactured from a sheet-like composite material according to the preamble of claim 1, or wherein the package is manufactured from a package sleeve according to the preamble of claim 8, and wherein the package is sealed in the region of the base surfaces and in the region of the gable surfaces. According to the invention, the maximum perpendicular distance between the straight front axis and the curved front edge is 5 mm or less, preferably 4 mm or less, more preferably 3,5 mm or less. The associated properties and advantages have already been explained and can be transferred from the composite material and the package sleeve to the package in a corresponding manner. The package can be manufactured either directly from a sheet-like composite material or it can be manufactured from a package sleeve which has previously been manufactured from a flat-shaped composite material.

[0027] Preferably, the package has an oblique gable. In particular, it can be provided that the gable of the package falls forwards, i.e. is lower in the region of the front side of the package than in the region of the rear side of the package. Due to the oblique course of the gable, it can be achieved that a dispensing element (e.g. spout and closure cap) arranged in the region of the gable impairs the stacking of packages less than in packages with a flat gable. This is due to the fact that the dispensing element does not necessarily form the highest point of the package (or at least does not project as far) in packages with an oblique gable compared to packages with a flat gable. In addition, better drainage of moisture from the gable surface can be achieved.

[0028] The invention will be explained in more detail below with reference to a drawing which simply represents a preferred exemplary embodiment, in which:

Fig. 1A: shows a sheet-like composite material according to the invention in a top view;

Fig. 1B: shown an enlarged portion of the sheet-like composite material shown in Fig. 1A;

Fig. 2A: shows a package sleeve, formed from the sheet-like composite material shown in Fig. 1A, in front view;

Fig. 2B: shows the package sleeve from Fig. 2A in a rear view;

Fig. 3A: shows the package sleeve from Fig. 2A and Fig. 2B in its unfolded state;

Fig. 3B: shows the package sleeve from Fig. 3A with sealed base;

Fig. 4A: shows a package, which is formed from the package sleeve shown in Fig. 1B after sealing; and

Fig. 4B: shows the package from Fig. 4A with ears applied.

[0029] Fig. 1A shows a sheet-like composite material 1 according to the invention in a top view. The sheet-like composite material 1 can comprise a plurality of layers of different materials; for example, paper, cardboard, plastic or metal, in particular aluminium. The composite material 1 has a plurality of fold lines 2 which are intended to facilitate the folding of the composite material 1 and divide the composite material 1 into a plurality of surfaces. The composite material 1 can be divided into a sleeve surface 3, a sealing surface 4, base surfaces 5 and gable surfaces 6. The base surfaces 5 comprise

triangular base surfaces 5T and quadrangular base surfaces 5Q. The gable surfaces 6 comprise triangular gable surfaces 6T and quadrangular gable surfaces 6Q, in particular one central quadrangular gable surface 6CQ. The sheet-like composite material 1 has an overcoated hole OCH in the area of the central quadrangular gable surface 6CQ for applying a closure element. The overcoated hole OCH can be formed as an area in which some of the layers (in particular the paper/cardboard layer) of the composite material are "missing" and the resulting "hole" is only (over) coated by the polymer layers.

[0030] A package sleeve can be formed from the composite material 1 by the composite material 1 being folded in such manner that the sealing surface 4 is connected, in particular sealed, to the opposite edge region of the sleeve surface 3. With the exception of the sealing surface 4, the sleeve surface 3 extends over the entire width of the composite material 1. The composite material 1 has two secondary fold lines 7 in the region of the sleeve surface 3. The two secondary fold lines 7 are straight and run parallel to one another. Moreover, the secondary fold lines 7 run through a contact point CB of three adjacent triangular surfaces 5T of the base surface 5 and through a contact point CG of three adjacent triangular surfaces 6T of the gable surfaces 6. The sleeve surface 3 is divided by the secondary fold lines 7 into an inner partial region 3A and two outer partial regions 3B. The inner partial region 3A lies between two secondary fold lines 7 and the outer partial regions 3B lie next to and outside of the two secondary fold lines 7.

[0031] The base surfaces 5 form two front corner points BF and two rear corner points BR. The gable surfaces 6 also form two front corner points GF and two rear corner points GR. The corner points BF, BR, GF, GR are corner points of the package to be manufactured from the composite material 1. Each corner point BF, BR of a base surface 5 is assigned a corresponding corner point GF, GR of a gable surface 6 which is in each case the corner point GF, GR which is arranged above this corner point BF, BR when the package is standing up. The base rear corner points BR and the gable rear corner points GR are connected by rear edge fold lines 8. The rear edge fold lines 8 have single straight sections 8A adjacent to the base rear corner points BR and adjacent to the gable rear corner points GR. In their middle sections, the rear edge fold lines 8 have double (parallel) straight sections 8B. Between the single straight sections 8A and the double (parallel) straight sections 8B, the rear edge fold lines 8 have curved transitional sections 8C.

[0032] Fig. 1B shows an enlarged portion of the sheet-like composite material 1 shown in Fig. 1A. The regions of the composite material 1 already described in connection with Fig. 1A are provided with corresponding reference numerals in Fig. 1B. The upper portion of the sheet-like composite material, including the central quadrangular gable surface 6CQ is shown in greater detail in Fig. 1B and explained below. The central quadrangular gable surface 6CQ has a front edge 9 which adjoins the sleeve surface 3, in particular its inner partial region 3A. The two ends of the front edge 9 are defined by the two front corner points GF of the gable surfaces 6. The front edge 9 shall be curved at least in sections, the front edge 9 in Fig. 1B is continuously (completely) curved and has a radius of curvature R9 of approximately 95 mm. The central quadrangular gable surface 6CQ has also a straight front axis 10 that connect the two front corner points GF of the central quadrangular gable surface 6CQ. The front edge 9 has a low point 11, which is defined as the point with the largest (maximum) perpendicular distance 12 to the straight front axis 10 (the low point 9 of the sheet-like composite material 1 can correspond to the foremost point a package that is made from the sheet-like composite material 1). The maximum perpendicular distance 12 between the straight front axis 10 and the curved front edge 9 is 5 mm or less, preferably 4 mm or less, more preferably 3,5 mm or less. The curved front edge 9 and the two lines between the front corner points GF and the rear corner points GR approximately merge tangentially (in contrast to known concepts where the curved front edge and the two lines between the front corner points GF and the contact points CG approximately merge tangentially).

[0033] Fig. 2A shows a package sleeve 13, formed from the sheet-like composite material 1 shown in Fig. 1A, in front view. Fig. 2B shows the package sleeve 13 from Fig. 2A in a rear view. The regions of the package sleeve 13 already described in connection with Fig. 1A or Fig. 1B are provided with corresponding reference numerals in Fig. 2A and in Fig. 2B. Fig. 2A shows a package sleeve 13 which is formed from the sheet-like composite material 1 shown in Fig. 1A, in a front view. The package sleeve 13 has been created from the composite material 1 in two steps: First, the composite material 1 is folded along the two secondary fold lines 7. The two outer partial regions 3B (left) and 3B (right) of the sleeve surface 3 are then connected together, in particular sealed, in the region of the sealing surface 4, resulting in a longitudinal seam 14 (hidden in Fig. 2A). The package sleeve 13 therefore has a circumferential structure, which is closed in a circumferential direction, with an opening in the region of the base surfaces 5 and with an opening in the region of the gable surfaces 6. The inner partial region 3A of the sleeve surface 3 is visible in the front view, both sides of which are delimited by the secondary fold lines 7. The remaining two outer partial regions 3B of the sleeve surface 3 are on the rear side of the package sleeve 13 and therefore hidden in Fig. 2A. Both outer partial regions 3B of the sleeve surface 3 are visible in the rear view in Fig. 2B. They are connected together by the longitudinal seam 14 and are delimited on both sides by the secondary fold lines 7. The inner partial region 3A of the sleeve surface 3 is on the front side of the package sleeve 13 and is therefore hidden in Fig. 2B.

[0034] Fig. 3A shows the package sleeve 13 from Fig. 2A and Fig. 2B in its unfolded state, Fig. 3B shows the package sleeve 13 from Fig. 3A with sealed base. The regions of the package sleeve 13 already described in connection with Fig. 1A to Fig. 2B are provided with corresponding reference numerals in Fig. 3A and in Fig. 3B. The unfolded state is achieved by folding back the package sleeve 13 along the secondary fold lines 7 running through the sleeve surface 3. The sleeve 13 is folded back by around 180°. The result of this folding back along the secondary fold lines 7 is that the two partial regions 3A,

3B of the sleeve surface 3 adjoining the secondary fold line 7 no longer lie on top of one another, but are arranged in the same plane. The package sleeve 13 is therefore only in its flat state (Fig. 2A, Fig. 2B) folded along the secondary fold lines 7; in the unfolded state (Fig. 3A, Fig. 3B), on the other hand, the package sleeve 13 (like the package to be manufactured therefrom) is no longer folded along the secondary fold lines 7 (therefore, the term "secondary" fold lines 7). The pre-folded state in Fig. 3B denotes (as in Fig. 3A) a state in which the two fold lines 2 in the region of the gable surfaces 6 have been pre-folded. The base surfaces 5, on the other hand, are already completely folded and sealed such that the package sleeve 13 has a sealed base. The package sleeve 13 is also folded along all sections 8A, 8B, 8C of the rear edge fold lines 8 in Fig. 3A and in Fig. 3B so that smooth rear edges are created.

[0035] Fig. 4A shows a package 15, which is formed from the package sleeve 13 shown in Fig. 2B after sealing; and Fig. 4B shows the package 15 from Fig. 4A with ears applied. The regions of the package 15 already described in connection with Fig. 1A to Fig. 3B are provided with corresponding reference numerals in Fig. 4A and Fig. 4B. The package 15 is shown after sealing, i.e. in the filled and sealed state. After sealing, a fin seam 16 is created in the region of the base surfaces 5 and in the region of the gable surfaces 6. While the fin seam 16 has already been applied to the package 15 in the region of the base surfaces 5, the fin seam 16 still protrudes from the package 15 in the region of the gable surfaces 6 in Fig. 4A. Partial regions of the gable surfaces 6 are folded outwards during the pre-folding (see Fig. 3B) and form protruding regions of excess material which are also referred to as "ears" 17 and in a later manufacturing step are applied against the package 15; for example, by an adhesion process. In Fig. 4A, the ears 17 still protrude from the package 15 and are applied in a later manufacturing step, for example by an adhesion process. In Fig. 4B, the upper ears 17 arranged in the region of the gable surface 6 are folded down and applied flat to the sleeve surface 3 of the package 15. Preferably, the upper ears 17 are adhered or sealed to the sleeve surface 3.

List of reference signs:

[0036]

- 1: sheet-like composite material
- 2: fold line
- 3: sleeve surface
- 3A: inner partial region (of sleeve surface 3)
- 3B: outer partial region (of sleeve surface 3)
- 4: sealing surface
- 5: base surface
- 5T: triangular base surface
- 5Q: quadrangular base surface
- 6: gable surface
- 6CQ: central quadrangular gable surface
- 6T: triangular gable surface
- 6Q: quadrangular gable surface
- 7: secondary fold line
- 8: rear edge fold line
- 8A: single straight section (of rear edge fold line 8)
- 8B: double (parallel) straight section (of rear edge fold line 8)
- 8C: curved transitional section (of rear edge fold line 8)
- 9: front edge (of central quadrangular gable surface 6CQ)
- 10: straight front axis
- 11: low point (of the front edge 9)
- 12: perpendicular distance (between front edge 9 and straight front axis 10)
- 13: package sleeve
- 14: longitudinal seam
- 15: package
- 16: fin seam
- 17: ear

- BF: front corner point (of base surfaces 5)
- BR: rear corner point (of base surfaces 5)
- CB: contact point (of the triangular surfaces 8 of the base surface 5)

CG: contact point (of the triangular surfaces 8 of the gable surface 6)

GF: front corner point (of gable surfaces 6)

5 GR: rear corner point (of gable surfaces 6)

OCH: overcoated hole

R9: Radius of curvature (of the front edge 9)

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Claims

1. Sheet-like composite material (1) for manufacturing a package (15), comprising:

- 15
- a polymer outer layer,
 - a polymer inner layer,
 - a fibrous support layer, which is arranged between the polymer outer layer and the polymer inner layer,
 - wherein the sheet-like composite material (1) has a plurality of fold lines (2), which are arranged and designed such that a closed package (15) can be manufactured by folding the sheet-like composite material (1) along the
 - 20 fold lines (2) and by connecting sealing surfaces (4) of the sheet-like composite material (1),
 - a sleeve surface (3),
 - base surfaces (5), wherein the base surfaces (5) comprise triangular base surfaces (5T) and quadrangular base surfaces (5Q), and
 - gable surfaces (6), wherein the gable surfaces (6) comprise triangular gable surfaces (6T) and quadrangular
 - 25 gable surfaces (6Q, 6CQ),
 - wherein the base surfaces (5) and the gable surfaces (6) are arranged on opposite sides of the sleeve surface (3),
 - wherein central quadrangular gable surface (6CQ) has a front edge (9) which adjoins the sleeve surface (3) and which is curved at least in sections, and
 - 30 - wherein the central quadrangular gable surface (6CQ) has a straight front axis (10) that connects the two front corner points (GF) of the central quadrangular gable surface (6CQ),

characterized in that

35 the maximum perpendicular distance (12) between the straight front axis (10) and the curved front edge (9) is 5 mm or less, preferably 4 mm or less, more preferably 3,5 mm or less.

2. Sheet-like composite material (1) according to claim 1,

characterized in that

40 the minimum perpendicular distance (12) between the straight front axis (10) and the curved front edge (9) is at least 0,5 mm, preferably at least 1,0 mm.

3. Sheet-like composite material (1) according to claim 1 or claim 2,

characterized in that

45 the front edge (9) of the central quadrangular gable surface (6CQ) is continuously curved.

4. Sheet-like composite material (1) according to any one of claims 1 to 3,

characterized in that

50 the front edge (9) of the central quadrangular gable surface (6CQ) has a radius of curvature (R9) of at least 40 mm, preferably at least 60 mm, more preferably at least 80 mm.

5. Sheet-like composite material (1) according to any one of claims 1 to 4,

characterized by

two secondary fold lines (7), which run parallel to one another through the sleeve surface (3).

55 6. Sheet-like composite material (1) according to any one of claims 1 to 5,

characterized by

two rear edge fold lines (8), which run through the outer partial region (3B) of the sleeve surface (3) and which preferably comprise single straight sections (8A), double straight sections (8B) and curved transitional sections (8C).

7. Sheet-like composite material (1) according to any one of claims 1 to 6,
characterized in that
the fibrous support layer of the composite material has a main fibre direction, which runs approximately parallel to the straight front axis (10) of the central quadrangular gable surface (6CQ).

8. Package sleeve (13) made of a composite material (1) for manufacturing a package (15), comprising:

- a sleeve surface (3), wherein the sleeve surface (3) comprises a front surface and a rear surface,
- base surfaces (5), wherein the base surfaces (5) comprise triangular base surfaces (5T) and quadrangular base surfaces (5Q), and
- gable surfaces (6), wherein the gable surfaces (6) comprise triangular gable surfaces (6T) and quadrangular gable surfaces (6Q, 6CQ),
- two secondary fold lines (7), which run parallel to one another through the sleeve surface (3), and
- a longitudinal seam (14), which connects two edge regions of the composite material (1) to form a circumferential package sleeve (13), which is open both in the region of the base surfaces (5) and in the region of the gable surfaces (6),
- wherein the base surfaces (5) and the gable surfaces (6) are arranged on opposite sides of the sleeve surface (3),
- wherein the package sleeve (3) is folded along both secondary fold lines (7),
- wherein central quadrangular gable surface (6CQ) has a front edge (9) which adjoins the sleeve surface (3) and which is curved at least in sections, and
- wherein the central quadrangular gable surface (6CQ) has a straight front axis (10) that connects the two front corner points (GF) of the central quadrangular gable surface (6CQ),

characterized in that

the maximum perpendicular distance (12) between the straight front axis (10) and the curved front edge (9) is 5 mm or less, preferably 4 mm or less, more preferably 3,5 mm or less.

9. Package sleeve (13) according to claim 8,

characterized in that

the package sleeve (13) is manufactured from a sheet-like composite material (1) according to any one of claims 1 to 7.

10. Package (15) made of a composite material (1),

- wherein the package (15) is manufactured from a sheet-like composite material (1) according to the preamble of claim 1, or wherein the package (15) is manufactured from a package sleeve (13) according to the preamble of claim 8, and
- wherein the package (15) is sealed in the region of the base surfaces (5) and in the region of the gable surfaces (6),

characterized in that

the maximum perpendicular distance (12) between the straight front axis (10) and the curved front edge (9) is 5 mm or less, preferably 4 mm or less, more preferably 3,5 mm or less.

11. Package (15) according to claim 10,

characterized in that

the package (15) has an oblique gable.

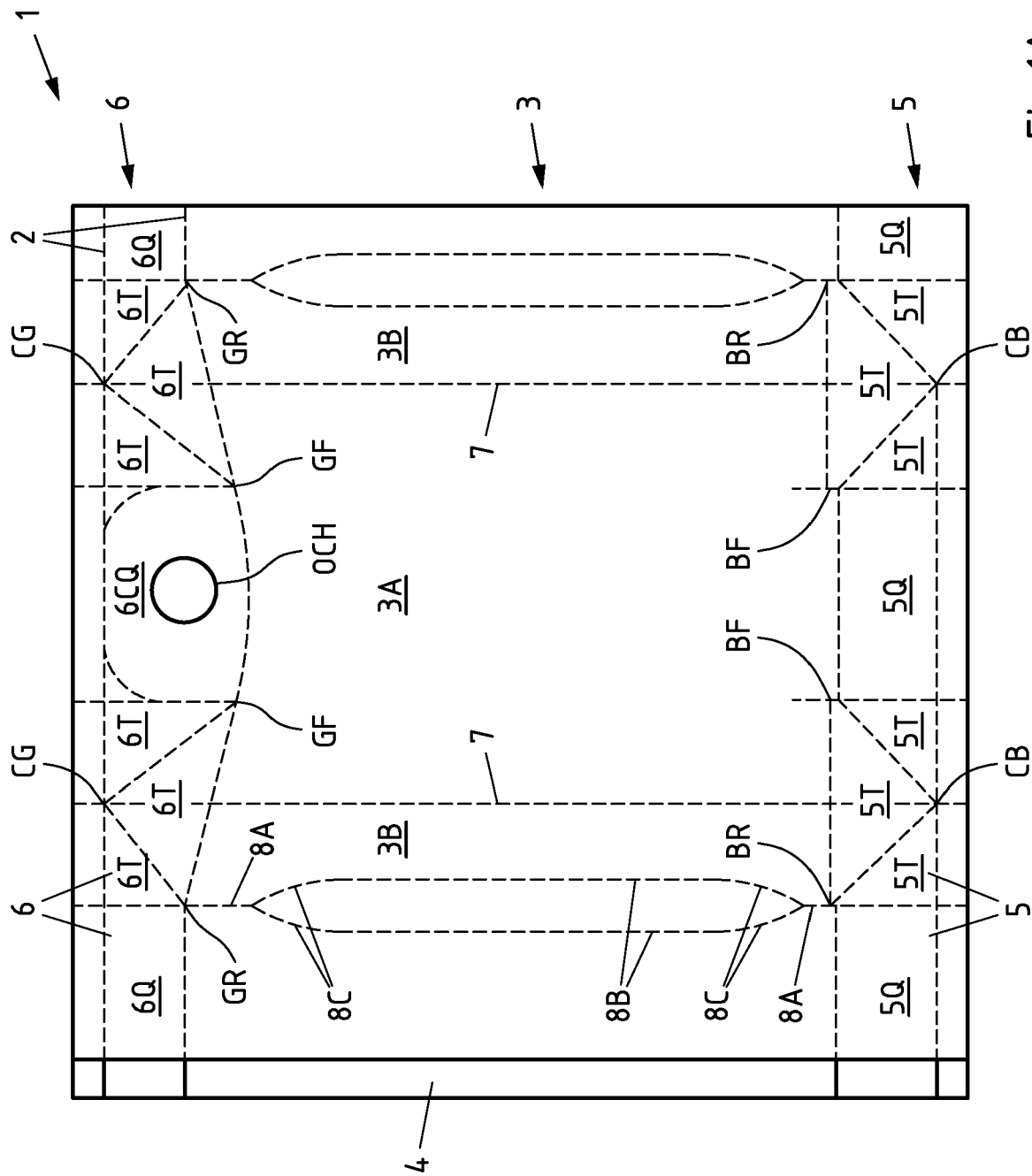


Fig.1A

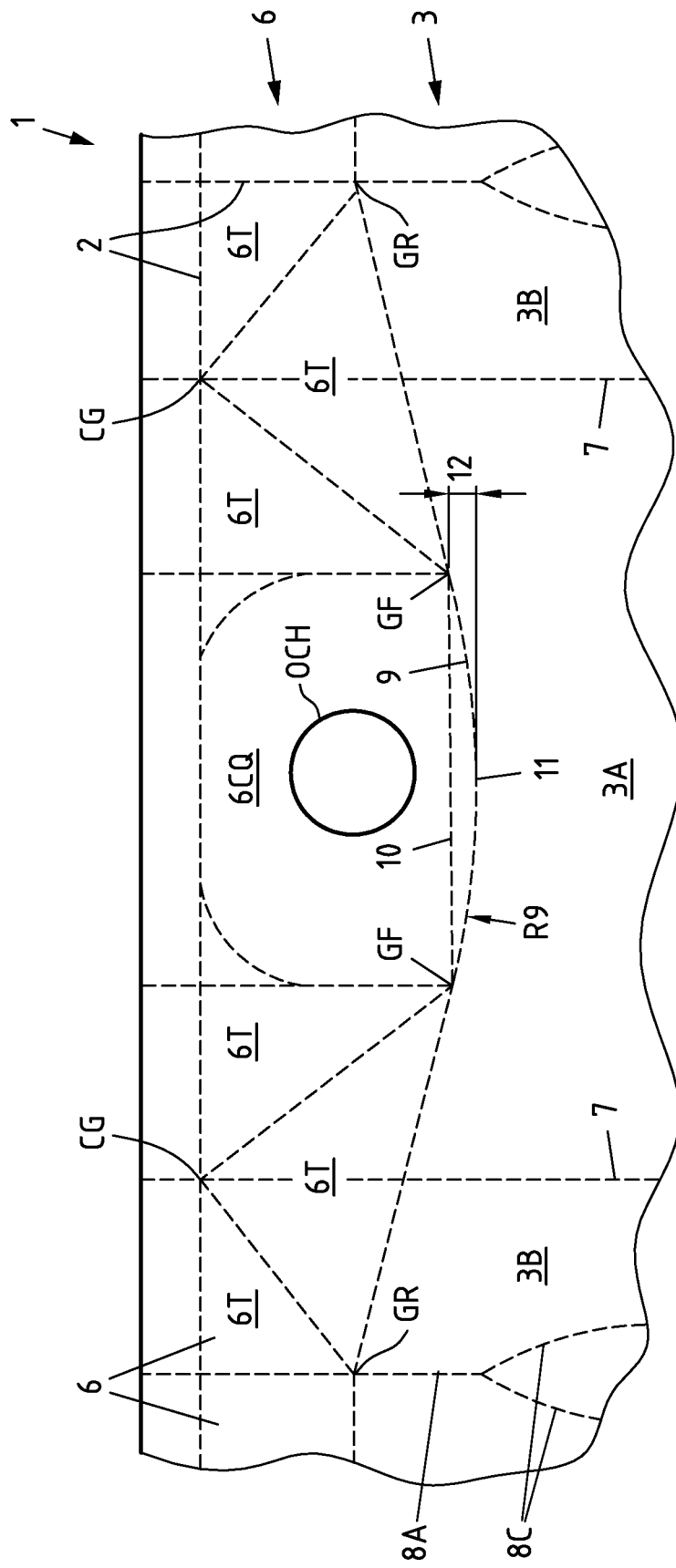


Fig. 1B

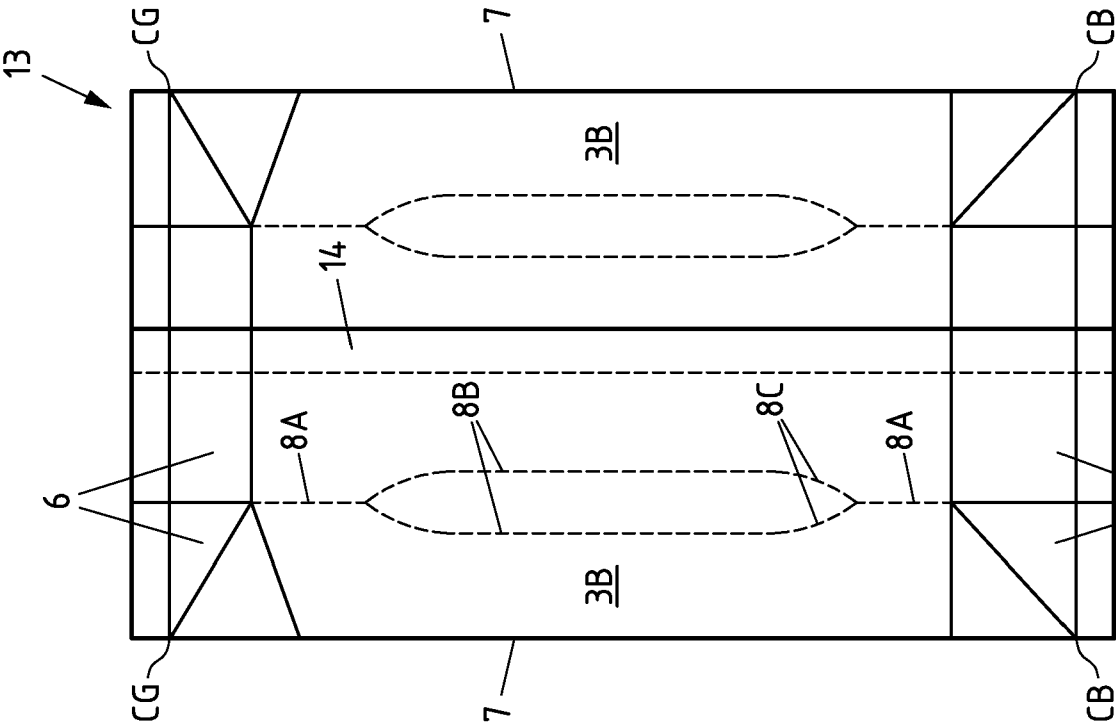


Fig. 2B

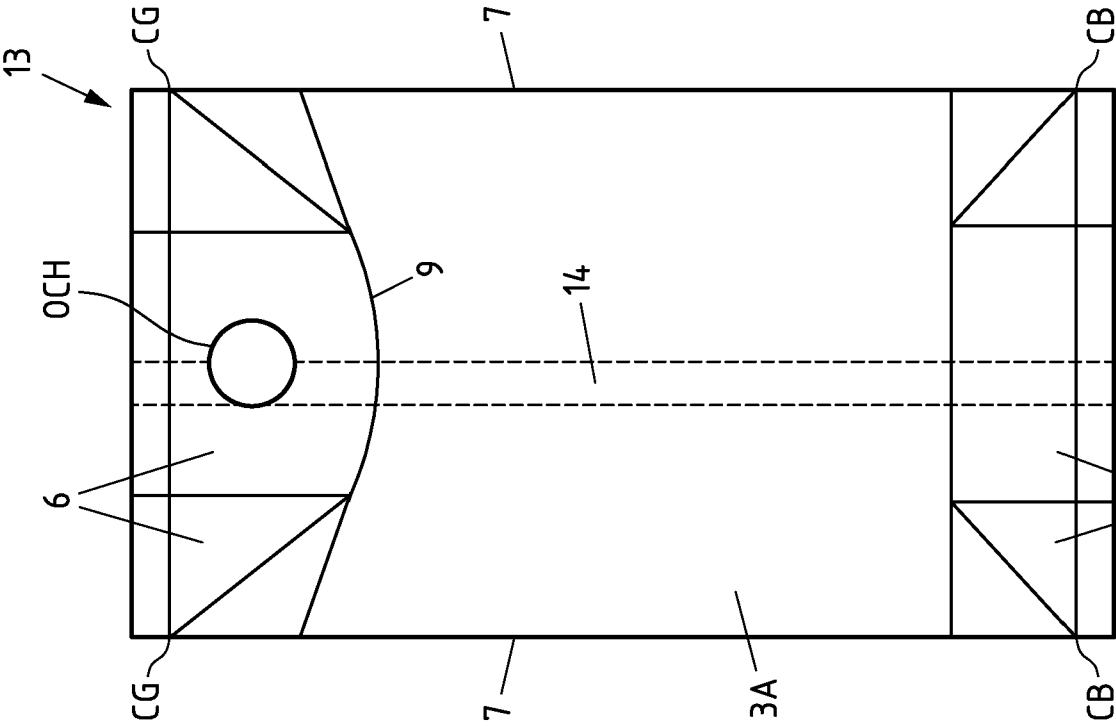


Fig. 2A

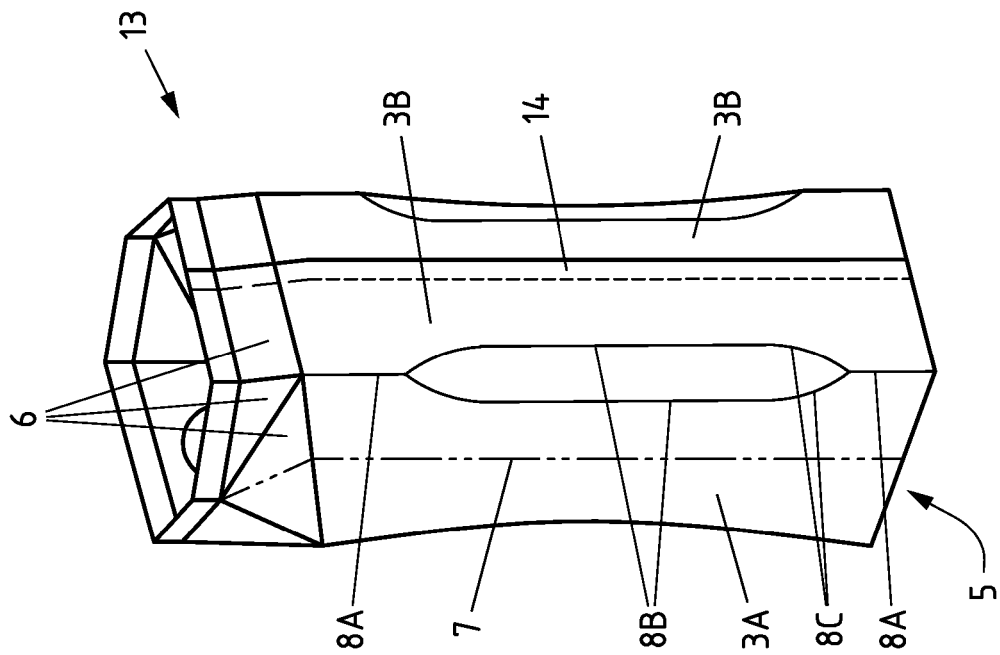


Fig.3B

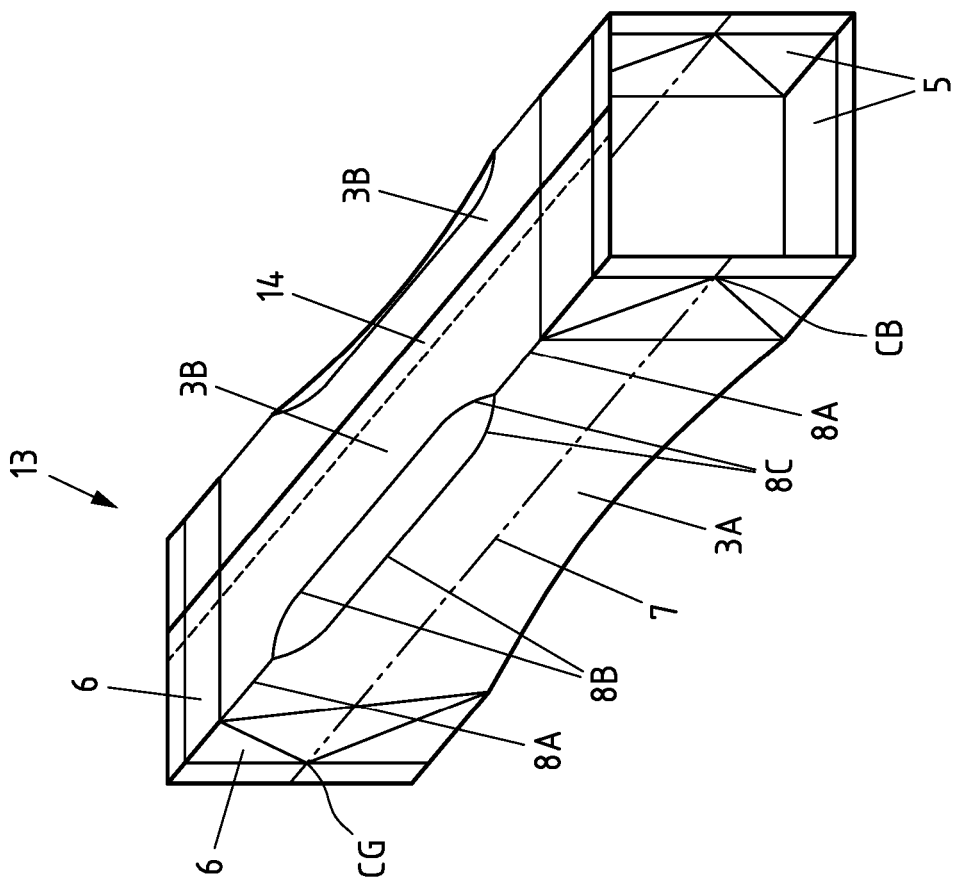


Fig.3A

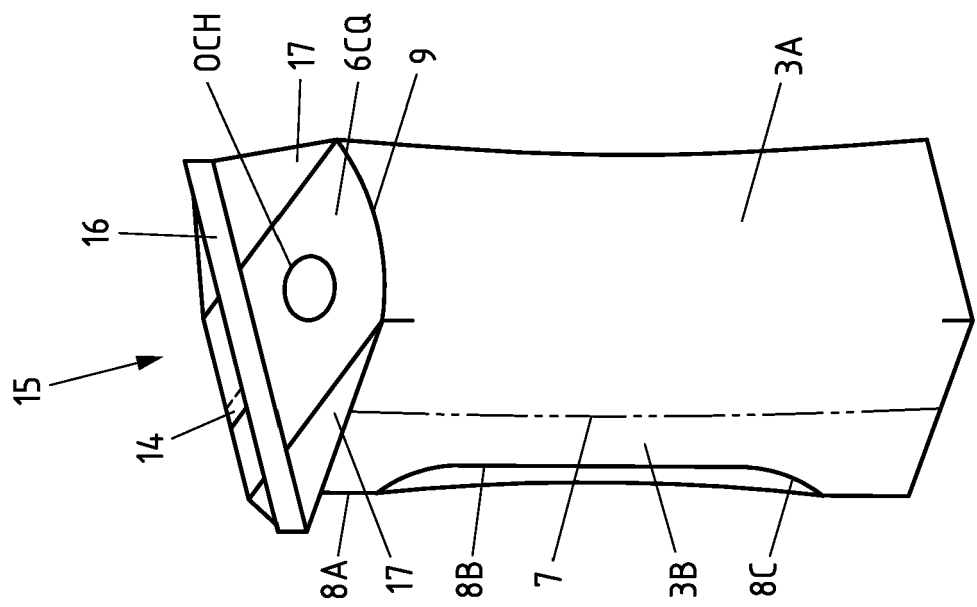


Fig. 4A

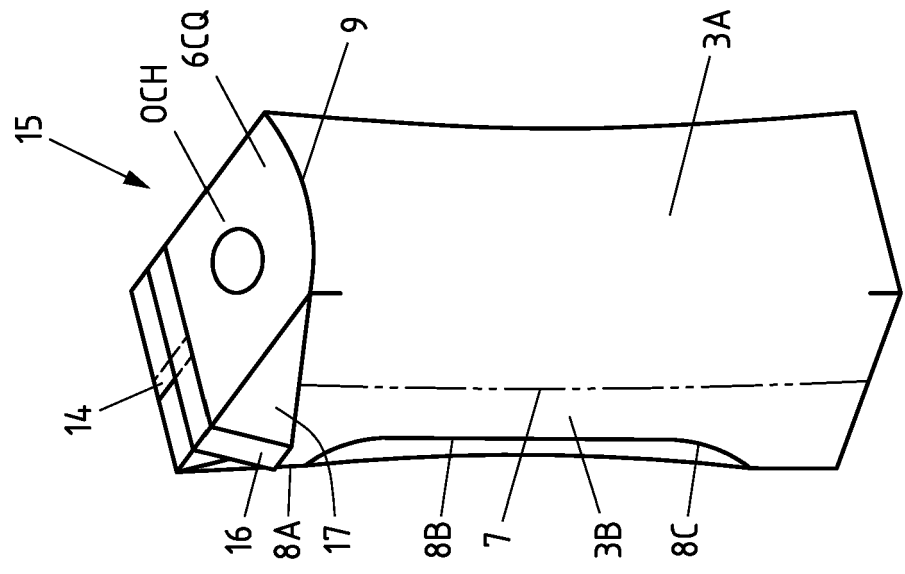


Fig. 4B



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Application Number

EP 23 18 6578

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			B65D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		8 January 2024	Grondin, David
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