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(72) Inventors:
• **BOUCHUIGUIR, Layth Sliman**
1293 Bellevue (CH)
• **MONTICONE, Pier Paolo**
1218 Le Grand-Saconnex (CH)

(71) Applicant: **JT International SA**
1202 Geneva (CH)

(74) Representative: **Plasseraud IP**
66, rue de la Chaussée d'Antin
75440 Paris Cedex 09 (FR)

(54) **STRETCHABLE OVEN CLOSURE FOR A SMOKING DEVICE**

(57) The invention relates to a closure (8) for an opening (2) of an oven (4), preferably an oven (4) of a smoking device (1), wherein the closure (8) comprises a stretchable material. Furthermore, the invention relates to a smoking device (1) comprising such a closure (8) and a

method for closing an oven (4) comprising the steps of extending a closure (8) from a contracted state to a stretched state, and detachably fixing an end (8b) of the closure (8) at least indirectly to the oven (4).

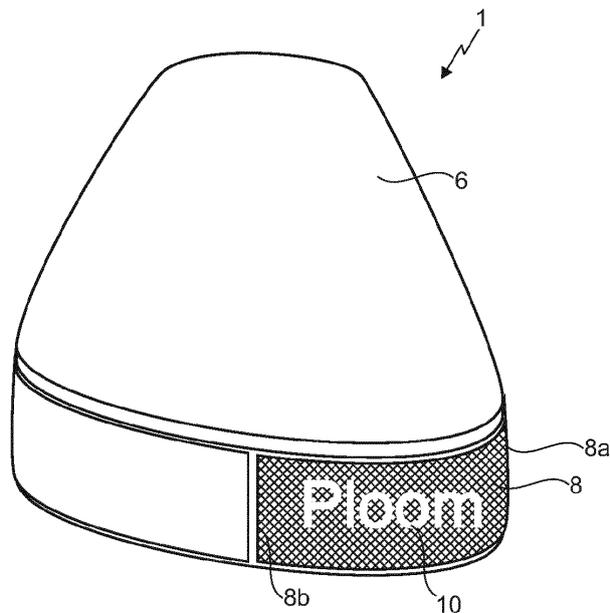


Fig. 3

Description

[0001] The present invention is directed to a closure for an opening of an oven of a smoking device as well as a system comprising an oven with a first opening and such a closure. Furthermore, a method for closing an oven is described.

[0002] In the last years the so-called reduced-risk or modified-risk devices (also known as vaporizers) have become popular as an alternative to traditional tobacco products such as cigarettes, cigars, cigarillos, and rolling tobacco. Numerous devices and systems are available on the market. They have in common that in contrast to the traditional products the tobacco is not burned but heated to produce an aerosol and/or vapor for inhalation.

[0003] In heat-not-burn devices, the substrate is heated in the aerosol generation device. Devices of this type generate an aerosol and/or vapor by heating a solid aerosol substrate, typically moist leaf tobacco, to a temperature typically in the range 150°C to 300°C. This temperature has been found advantageous since the substrate is releasing flavor in form of an aerosol but without combusting or burning the substrate. The released aerosol and/or vapor is enriched by the components sought by the user. Undesired burnt or bitter taste resulting from combustion and burning the substrate could be avoided. Accordingly, harmful by-products of combustion and burning could be avoided.

[0004] Using of the commercially available aerosol generation devices is often considered not to be very user-friendly. This is mainly caused by the fact, that the substrate to be heated needs to be inserted in a heating chamber. This heating chamber (or oven) has to be closable to avoid undesired clogging of the oven with dirt or small objects when the device is not in use and protect integrity of the oven. Furthermore, the oven has to be thermally isolated to avoid the risk of user burns. The closure of the oven is moved frequently by the user. Thus, it must be durable but user-friendly.

[0005] From document EP 3003073 B1, a container for an elongate electronic nicotine delivery system or other flavoured vapor delivery system is known. The container has a lid that is pivotally attached to a body so that it covers first and ancillary openings in the insert in a closed position.

[0006] A further closure is exemplarily described in the patent application WO 2020/225 102 A1. This closure is moveable relative to an aperture of the device between a closed position in which the closure covers the aperture and an open position in which the aperture is substantially unobstructed by the closure. The closure comprises a solid a body and resilient element arranged so as to bias the solid body towards the closed position from a first range of positions and to bias the closure towards an open position from a second range of positions.

[0007] In both of the prior art publications, the closure is quite complex and the voluminous body covering the aperture makes handling difficult. Thus, it is an object of

the invention to provide a closure for an oven which is easy to handle, requires little space and securely closes the oven.

[0008] It has been found that these problems could be overcome by a closure according to claim 1 and a system according to claim 11.

[0009] A closure for an opening of an oven according to the present invention comprises a stretchable material. Such a stretchable material is preferably made of an elastic and/or flexible material. The material preferably comprises an elastomer. It has been found that such a closure could be very thin. Thus, handling is very easy, and the closure only requires little space. Due to the flexibility of the material, in an open state, the closure could be brought in an advantageous position, in which it does not hinder handling of the device and/or inserting a substrate into the oven.

[0010] Preferably, the closure is reversibly switchable between a contracted state and a stretched state. In a preferred embodiment, the length of the closure in a longitudinal direction in the stretched state is greater than in the contracted state. This embodiment is advantageous since in the contracted state the closure requires even less space and handling is even easier.

[0011] In a preferred embodiment, the closure comprises a first end which is at least indirectly permanently connected to the oven and a second end, which is at least indirectly detachably connected to the oven. Preferably the first end is connected to an outer surface of the smoking device. Thus, the closure remains connected with the device in the open state. This reduces the risk of loosing the closure. The first end could be rotatably connected to the oven and/or the device. This allows rotating the closure away from the aperture of the oven.

[0012] Preferably, the second end is detachably connected to the oven by a coupling device. The coupling device preferably comprises a coupling member selected from a group comprising a hook, a magnet, a hook-and-loop fastener, a button, a loop, an eyelet, an eye and an adhesive. Thus, the second end could be detachably fixed to the oven. Preferably in this state the closure covers an aperture of the oven. In this state this aperture is preferably closed in a gastight manner. This ensures that the aerosol could not flow out through this aperture in the closed state.

[0013] Preferably the coupling member could be detachably connected to the device at a further position, preferably on the surface of the device. Thus, the closure is fixed to the device at both ends. This further facilitates handling of the device in a state, in which the aperture of the oven is open.

[0014] In a preferred embodiment, a first area of the closure has a first color in its contracted state and a second color, which is different to the first color, in its stretched state. Thus, a user can easily identify whether the closure is in the contracted state or in the stretched state.

[0015] Preferably, the closure covers an aperture of

the oven in the stretched state. Especially in combination with the above-mentioned embodiment, in which a color of a first area of the closure is different in the contracted state and the stretched state, a user could easily identify by the color of this area, whether the closure is in the stretched state and covers the aperture of the oven correctly. For example, the first area could be green in a contracted state, in which the aperture of the oven is accessible, and yellow in a stretched state, in which it covers the aperture of the oven.

[0016] More preferably, the first area is a surface of the closure, preferably a visible surface, facing away from the oven chamber. The first area preferably has a defined pattern, which is preferably selected from a group comprising stripes, circles, a symbol, preferably a symbol indicating an opened or closed state, an alphabetic character and letters. This allows the user to be alerted to the state of the closure in more detail. For example, in a stretched state, the entire visible surface of the closure is yellow. However, only the first area changes its color (for example to yellow) when the closure is brought in the contracted state. Thus, the pattern of the first area becomes recognizable to the user in the contracted state. The pattern could comprise the letters of the word "open" to inform the user about the open state of the closure. However, also other symbols or letters are suitable to inform the user about the state of the closure. In a preferred embodiment, a trademark appears or disappears when the closure is switched from an open state to a closed state or vice versa.

[0017] Preferably, the length of the closure in a longitudinal directions in the stretched state is greater than in the contracted state by a factor of $\geq 1,1$, preferably $\geq 1,2$, more preferably $\geq 1,5$, most preferably ≥ 2 and preferably ≤ 20 , preferably ≤ 15 , more preferably ≤ 10 , most preferably ≤ 5 . This ensures that the closure could cover the aperture of the oven in the stretched state and fully uncover the aperture in the contracted state.

[0018] In a preferred embodiment, the stretchable material is selected from a group comprising a textile, a silicon and an elastomer, which preferably comprises a strain sensitive material which preferably changes its optical properties depending on the applied strain. Such a strain sensitive material could easily be used to indicate the applied strain, e.g. by a change of color. An example for such a material is described by researchers of the University of Connecticut in Nat Commun 7, 11802 (2016).

[0019] The invention is also directed to a system comprising an oven having a first opening and a closure as described above for closing this first opening.

[0020] Preferably, the oven is an electric oven and more preferably an oven of a smoking device.

[0021] Furthermore, a method for closing an oven is disclosed. This method comprises the steps of:

- extending a closure from a contracted state to a stretched state, and

- detachably fixing an end of the closure at least indirectly to the oven.

[0022] In a preferred method, the step of fixing an end of the closure at least indirectly to the oven comprises the step of detachably connecting a first connecting member to a second connecting member. The first connecting member is preferably selected from a group comprising a hook, a magnet, a hook-and-loop fastener, a button, a loop, an eyelet, an eye and an adhesive.

[0023] Preferably, the method comprises the step of changing optical properties of a first area of the closure when extending the closure from a contracted state to a stretched state. The first area preferably comprises at least one defined pattern, which is more preferably selected from a group comprising a stripe, a circle, a symbol, preferably a symbol indicating an opened or closed state, an alphabetic character, a number and letters.

[0024] Preferably, the method steps are intended to be carried out using a closure as described above. The method in particular relates to using a closure for an opening of an oven as described above. Conversely, all the features of a closure disclosed in combination with the method steps are also preferred embodiments of the above-described closure individually or in combination with other features. Preferably, the above-mentioned closure comprises at least means allowing the method steps (individually and/or in combination) to be performed by a user.

[0025] Further advantages, objectives and features of the present invention will be described, by way of example only, in the following description with reference to the appended figures. In the figures, like components in different embodiments can exhibit the same reference symbols.

[0026] The figures show:

Fig. 1 a schematic view of a device comprising an aperture of an oven in an open state;

Fig. 2 a schematic view of a device comprising an aperture of an oven in a closed state;

Fig. 3 a schematic view of a device in a further preferred embodiment in a closed state;

Fig. 4 a schematic illustration of a closure in a contracted state (above) and elongated state (below);

Fig. 5 is a schematic illustration of a device having an oven 4 and a closure 6;

Fig. 6 a schematic illustration of a first embodiment of the closure with closing members;

Fig. 7 a schematic illustration of a second embodiment of the closure with closing members;

Fig. 8 a schematic illustration of a third embodiment of the closure with closing members.

[0027] Fig. 1 shows a schematic view of a device 1 comprising an aperture 2 of an oven 4 in an open state. The device 1 comprises a housing 6, which surrounds the oven. The housing 6 preferably isolates the oven 4 thermally. Thus, the risk for a user to get in contact with hot surfaces of the oven 4 is reduced.

[0028] For closing the aperture 2 of the oven 4, a closure 8 is provided. In Fig. 1 the closure is shown in a contracted state. Thus, the distance between a first end 8a and a second end 8b of the closure 8 is so short, that the second end 8b does not reach the aperture 2. The first end 8a is fixed at the housing 6. A first color of the closure 8 is indicated in Fig. 1 by the slanted hatching.

[0029] Fig. 2 shows a schematic view of the device 1 as shown in Fig. 1 but in a closed state. The aperture 2 of the oven 4 is covered by the closure 8 and is not visible any more in Fig. 2. The distance between a first end 8a and a second end 8b of the closure 8 is longer than in Fig. 1. Thus, the closure 8 extends from the first end 8a which is fixed to the housing 6, over the aperture (not visible in Fig. 2). Thus, the aperture 2 and the oven 4 are closed by the closure.

[0030] A second color of the closure 8, which is different with respect to the first color, is indicated in Fig. 2 by the cross hatching.

[0031] Fig. 3 shows a schematic view of a device as illustrated in Fig. 1 in a further preferred embodiment in a closed state. Like it is shown in Fig. 2 also in Fig. 3 the aperture 2 of the oven 4 is covered by the closure 8 and is not visible in Fig. 3, too. The closure 8 is extended and the second end 8b of the closure 8 extends over the aperture (not visible in Fig. 3). Thus, the aperture 2 and the oven 4 are closed by the closure.

[0032] However, in the embodiment illustrated in Fig. 3 only parts of the closure change its color due to the transformation in the extended state. Thus, not the entire surface of the closure changes its color but only parts. These parts could have a specific pattern 10, for example letters 10. In the illustrated embodiment the letters "Ploom" 10 are visible due to the color change of parts of the closure. The same effect could also appear in a further embodiment, in which all parts of the closure change its color, but different parts change to a different color.

[0033] A second color of the closure 8, which is different with respect to the first color, is indicated in Fig. 2 by the cross hatching.

[0034] Fig. 4 shows a schematic illustration of a schematic illustration of a closure 8 in a contracted state (upper illustration in Fig. 4) and an elongated state (lower illustration in Fig. 4). As illustrated by the lines L1 and L2 indicating a first length L1 and a second length L2, the length of the closure 8 between a first end 8a and a second end 8b in the elongated state is bigger. The color change from a first color (slanted hatching) of the closure

8 to a different second color (cross hatching) is indicated by the different hatchings.

[0035] Fig. 5 is a schematic longitudinal cross-section of a device having an oven 4 and a housing 6 with a closure 8 covering an opening 2 of the oven 4. In this illustration an energy source 12 is visible. This energy source is preferably a (rechargeable) battery. This battery is electrically connected with the oven 4. In the illustrated embodiment, the oven 4 has an elongated form and an essentially circular cross section. This shape of the oven 4 is advantageous for heating a substrate in form of a stick. Such a stick could be easily inserted through the first opening (or aperture) 2. Due to the circular cross section, a circular stick contacts the hot surfaces of the oven 4 and isolating air between these surfaces and the substrate to be heated could be avoided or reduced.

[0036] In Fig. 5 the device is shown in a closed state, in which the closure 8 extends from its first end 8a to its second end 8b over the aperture 2 of the oven 4. Thus, it could be avoided that undesired substances enter the oven 4.

[0037] Fig. 6 is a schematic illustration of a first embodiment of the closure with closing members 14 and 16. In this embodiment, the second end 8b of the closure 8 can be fixed to the housing 6 of the device 1 by means of a first closing member 14, e.g. a magnetic element 14. This magnetic element 14 could be releasably connected with a complementary element 16, which in this embodiment is a planar surface area 16 of the housing 6. In the illustrated state, the closure 8 covers the aperture 2 and no particles could accidentally enter the oven 4.

[0038] Similar to a magnetic element 14, also a glue or other bonding member 14 could be used as one of the closing members 14 and/or 16. Preferably the other (second) closing member 16 is configured to releasably bind the first closing member 14.

[0039] Fig. 7 is a schematic illustration of a second embodiment of the closure with closing members 14 and 16. In this embodiment, the second end 8b of the closure 8 can be fixed to the housing 6 of the device 1 by means of a hook-and-loop fastener 14,16 (e.g. a Velcro® fastener). This hook-and-loop fastener 14, 16 could comprise a first closing member 14 or 16 which comprises (tiny) hooks, whereas the second closing member 14 or 16 features (smaller) loops. When the two closing members 14 and 16 are pressed together the hooks catch in the loops and the two pieces fasten or bind temporarily. In the illustrated state, the closure 8 is not covering the aperture 2 completely, since the first closing member 14 is not yet bound to the second closing member 16. After connection of both closing members 14 and 16 the aperture is securely covers by the closure and no particles could accidentally enter the oven 4.

[0040] Fig. 8 is a schematic illustration of a third embodiment of the closure with closing members 14 and 16. In the illustrated state, the closure 8 is not yet covering the aperture 2 and the oven 4 completely, since the first

closing member 14 is not yet interacting with the second closing member 16. In Fig. 8, the second end 8b of the closure 8 can be fixed to the housing 6 of the device 1 by means of a hook 14 which could mechanically interact with a corresponding protrusion 16 or notch 16. Due to the elasticity of the material of the closure 8, the closure 8 could be further elongated to release the hook 14 from the protrusion 16 or notch 16 and to open the aperture. Thus, repeatable closure of the oven and its first opening (the aperture) is possible.

[0041] It will be understood that the embodiments explained above are merely a first embodiment of the method and/or system of the invention. In this respect, the disclosure of the invention is not limited to these embodiments.

[0042] The applicant reserves his right to claim all features disclosed in the application document as being an essential feature of the invention, as long as they are new, individually or in combination, in view of the prior art. Furthermore, it is noted that in the figures features are described, which can be advantageous individually. Someone skilled in the art will directly recognize that a specific feature being disclosed in a figure can be advantageous also without the adoption of further features from this figure. Furthermore, someone skilled in the art will recognize that advantages can evolve from a combination of diverse features being disclosed in one or various figures.

List of reference symbols

[0043]

1	device, smoking device,
2	first opening, aperture (of the oven),
4	oven, heating device,
6	housing,
8	closure,
8a	first end (of the closure),
8b	second end (of the closure),
10	pattern, text, numbers, symbols,
12	energy source, battery,
14, 16	first and second closing member, magnet, glue, hook, protrusion, notch, hook-and-loop fastener,
L1	length (of the closure) in a contracted state,
L2	length (of the closure) in an elongated state.

Claims

1. A closure (8) for an opening (2) of an oven (4), preferably an oven (4) of a smoking device (1), **characterized in that** the closure (8) comprises a stretchable material.
2. The closure (8) according to claim 1, **characterized in that**

the closure (8) is reversibly switchable between a contracted state and a stretched state, wherein the length (L2) of the closure in a longitudinal direction in the stretched state is preferably greater than in the contracted state (L1).

3. The closure according to claim 1 or 2, **characterized in that** the closure (8) comprises a first (8a) end which is at least indirectly permanently connected to the oven (4) and a second end (8b), which is at least indirectly detachably connected to the oven (4).
4. The closure according to claim 3, **characterized in that** the second end (8b) is detachably connected to the oven (4) by a coupling device (14, 16) comprising a coupling member (14, 16) selected from a group comprising a hook, a magnet, a hook-and-loop fastener, a button, a loop, an eyelet, an eye and an adhesive.
5. The closure according to claim 3 or 4, **characterized in that** the first end (8a) is rotatably connected to the oven (4) and/or the device (1).
6. The closure according to any of claims 2 - 5, **characterized in that** a first area of the closure (8) has a first color in its contracted state and a second color, which is different to the first color, in its stretched state.
7. The closure according to claim 6, **characterized in that** the first area is a surface of the closure (8), preferably the visible surface facing away from the oven chamber (4), wherein the first area preferably has a defined pattern, which is preferably selected from a group comprising stripes, circles, a symbol, preferably a symbol indicating an opened or closed state, an alphabetic character and letters.
8. The closure according to any of claims 2 - 7, **characterized in that** the length (L(2)) of the closure (8) in a longitudinal directions in the stretched state is greater than its length (L(1)) in the contracted state by a factor of ≥ 1.1 , preferably ≥ 1.2 , more preferably ≥ 1.5 , most preferably ≥ 2 and preferably ≤ 20 , preferably ≤ 15 , more preferably ≤ 10 , most preferably ≤ 5 .
9. The closure according to any preceding claim, **characterized in that** the stretchable material is selected from a group comprising a textile, a silicon and an elastomer, which preferably comprises a strain sensitive material which preferably changes its optical properties

depending on the applied strain.

10. The closure according to any of claims 3 - 9,
characterized in that
 the length (L1) of the closure in the contracted state
 is shorter than the shortest distance between the
 opening (2) of the oven (4) and a point at which the
 first end (8a) is connected to the oven (4) and/or the
 device (1). 5
 10
11. A System (1) comprising an oven having a first open-
 ing and a closure (8) according to any preceding
 claims for closing this first opening (2). 10
12. The system according to claim 11,
characterized in that
 the oven (4) is an electric oven and preferably an
 oven (4) of a smoking device (1). 15
13. The system according to claim 11 or 12,
characterized by
 a housing (6), which surrounds the oven at least in
 parts and preferably isolates the oven (4) thermally. 20
14. The system according to any of claims 11 - 13,
characterized in that
 a coupling member (16) for detachably connecting
 a second end (8b) of the closure (8) to the oven (4)
 and a point at which a first end (8a) is connected to
 the oven (4) and/or the device (1) are located at op- 25
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 opposite sides of the oven (4) and/or the opening (2)
 of the oven (4).
 15. The system according to claim 11 - 14,
characterized by
 a battery (12), preferably a rechargeable battery,
 which is electrically connected with the oven (4).
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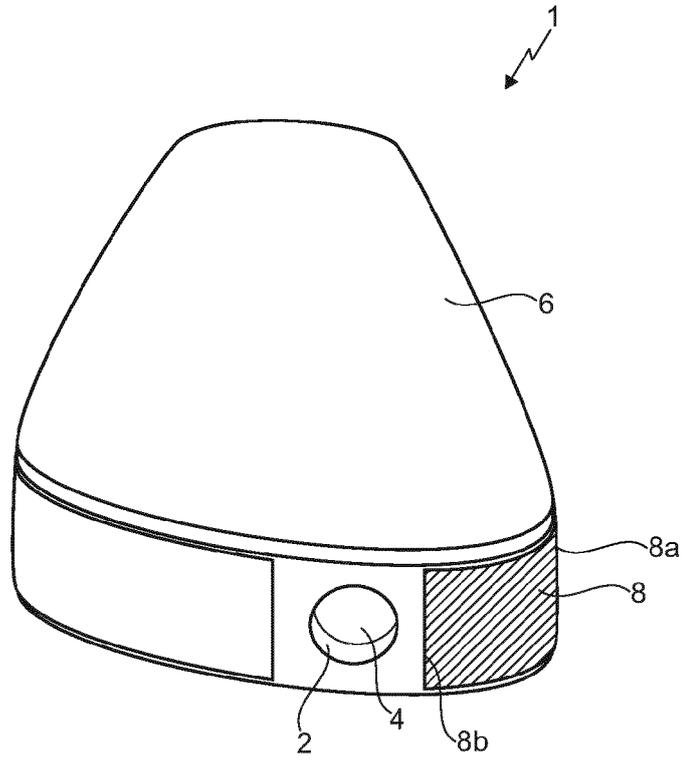


Fig. 1

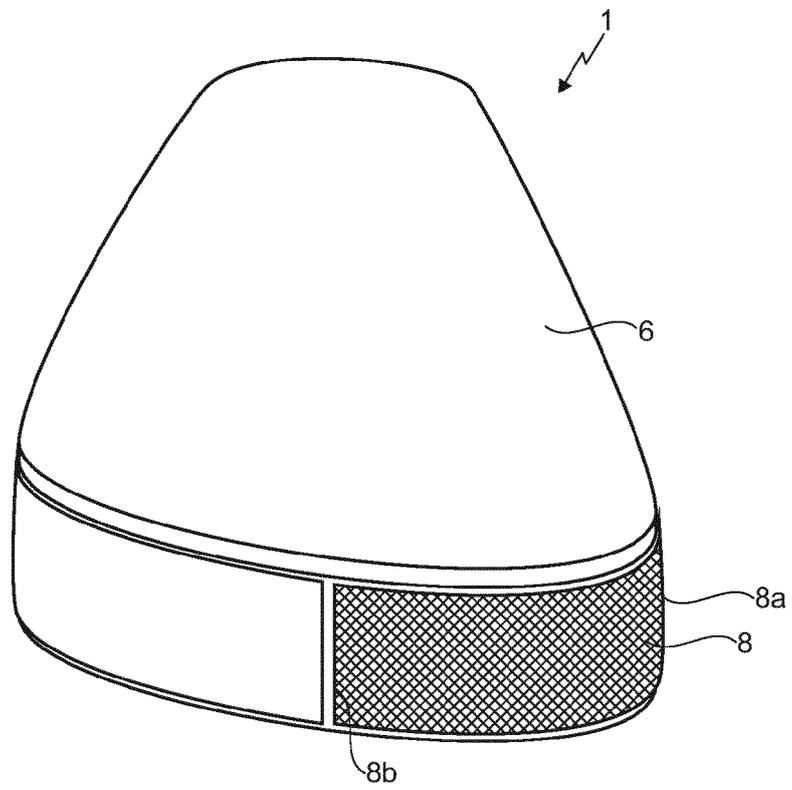


Fig. 2

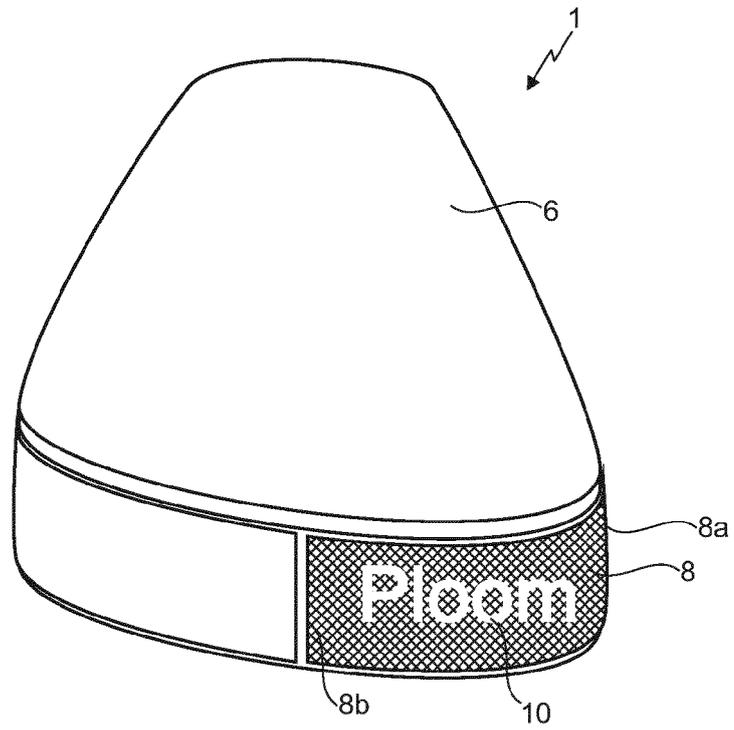


Fig. 3

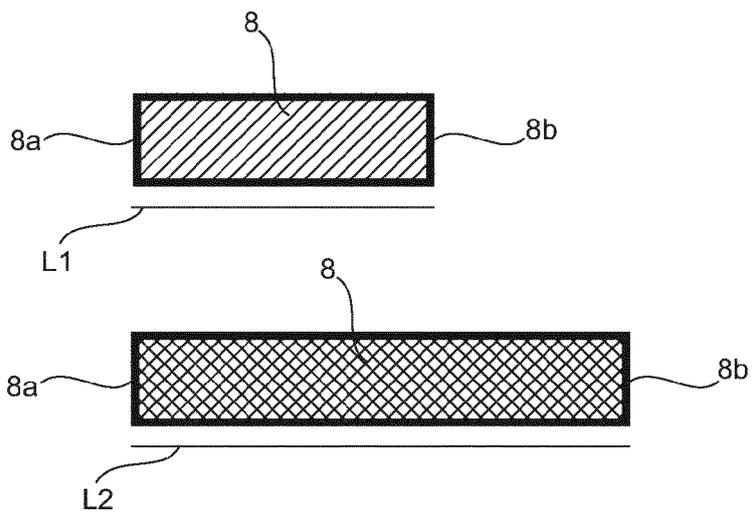


Fig. 4

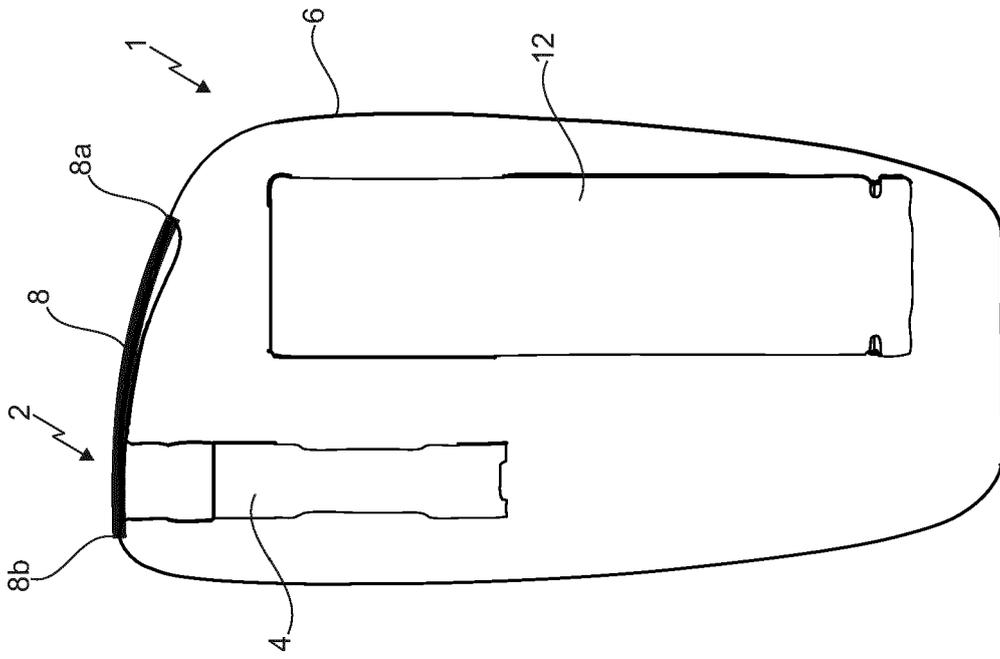


Fig. 5

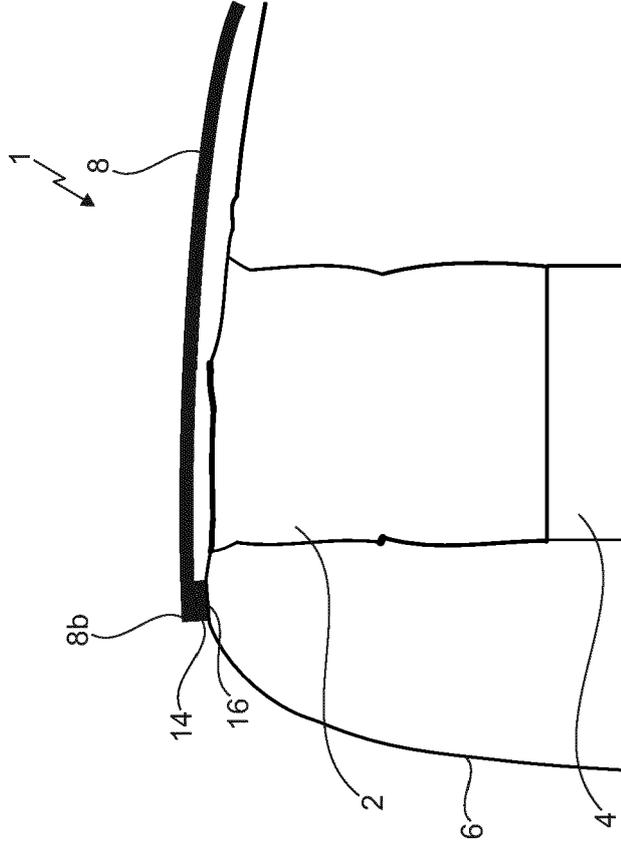


Fig. 6

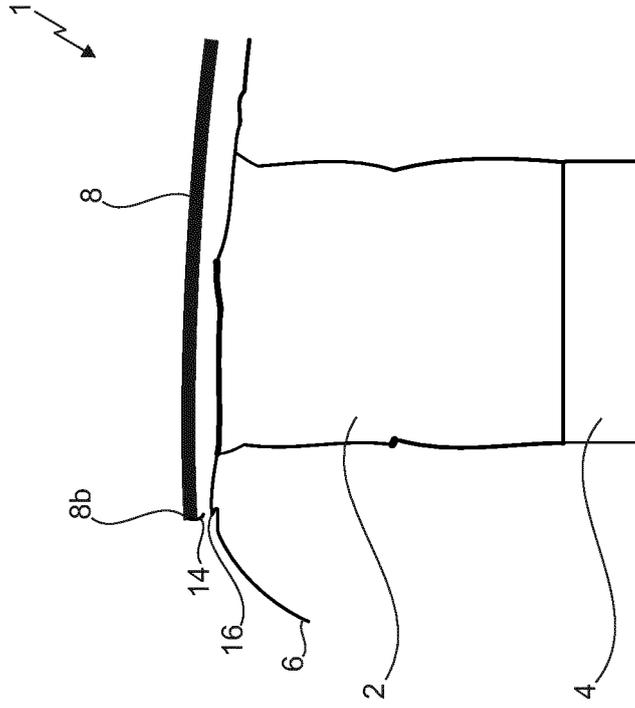


Fig. 8

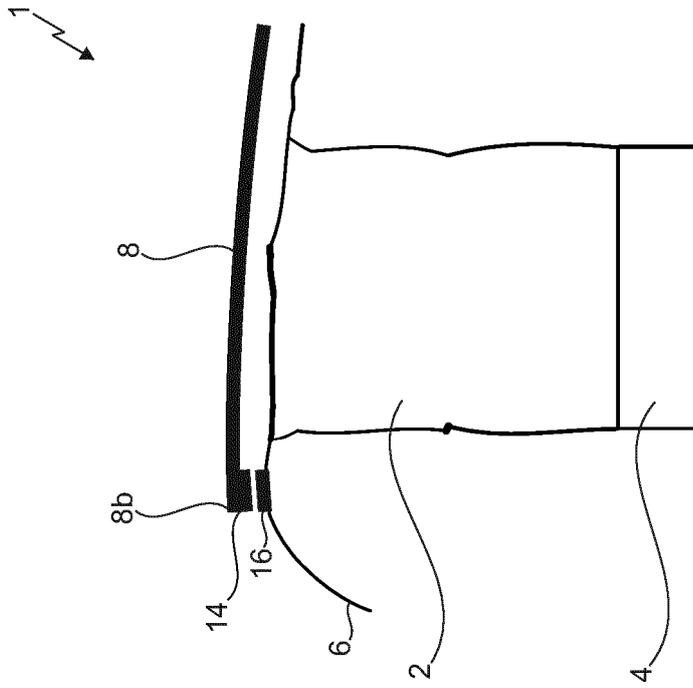


Fig. 7

ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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