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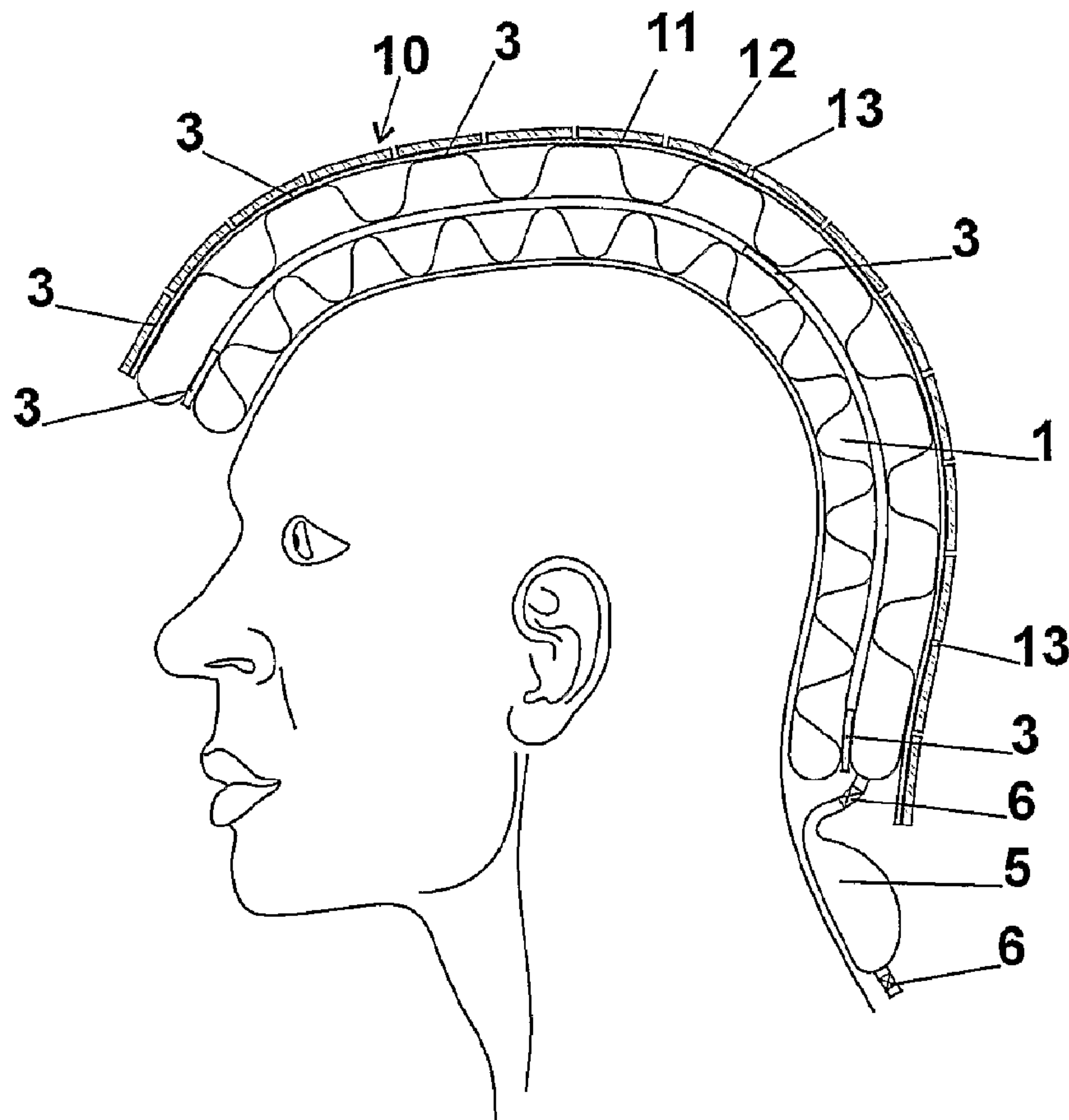
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(54) Titre : CASQUE DE PROTECTION FLEXIBLE

(54) Title: FLEXIBLE PROTECTIVE HELMET



(57) Abrégé/Abstract:

The invention relates to a protective helmet comprising an inner hood (1) consisting of a spacer knitted fabric consisting of a monofilament yarn. Said hood is covered by a pneumatic central layer (4) which can be pressurised by means of compressed air

(57) **Abrégé(suite)/Abstract(continued):**

and can be inflated by means of an air pump (5) which can be, for example, removed and provided with valves (6). An outer layer (10) consists of an inner textile layer (11) which lies over the pneumatic central layer (4), and plates (12) which are fixed to the textile layer (11), for example by adhesion. Said plates (12) consist, for example, of plastic, composite materials, or natural materials. The plates (12) can be arranged in such a way that joints (13) are created thereinbetween, the outer layer (10) thus being provided with a certain elasticity in order to cater for different head shapes and sizes.

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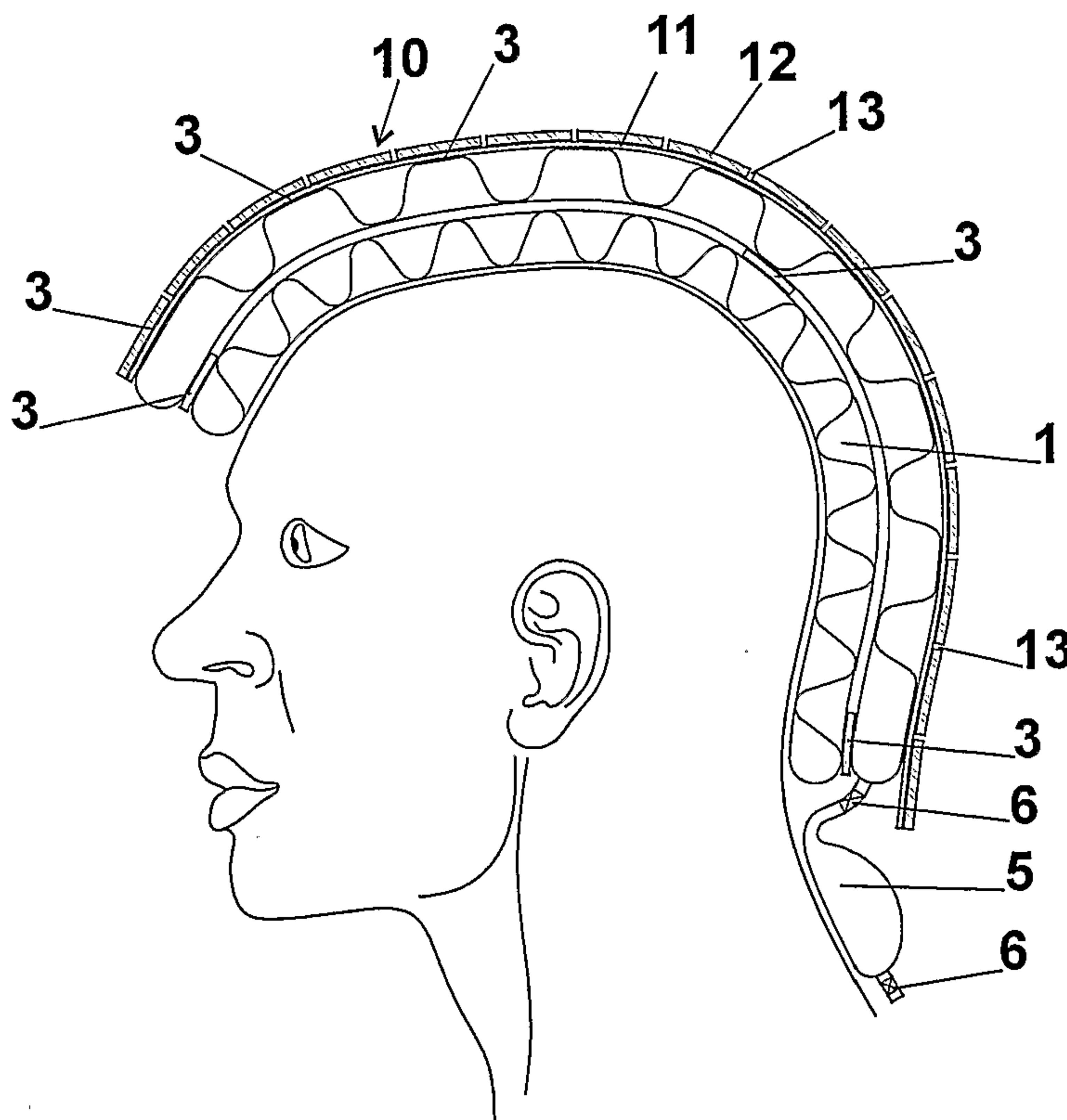
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[Fortsetzung auf der nächsten Seite]

(54) Title: FLEXIBLE PROTECTIVE HELMET

(54) Bezeichnung: FLEXIBLER SCHUTZHELM



(57) **Abstract:** The invention relates to a protective helmet comprising an inner hood (1) consisting of a spacer knitted fabric consisting of a monofilament yarn. Said hood is covered by a pneumatic central layer (4) which can be pressurised by means of compressed air and can be inflated by means of an air pump (5) which can be, for example, removed and provided with valves (6). An outer layer (10) consists of an inner textile layer (11) which lies over the pneumatic central layer (4), and plates (12) which are fixed to the textile layer (11), for example by adhesion. Said plates (12) consist, for example, of plastic, composite materials, or natural materials. The plates (12) can be arranged in such a way that joints (13) are created thereinbetween, the outer layer (10) thus being provided with a certain elasticity in order to cater for different head shapes and sizes.

(57) **Zusammenfassung:** Der erfindungsgemässe Schutzhelm ist aufgebaut aus einer inneren Haube (1) aus einem Distanzgewirk aus einem monofilaren Garn. Darüber befindet sich eine mit Druckluft

beaufschlagbare pneumatische Mittelschicht (4), welche mit einer beispielsweise abnehmbaren und mit Ventilen (6) versehenen Luftpumpe (5) aufgeblasen werden kann. Eine

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Zur Erklärung der Zweibuchstaben-Codes und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

Aussenschicht (10) ist aufgebaut aus einer inneren Textillage (11), welche über die pneumatische Mittelschicht (4) zu liegen kommt, und Platten (12), die auf der Textillage (11) beispielsweise durch Kleben befestigt sind. Diese Platten (12) bestehen beispielsweise aus Kunststoff, Verbundwerkstoffen oder natürlich nachwachsenden Materialien. Die Platten (12) können so angeordnet sein, dass zwischen ihnen Fugen (13) entstehen, womit die Aussenschicht (10) eine gewisse Elastizität aufweist, um verschiedenen Kopfgrößen und -Formen Rechnung zu tragen.

FLEXIBLE PROTECTIVE HELMET

The present invention relates to a flexible protective helmet.

5 Several flexible protective helmets are familiar.

Their invention concept in general comprises creating a protective helmet that when not in use can be folded to save space and on the other hand, due to its shape and size, when
10 in use is identifiable as a protective helmet. This as such should increase its acceptance.

Several such protective helmets that can be folded have become familiar, for instance, from WO 00/57739 (D1), WO 01/24651
15 (D2), EP 0 802 741 (D3) and EP 1 332 688 (D4).

Among the protective helmets mentioned here, the one for cyclists, disclosed under D1, is designed in modular concept and is thus foldable and can be dismantled, however, it is
20 clearly identifiable as a protective helmet when in use. Space saving in a folded state is rather insignificant.

The protective helmet according to D2 consists of an inner layer made of shockproof material that is disintegrated into
25 truncated butt-joined or interlocked teathed pieces. This layer of shockproof material is covered with a textile and elastic material on the outside and inside. Due to this, when worn it feels more of a cap. The possibility of folding it is restricted due to the shape of the shockproof inner layer.

30 The protective helmet that is familiar according to D3 features a cap-shaped design, whereby this cap is made of numerous, preferably six, spherical segment-shaped pieces, which are preferably made of foamed plastic. Among

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themselves, for instance, these segments are connected by means of ribbons.

5 The protective helmet according to D4 is again made in modular concept and based on the desired intensity or type of head protection it can be complemented in modular manner.

10 Whereas the ones according to D1 and D4 only partially fulfil the tasks, the ones mentioned in D2 and D3 are more relevant to the present invention without fulfilling the requirements for the ability of being folded or put aside on the one hand and fulfilling the acceptance requirement on the other hand.

15 The task to be solved by the present invention is the creation of a collapsible or foldable protective helmet for sportspersons, which provide optimum protection for the chosen type of sports and at the same time which is not
20 prima-vista apparent as a protective helmet.

The solution of the posed task is reproduced in the characteristic part of Claim 1 with respect to its main characteristic, and in the following claims with respect to
25 further advantageous embodiments. The inventive concept is explained in detail by means of the attached drawings. The following are shown:

30 Fig. 1 a longitudinal section through an innermost layer,

Fig. 2 a longitudinal section through an innermost and a middle layer,

35 Fig.3-6 different embodiments for the middle layer, in schematic plan views,

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Fig. 7 a longitudinal section through an inner, a middle and an outer layer,

5 Fig. 8 an embodiment of an outermost layer in a schematic longitudinal section,

Fig. 9 a further embodiment of an outermost layer in a schematic longitudinal section,

10 Fig.10,11 further embodiments of the outermost layers in a schematic longitudinal section.

Fig. 1 shows the longitudinal section through an innermost layer of the foldable protective helmet schematically according to the invention. It preferably consists of a so-called monofilament spacer, with which a monofilament yarn is knitted between two woven or knit layers 2. Such spacers are familiar; they allow being cut and sewn in arbitrary shapes such that an attached hood 1 that is elastic but mostly permeable to air can be made. On the outer layer 2 of this hood 1, one side of a fastening means 3 is attached at a suitable point, for instance, a fastener by means of sawing or adhesion so that a middle layer according to Fig. 2 can be fixed to this innermost layer without danger of displacement.

Fig. 2 is the illustration of a second double-walled and gas-tight middle layer 4 with compressed-air inflating possibility. As material for the middle layer, for instance, plastic films made of PU or PVC preferably come in question. For manufacturing the middle layer 4, for instance, two layers of such a film are laid one over the other and, as shown in the Figures 3-6, welded with one another. From the middle layer 4, fibre from hood 1 made of spacers is tied and connected in a detachable manner on the corresponding fixed lock parts 3 on the middle layer 4 with that of the hood 1. At a suitable point that does not

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disturb the person wearing the protective helmet according to the invention, there is an air pump 5 for instance that is made of a bulb that can be squeezed together. In Fig. 2, this is located for instance in the region of the neck.
5 Obviously, any position can be provided, so long as it does not disturb the person wearing the protective helmet. Also a version that is detachable after inflation is appropriate to the invention. The air pump 5 features a valve 6 each for supplying the pneumatic middle layer 4 with air and one
10 for the air pump 5. Such valves are in fact familiar.

Figures 3 to 6 are schematic plan views of embodiments of the pneumatic middle layer, respectively in plan view. It is possible to create the desired concave shape of the
15 pneumatic middle layer 4 only through attaching weld seams 7 in the air-tight material of this middle layer 4 in their inflated states by means of compressed air. This material is preferably, however, already formed by means of cutting so that through inflating it must only be brought to the
20 necessary fitting shape.

Through suitably arranged interruptions 8 in the weld seams 7, it is ensured that the entire middle layer 4 consists of individual interconnected volumes. According to the
25 invention, cut-outs or slots are likewise provided in the pneumatic middle layer 4, which are confined all round by weld seams 7. Such cut-outs permit vapour diffusion from the scalp through the hood 1 and pneumatic middle layer.

30 In the inflated state, the pneumatic middle layer 4 folds out around the hood 1 made of spacers under concurrent formation of many air cushions 9, confined by the weld seams 7, as schematically depicted in Fig. 2.

35 In Fig. 7 - as representative for many others - an embodiment of an outer layer 10 is illustrated. Again, between the pneumatic middle layer 4 and a textile layer 11

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of the outer layer 10 a means of connection 3 is provided, which allows the two layers 4, 10 to be connected with one another in a detachable manner. As a preferred, however not restrictive, example for such a means of connection, a
5 Velcro strip is provided again. Whereas for many, this can lie amongst decorative possibilities; here only technical features are described.

Figures 8, 9 show schematic cross-sections through such
10 outer layers according to Fig. 7. An inner textile layer 11, for instance, made of knit or woven fabric carrier plates 12. These plates 12 are preferably concave shaped. According to their outside contour, they can be formed such that they overlap one another like bricks as depicted in
15 Fig. 8, or in essence form a smooth layer as shown in Fig. 9. As materials for the plates 12, above all and according to the invention, one considers shockproof plastics, however, also natural, renewable raw materials like wood, coconut shells or other hard, non-brittle and natural,
20 renewable raw materials and also metals or composite materials made of plastic and metal. In Fig. 9, joints 13 are depicted, which serve for compensation of different head sizes and shapes. Should the plates form a surface that is interrupted by the joints 13, but smooth in
25 essence, then they will be, for instance, cut with polygonal, preferably hexagonal contours. Other shapes are by all means possible and familiar under the term parqueting.

30 The embodiments depicted in Figures 10 and 11 are also conceivable and included in the invention concept. In Fig. 10, the plates 12 fixed on the textile layer 11 are interlaced in one another so that they remain movable relative to one another.

35

In Fig. 11 the plates form two overlapping layers: plates 12a that in essence are made flat, form an inner layer;

- 6 -

plates 12b that are made shell-shaped overlap the inner plates 12a respectively through their edges. Through this, the joints 13 are covered according to Fig. 9.

- 5 The plates 12 are fixed on the textile layer 11 preferably by adhesive means. Through variation of the size of the adhesive points, within the scope of elasticity of the textile layer 11 again, different head sizes and shapes can be accounted for, without many such head sizes being
10 provided in the cut and in other production.

In case the protective effect of flexible protective helmet striven for allows this, the pneumatic middle layer 4 can be omitted. The outer layer 10, comprising the textile
15 layer 11 and the plates 12 fixed on it, is then drawn directly over the hood 1. What is essential thereby is that the means of connection 3 are attached on the points corresponding with one another. At most, for this approach, a small cut outer layer must be provided.

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CLAIMS

1. A flexible protective helmet characterised in that it at least comprises two layers joinable with and separable from one another,
 - an inner hood made of a textile material,
 - an outer layer comprising hard plates,
 - a third layer, namely a pneumatic middle layer, insertable between the inner hood and the outer layer.
2. The flexible protective helmet, according to Claim 1, characterised in that the inner hood consists of a spacer.
3. The flexible protective helmet, according to Claim 1, characterised in that the middle layer is made of two layers of a plastic film, which are connected by means of weld seams such that this middle layer is air tight and takes on a concave shape when inflated with compressed air.
4. The flexible protective helmet, according to Claim 3, characterised in that the middle layer features a multiplicity of cut-outs respectively confined by weld seams.
5. The flexible protective helmet, according to Claim 1, characterised in that the concave shape striven for is at least partly determined by cutting the plastic film and by means of compressed air, being able to adapt it to the individual head size and shape of the person to wear it.
6. The flexible protective helmet, according to any one of claims 1 to 5, characterised in that in order to

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inflate the middle layer, a manually operated air pump is provided.

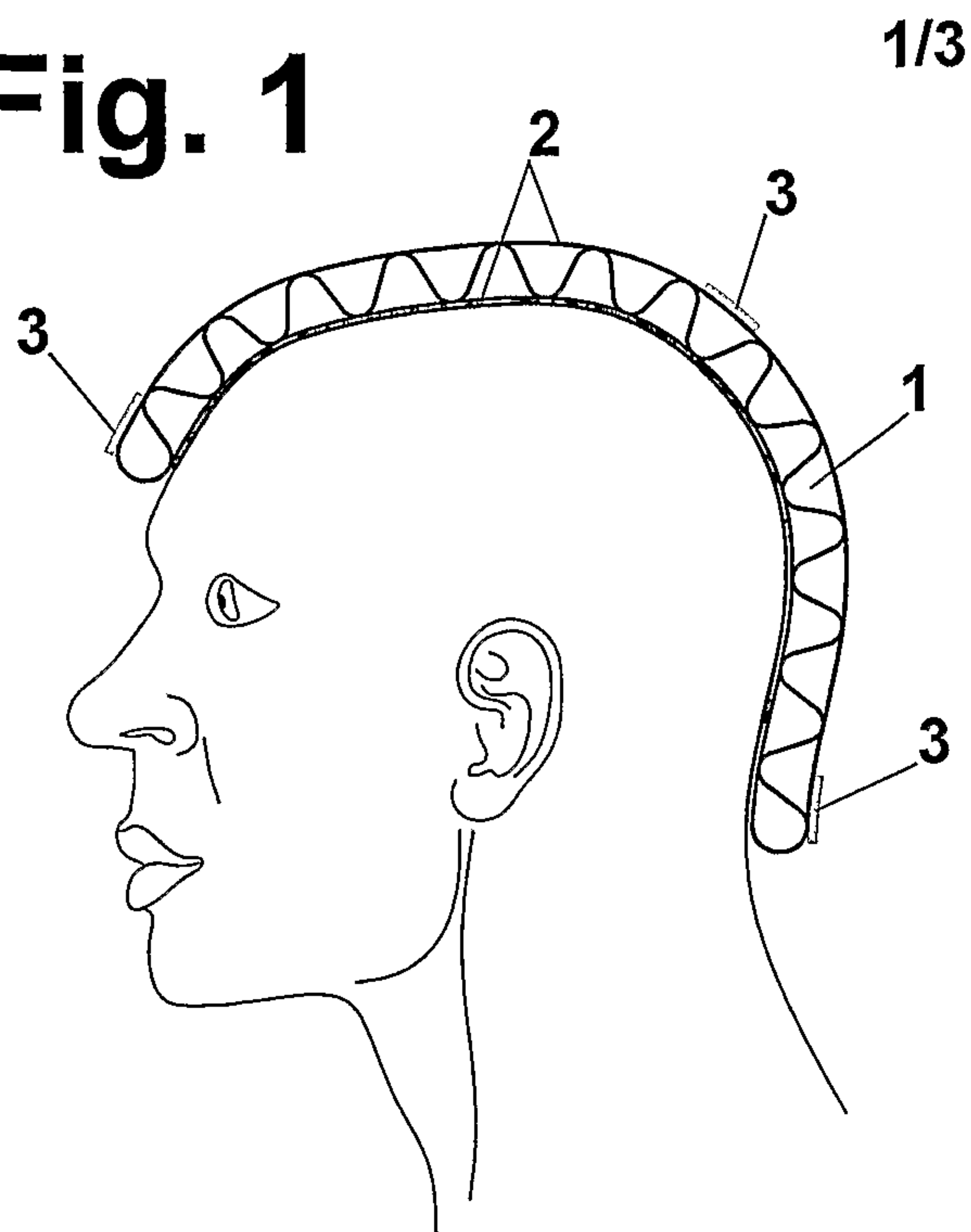
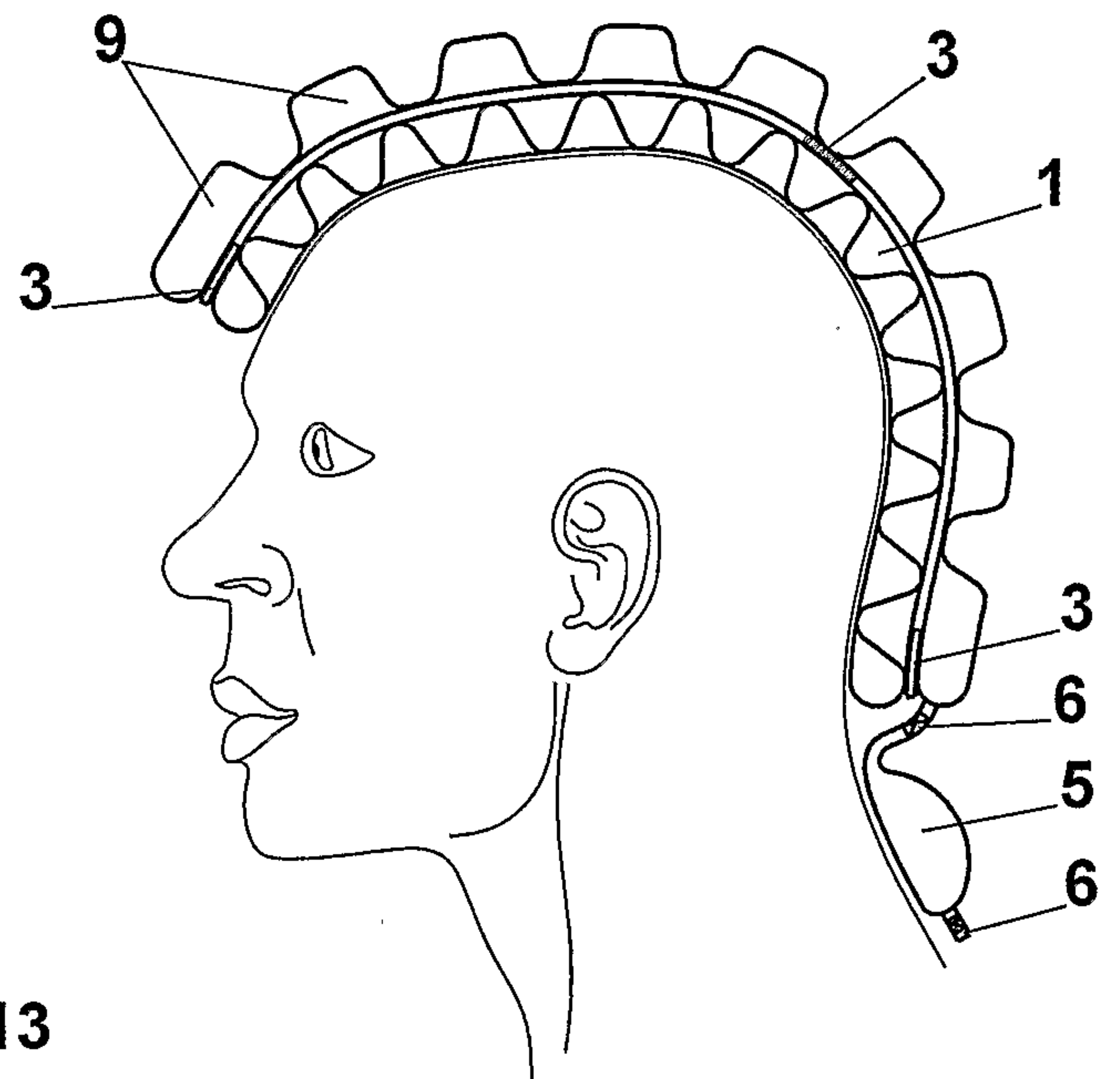
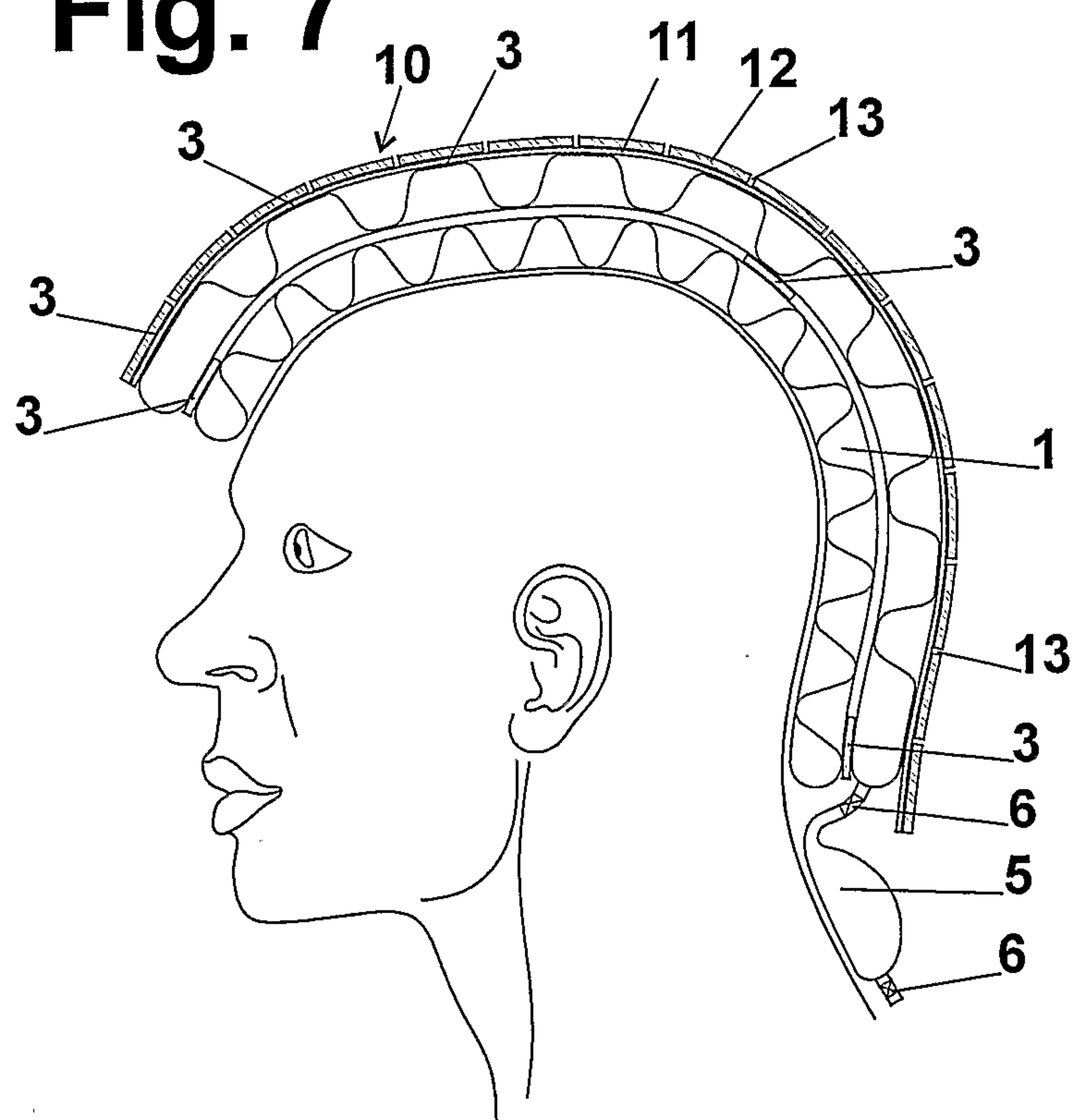
7. The flexible protective helmet, according to Claim 6, characterised in that the air pump is detachable from the protective helmet.
8. The flexible protective helmet, according to Claim 1, characterised in that the outer layer is made of an inner textile layer and plates mounted on the outside.
9. The flexible protective helmet, according to Claim 8, characterised in that the textile layer is made of a knit or woven fabric.
10. The flexible protective helmet, according to Claim 8 or 9, characterised in that the plates are fixed on the textile layer by adhesive means.
11. The flexible protective helmet, according to Claims 8 to 9, characterised in that the plates form a smooth outer shape with one another.
12. The flexible protective helmet, according to Claims 8 to 11, characterised in that the plates are separated from one another by means of joints.
13. The flexible protective helmet, according to Claim 11, characterised in that the plates form a parquet shape with one another.
14. The flexible protective helmet, according to Claim 13, characterised in that the plates have polygonal contours.

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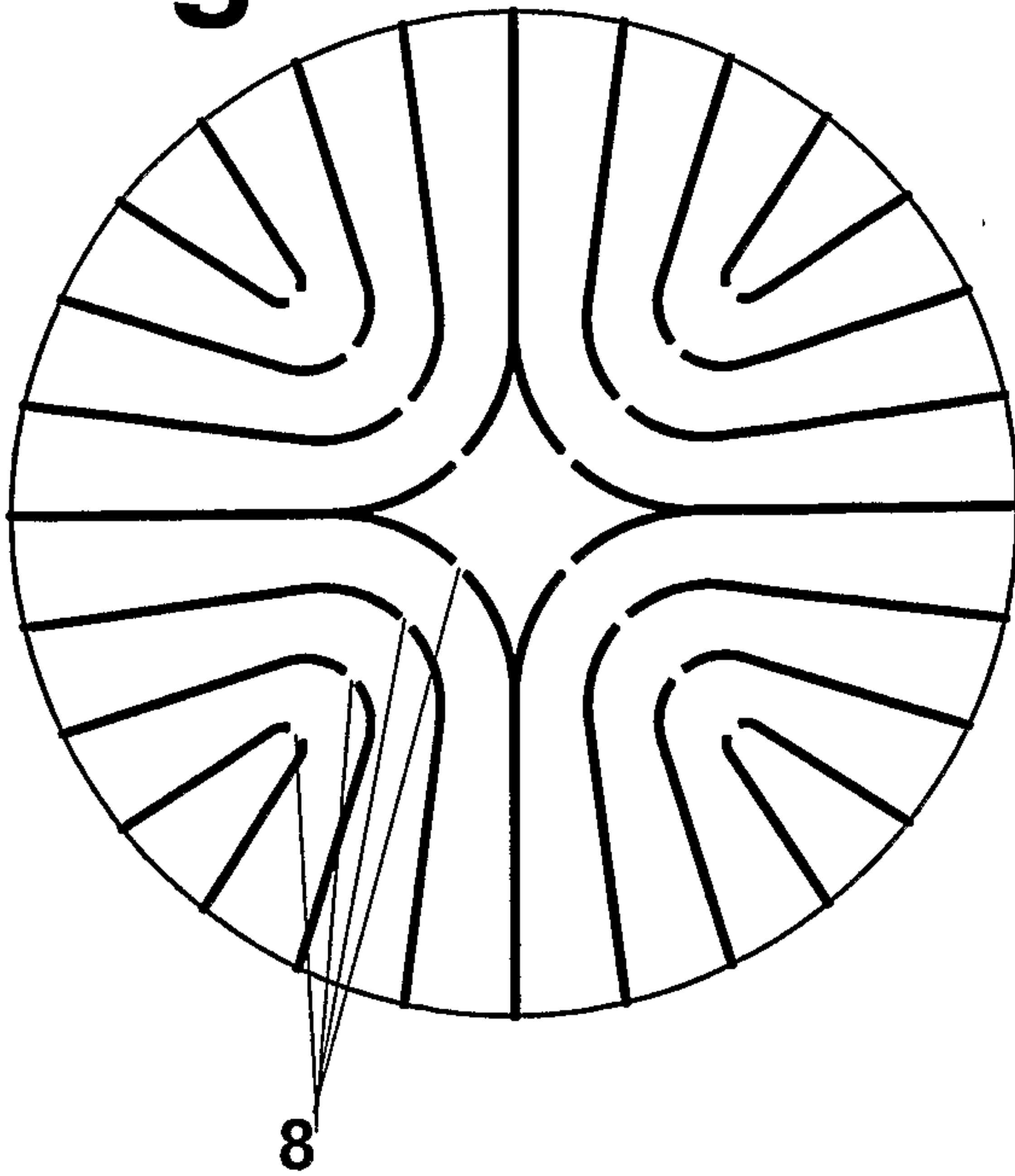
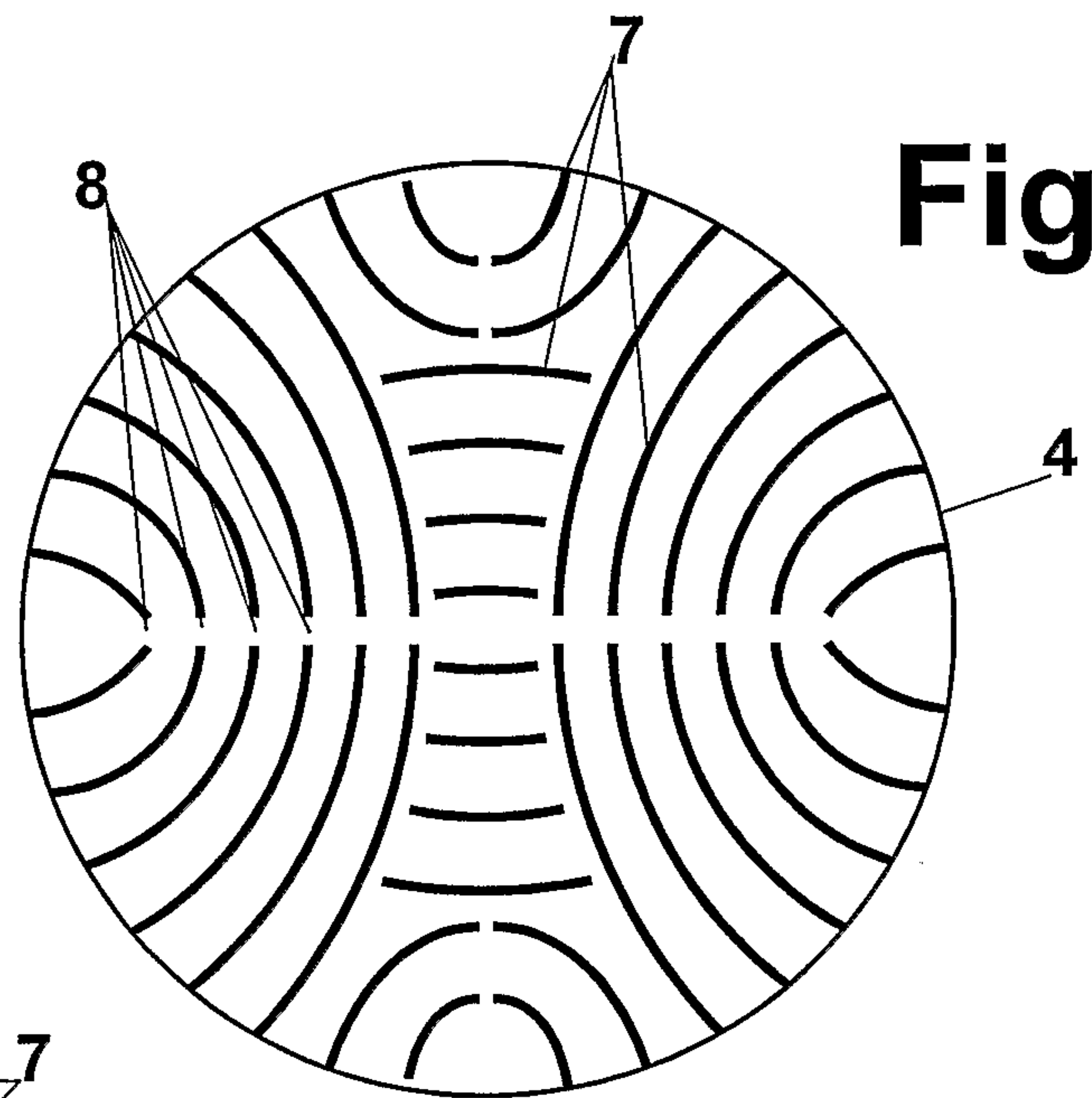
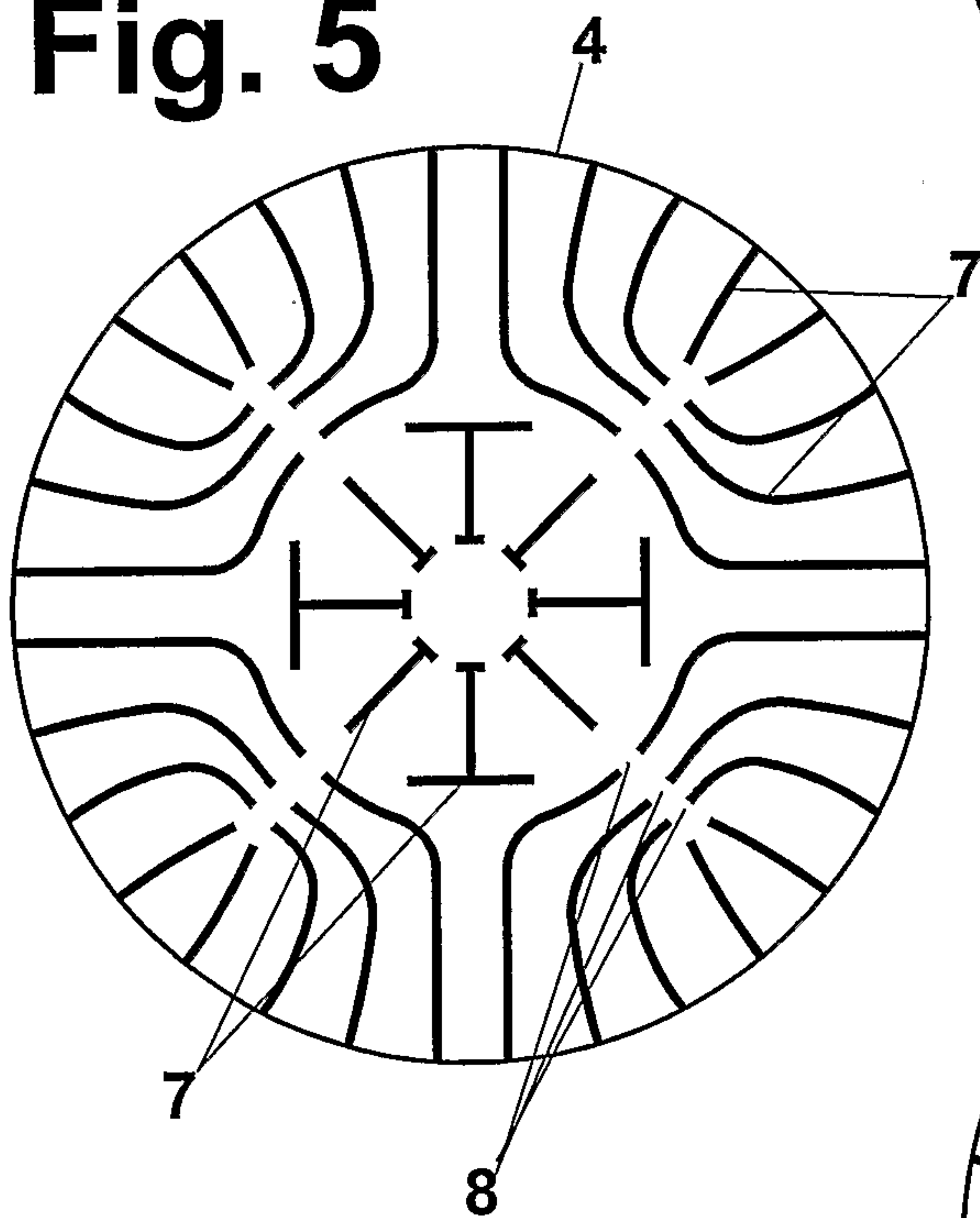
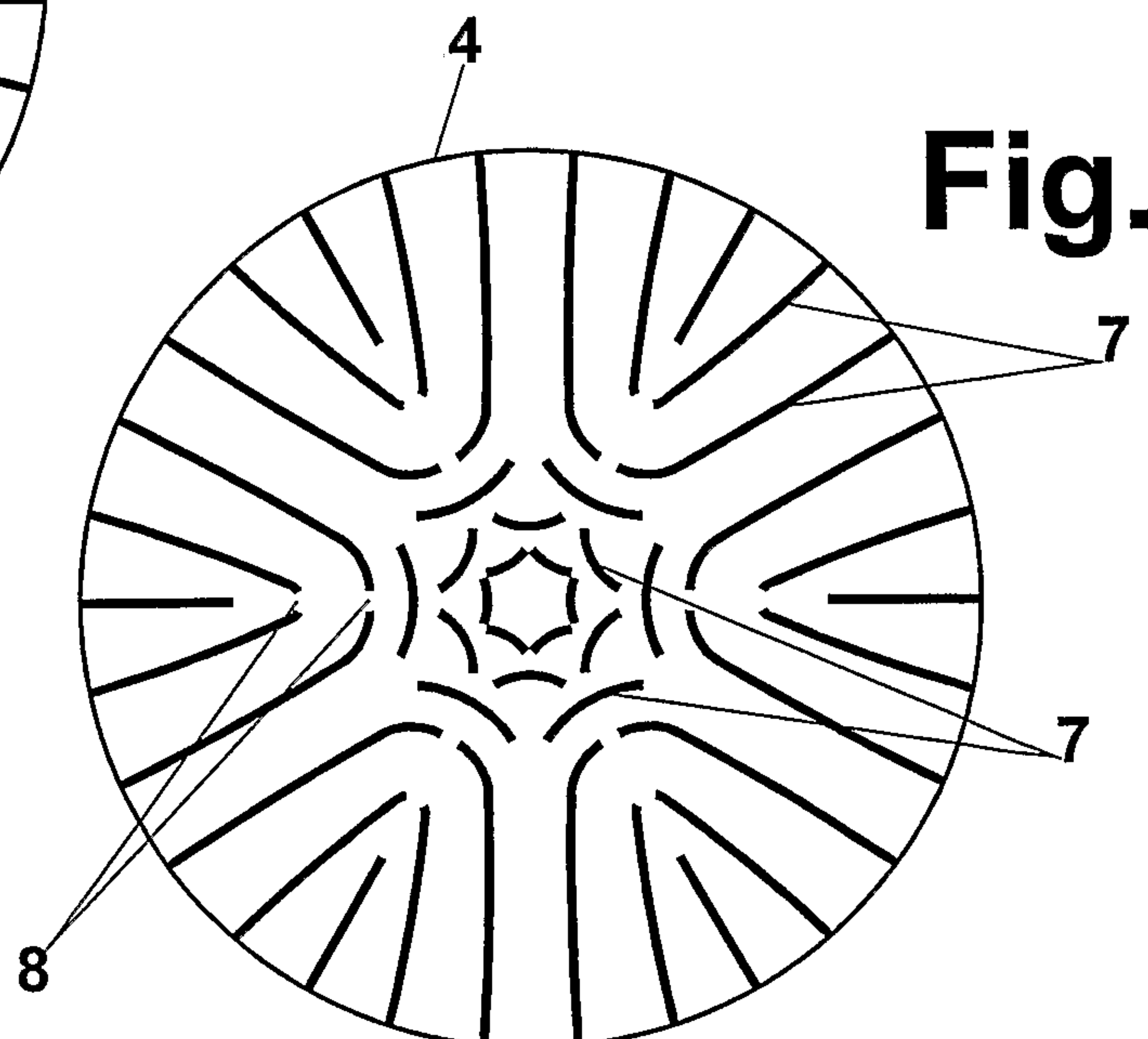
15. The flexible protective helmet, according to Claims 8 to 11, characterised in that the plates are overlapped in one another in brickwork pattern.
16. The flexible protective helmet, according to Claims 8 to 10, characterised in that the plates are arranged interlaced - one below the other.
17. The flexible protective helmet, according to Claims 8 to 10, characterised in that the plates feature two embodiments, namely an inner flat plate and an outer shell-shaped plate that overlaps the inner one along the edges.
18. The flexible protective helmet, according to Claims 8 to 11, characterised in that the plates are concave in shape.
19. The flexible protective helmet, according to Claims 8 to 16, characterised in that the plates are made of plastic.
20. The flexible protective helmet, according to Claims 8 to 18, characterised in that the plates are made of a natural renewable raw material.
21. The flexible protective helmet, according to Claims 8 to 18, characterised in that the plates are made of metal or a metal-Plastic-composite material.
22. The flexible protective helmet, according to Claim 1, characterised in that between the inner hood and the outer layer, means of connection are arranged such that the inner hood and the outer layer can be detachably connected with them.

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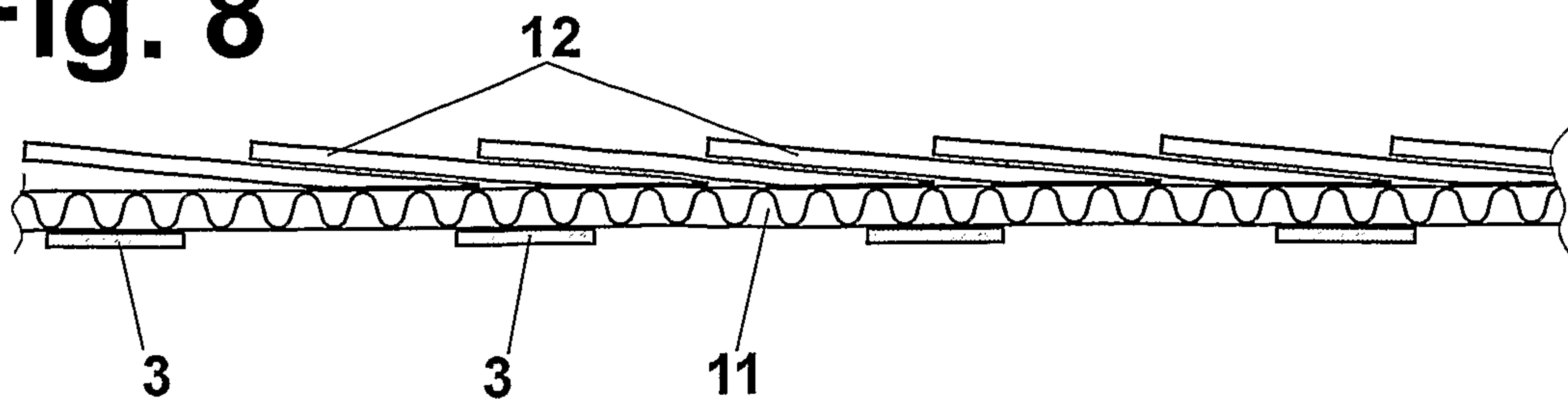
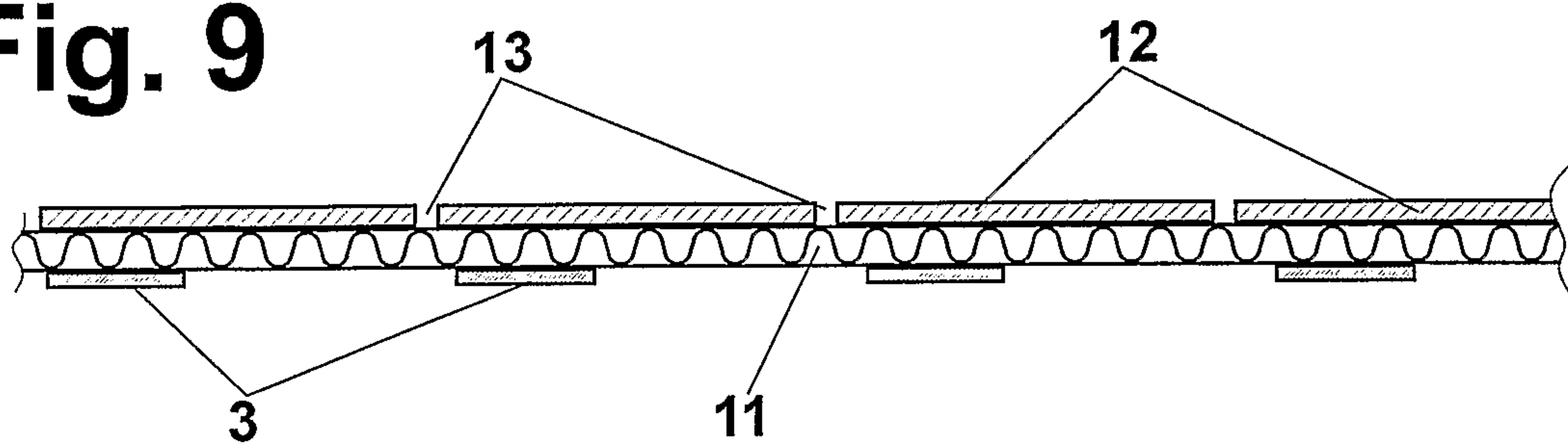
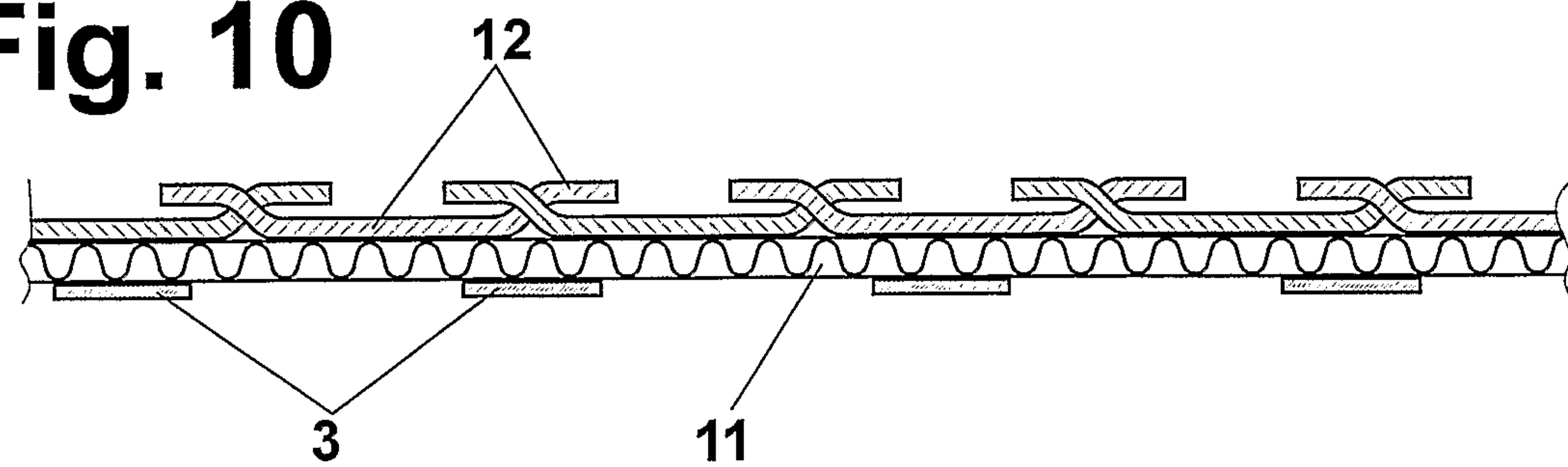
23. The flexible protective helmet, according to Claim 1, characterised in that between the inner hood and the outer layer, means of connection are arranged such that the inner hood and the middle layer can be detachably connected with them.
24. The flexible protective helmet, according to Claim 1, characterised in that between the middle layer and the outer layer, means of connection are arranged such that the inner hood and the middle layer can be detachably connected with them.
25. The flexible protective helmet, according to Claims 22 to 25, characterised in that the means of connection are Velcro strips.

Fig. 1**Fig. 2****Fig. 7**

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Fig. 3**Fig. 4****Fig. 5****Fig. 6**

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Fig. 8**Fig. 9****Fig. 10****Fig. 11**