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(54) RECESS FORMER CONFIGURED TO CAST A RECESS IN A CONCRETE SEGMENT AND A METHOD OF CASTING A RECESS IN A CONCRETE SEGMENT

(57) The present invention relates to a recess former configured to cast a recess in a concrete segment preferably for carrying out the lifting of the concrete segment, to an assembly configured to cast a recess in a concrete segment for carrying out the lifting of the concrete segment, and to a method of casting a recess in a concrete segment for carrying out the lifting of the concrete segment.

EP 4 459 072 A1

Description

OBJECT OF THE INVENTION

[0001] The present invention relates to a recess former configured to cast a recess in a concrete segment preferably for carrying out the lifting of the concrete segment.

[0002] The object of the present invention is also an assembly configured to cast a recess in a concrete segment for carrying out the lifting of the concrete segment.

[0003] Another object of the present invention is a method of casting a recess in a concrete segment for carrying out the lifting of the concrete segment.

BACKGROUND OF THE INVENTION

[0004] During the manufacture of concrete elements, it is often necessary to include components of metal or other materials into the concrete element during the casting of the concrete. These components are generally used to attach other elements to the concrete element or are used for the attachment of lifting means for the lifting and handling of the concrete element.

[0005] Such components include so called lifting anchors which are used to attach lifting equipment to the concrete element. One such lifting anchor in widespread use is an elongate substantially planar lifting anchor which is partially embedded into the concrete element. The anchor has a through aperture adjacent its free end while the other end which is embedded in the concrete is adapted to form a mechanical interlock with the concrete of the element in which it is embedded or the internal framework of the concrete element. The through aperture is shaped to receive lifting means or other attachment device.

[0006] The lifting anchors are embedded in the concrete elements at the time of casting the concrete. When setting up the mould or formwork, the free end of the anchor which has the through aperture to receive the lifting anchor is secured in a recess former. The recess former is in contact with the formwork or mould used to cast the concrete element. After the concrete has hardened and the mould or formwork is removed, the recess former is itself removed, leaving a recess in the surface of the concrete element such that the attachment end of the anchor is accessible.

[0007] However, the recess formers of the state of the art do not allow a good fit between the recess former and the countermould, due to the rigidity of the recess former, which sometimes result in a difficult closure of the countermould and, in turn, more concrete is needed to fill the mould completely.

[0008] The recess former of the present invention solves the above-mentioned disadvantage.

DESCRIPTION OF THE INVENTION

[0009] The present invention relates to a recess former which allows the proper formation of a recess in a concrete element, allowing a better closure of the countermould, also reducing the quantity of concrete needed to fill the mould and allowing an easy removal of the recess former from the concrete element once casted.

[0010] The recess former is configured to cast a recess in a concrete segment for carrying out the lifting of the concrete segment, wherein the concrete segment is configured to be casted in a mould comprising at least a base and a countermould, wherein the concrete segment comprises an anchor; and wherein the recess former comprises:

- a first surface configured to be in contact, in use, with the countermould;
- a second surface configured to define the recess while the concrete segment is being casted, wherein the second surface comprises an opening configured to couple the recess former to the anchor; and
- a first height defined, in use, in a direction of a depth of the recess; wherein the recess former is configured to be compressed when the countermould is in contact with the first surface, in such a way that the first height becomes a second height smaller than the first height.

[0011] Thus constituted, the recess former offers the possibility of being compressed, in such a way that the countermould closes better thus resulting in a reduction of the concrete used to cast the concrete element since the final geometry of the concrete element is closer to the theoretical one. In addition, the locking system of the countermould, preferably hydraulic, is less stressed. Optionally, it may be also avoided that the recess former is completely embedded in the concrete or below the level of the surface of the concrete element once casted, facilitating its removal

[0012] Optionally, the ratio between the first height and the second height is in the interval (1.04-1.17). Preferably, the ratio between the first height and the second height is in the interval (1.08-1.13). More preferably, the ratio between the first height and the second height is 1.09.

[0013] Optionally, the recess former comprises an elastomeric material, being the elastomeric material preferably a silicone rubber, thus offering good resistance to extreme temperatures, being able to operate normally from -100 to 300 °C.

[0014] Optionally, the silicone rubber comprises a hardness in the interval (20-35) shore A. Preferably, the silicone rubber comprises a hardness in the interval (25-32) shore A. More preferably, the silicone rubber comprises a hardness of 30 shore A.

[0015] Additionally, the recess former previously described, optionally comprises extraction means configured to extract the recess former from the concrete segment after the concrete segment is casted.

[0016] In this way, the recess former can be extracted

from the concrete segment once the concrete segment is casted and the countermould has been removed from the mould.

[0017] Optionally, the extraction means comprise at least one lateral protrusion extending from the second surface, wherein the at least one lateral protrusion is partially coplanar with the first surface.

[0018] So, the extraction of the recess former can be carried out without additional lifting equipment.

[0019] Preferably, the extraction means comprises two lateral protrusions extending from the second surface in opposite directions, wherein the two lateral protrusions are partially coplanar with the first surface.

[0020] In this way, the extraction of the recess former can be carried out in an essentially vertical direction.

[0021] Optionally, the extraction means comprise at least one eyebolt disposed below the first surface. Preferably, the extraction means comprises two eyebolts symmetrically disposed with respect to the opening of the second surface. In this way, the extraction of the recess former can be carried out in an essentially vertical direction.

[0022] Optionally, the extraction means comprise at least one sling that emerges from the first surface. Preferably, the at least one sling emerges from the first surface through two slots of the recess former symmetrically disposed with respect to the opening of the second surface. In this way, the extraction of the recess former can be carried out in an essentially vertical direction.

[0023] Optionally, the extraction means comprises at least one through-hole from the first surface to the second surface, where the at least one through-hole is configured to allow the insertion of compressed air.

[0024] Optionally, the opening of the recess former comprises an upper surface configured, in use, to rest on an upper end of the anchor.

[0025] Preferably, the upper surface of the recess former is in contact with the second surface. In this way, in use, the anchor may surpass the second surface on opposite sides of the recess former.

[0026] Preferably, the upper surface of the recess former is separated from the second surface. In this way, in use, the upper end of the anchor remains embedded inside the recess former, not surpassing the second surface on opposite sides of the recess former.

[0027] The invention also relates to an assembly configured to cast a recess in a concrete segment for carrying out the lifting of the concrete segment, wherein the assembly comprises:

- the recess former described above; and
- an anchor wherein the opening of the second surface of the recess former is coupled.

[0028] The invention also relates to a method of casting a recess in a concrete segment for carrying out the lifting of the concrete segment, wherein the concrete segment is configured to be casted in a mould comprising at least a base and a countermould, wherein the concrete segment comprises an anchor; and wherein the method is carried out with the recess former described above and comprises:

- a step of coupling the recess former to the anchor by means of the opening of the second surface of the recess former;
- a step of coming into contact the countermould with the first surface of the recess former; and
- a step of compression of the recess former by means of the countermould, in such a way that the first height becomes a second height smaller than the first height.

[0029] Optionally, the step of compression provides a compression of the first height of between 4% and 17%.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030]

Figure 1 shows the recess former of the invention according to a first preferred embodiment of the extraction means.

Figure 2 shows a scheme of the recess former of the invention before the recess former is compressed by the countermould on the left side and after the recess former has been compressed by the countermould on the right side.

Figure 3 shows the recess former of the invention coupled to the anchor of the concrete element.

Figure 4 shows the recess former of Figure 2 once the concrete segment is casted and the countermould has been removed from the mould, according to a second preferred embodiment of the extraction means.

Figure 5 shows the concrete segment once the recess former of Figure 2 has been extracted from the concrete segment.

Figure 6 shows the recess former of the invention according to a third preferred embodiment of the extraction means.

Figure 7 shows the recess former of the invention according to a fourth preferred embodiment of the extraction means.

Figure 8 shows a bottom view of the Figure 6.

Figure 9 shown lifting means (not being part of the invention) configured to carry out the lifting of the concrete segment by means of the anchor once the recess former has been removed from the mould.

PREFERRED EMBODIMENT OF THE INVENTION

[0031] The invention is described in detail as follows. It relates to a recess former (10) configured to cast a recess (50) in a concrete segment (100), preferably for carrying out the lifting of the concrete segment (100),

wherein the concrete segment (100) is configured to be casted in a mould comprising at least a base and a countermould (70), wherein the concrete segment (100) comprises an anchor (101); and

wherein the recess former (10) comprises:

- a first surface (1) configured to be in contact, in use, with the countermould (70);
- a second surface (2) configured to define the recess (50) while the concrete segment (100) is being casted, wherein the second surface (2) comprises an opening (3) configured to couple the recess former (10) to the anchor (101); and
- a first height (H1) defined, in use, in a direction of a depth of the recess (50);

wherein the recess former (10) is configured to be compressed when the countermould (70) is in contact with the first surface (H1), in such a way that the first height (H1) becomes a second height (H2) smaller than the first height (H1).

[0032] Additionally, the recess former (10) comprises extraction means (4, 4', 5, 6) configured to extract the recess former (10) from the concrete segment after the concrete segment (100) is casted.

[0033] Additionally, the opening (3) of the recess former (10) comprises an upper surface (7) configured, in use, to rest on an upper end (102) of the anchor (101).

[0034] According to a first preferred embodiment of the extraction means shown in Figure 1, the extraction means (4, 4', 5, 6) comprise at least one lateral protrusion (4) extending from the second surface (2), wherein the at least one lateral protrusion (4) is partially coplanar with the first surface (1). According to a second preferred embodiment shown in Figure 4, the extraction means (4, 5, 6) comprises two lateral protrusions (4) extending from the second surface (2) in opposite directions, wherein the two lateral protrusions (4) are partially coplanar with the first surface (1). As can be seen in Figure 5, the direction of the two lateral protrusions (4) is perpendicular, in use, to the depth of the recess (50).

[0035] In this way, the extraction of the recess former can be carried out in an essentially vertical direction making use of the two lateral protrusions (4) as can be seen from Figure 4.

[0036] In this preferred embodiment, the upper surface (7) of the opening (3) is separated from the second surface (2). In this way, in use, the upper end (102) of the anchor (101) remains embedded inside the recess former (10), not surpassing the second surface (2) on opposite sides of the recess former (10), as can be seen from Figure 1 together with Figure 2.

[0037] Optionally, the two lateral protrusions (4') may be extended in a circumferential way around the second surface (2), as can be seen in Figure 3.

[0038] According to a third preferred embodiment of the extraction means shown in Figure 6, the extraction means (6) comprise at least one sling (6) that emerges from the first surface (1), wherein the at least one sling emerges from the first surface (1) through two slots (9) of the recess former (10) symmetrically disposed with respect to the opening (3) of the second surface (2).

[0039] According to a fourth preferred embodiment of the extraction means shown in Figure 7, the extraction means (5) comprise at least one eyebolt (5) disposed optionally below the first surface (1). Preferably, the recess former (10) comprises at least one groove (8) carried out in the first surface (1) wherein the at least one eyebolt (5) is disposed. Preferably, the extraction means (5) comprises two eyebolts (5) symmetrically disposed with respect to the opening (3) of the second surface (2).

[0040] Preferably, the second surface (2) may comprise protrusions (11) centred with the opening (3) and disposed in opposites sides of the second surface. These protrusions (11) optionally allow to extend the opening till the second surface (2) to dispose in the opening an anchor (101) of greater dimensions by reinforcing the recess former (10).

[0041] Figure 8 shows a bottom view of Figure 6, wherein the opening (3) of the recess former (10) is shown, wherein the upper surface (7) of the opening (3) is separated from the second surface (2). In this way, in use, the upper end (102) of the anchor (101) remains embedded inside the recess former (10), not surpassing the second surface (2) on opposite sides of the recess former (10).

[0042] For any of the embodiments described above, the upper surface (7) of the opening (3) may be in contact with the second surface (2). In this way, in use, the anchor (101) may surpass the second surface (2) on opposite sides of the recess former (10) as shown in Figure 3.

[0043] The protrusions (11) centred with the opening and any of the openings (3) described above may be combined with any of the extraction means, alone or in combination of the embodiments described above.

[0044] The invention also relates to an assembly configured to cast a recess (50) in a concrete segment (100), preferably for carrying out the lifting of the concrete segment (100), wherein assembly comprises:

- the recess former (10) described above; and
- an anchor (101) comprising an upper end (102) wherein the upper surface (7) of the opening (3) of the second surface (2) of the recess former (10) rests.

[0045] Figure 2 shows a scheme of the recess former (10) of the invention before the recess former is compressed by the countermould (70) on the left side and after the recess former (10) has been compressed by the countermould (70) on the right side, following a method of casting a recess (50) in a concrete segment (100), preferably for carrying out the lifting of the concrete segment as can be seen in Figure 9, wherein the concrete

segment (100) is configured to be casted in a mould comprising at least a base and a countermould (70), wherein the concrete segment (100) comprises an anchor (101); and
wherein the method is carried out with the recess former (10) described above and comprises:

- a step of coupling the recess former (10) to the anchor by means of the opening (3) of the second surface (2) of the recess former (10), resting the upper surface (7) of the opening (3) of the recess former (10) on an upper end (102) of the anchor (101);
- a step of coming into contact the countermould (70) with the first surface (1) of the recess former (10); and
- a step of compression of the recess former (10) by means of the countermould (70), in such a way that the first height (H1) becomes a second height (H2) smaller than the first height (H2), as shown in Figure 2 (right side).

Claims

1. A recess former (10) configured to cast a recess (50) in a concrete segment (100), wherein the concrete segment (100) is configured to be casted in a mould comprising at least a base and a countermould (70), wherein the concrete segment (100) comprises an anchor (101); and
wherein the recess former (10) comprises:

• a first surface (1) configured to be in contact, in use, with the countermould (70);
• a second surface (2) configured to define the recess (50) while the concrete segment (100) is being casted, wherein the second surface (2) comprises an opening (3) configured to couple the recess former (10) to the anchor (101); and
• a first height (H1) defined, in use, in a direction of a depth of the recess (50);

characterised in that the recess former (10) is configured to be compressed when the countermould (70) is in contact with the first surface (H1), in such a way that the first height (H1) becomes a second height (H2) smaller than the first height (H1).

2. The recess former of claim 1, wherein the ratio between the first height (H1) and the second height (H2) is in the interval (1.04-1.17).

3. The recess former of any one of preceding claims, wherein the recess former (10) comprises an elastomeric material.

4. The recess former of claim 3, wherein the elastomeric material is a silicone rubber.

5. The recess former of claim 4, wherein the silicone rubber comprises a hardness in the interval (20-35) shore A.

6. The recess former of any one of preceding claims further comprising extraction means (4, 4', 5, 6) configured to extract the recess former (10) from the concrete segment after the concrete segment (100) is casted.

7. The recess former of claim 6, wherein the extraction means (4, 4', 5, 6) comprise at least one lateral protrusion (4) extending from the second surface (2), wherein the at least one lateral protrusion (4) is partially coplanar with the first surface (1).

8. The recess former of claim 7, wherein the extraction means (4, 5, 6) comprises two lateral protrusions (4) extending from the second surface (2) in opposite directions, wherein the two lateral protrusions (4) are partially coplanar with the first surface (1).

9. The recess former of claim 6, wherein the extraction means (4, 4', 5, 6) comprise at least one eyebolt (5) disposed below the first surface (1).

10. The recess former of claim 9, wherein the recess former (10) comprises at least one groove (8) carried out in the first surface (1) wherein the at least one eyebolt (5) is disposed.

11. The recess former of any one of claims claim 9 or 10, wherein the extraction means (4, 4', 5, 6) comprises two eyebolts (5) symmetrically disposed with respect to the opening (3) of the second surface (2).

12. An assembly configured to cast a recess (50) in a concrete segment (100), wherein the assembly comprises:

• the recess former (1) of any one of the preceding claims; and
• an anchor (101) wherein the opening (3) of the second surface (2) of the recess former (10) is coupled.

13. The assembly of claim 12, wherein the anchor (101) comprises an upper end (102) wherein an upper surface (7) of the opening (3) of the second surface (2) of the recess former (10) rests.

14. A method of casting a recess (50) in a concrete segment (100), wherein the concrete segment (100) is configured to be casted in a mould comprising at least a base and a countermould (70), wherein the concrete segment (100) comprises an anchor (101); and
wherein the method is carried out with the recess

former (10) of any one of claims 1-11 and comprises:

- a step of coupling the recess former (10) to the anchor by means of the opening (3) of the second surface (2) of the recess former (10); and
- a step of coming into contact the countermould (70) with the first surface (1) of the recess former (10);

characterised in that the method further comprises a step of compression of the recess former (10) by means of the countermould (70), in such a way that the first height (H1) becomes a second height (H2) smaller than the first height (H2).

15. The method of claim 14, wherein the step of coupling the recess former (10) to the anchor by means of the opening (3) of the second surface (2) of the recess former (10) is carried out resting the upper surface (7) of the opening (3) of the recess former (10) on an upper end (102) of the anchor (101).

16. The method of any one of claims 14 or 15, wherein the step of compression provides a compression of the first height of between 4% and 17%.

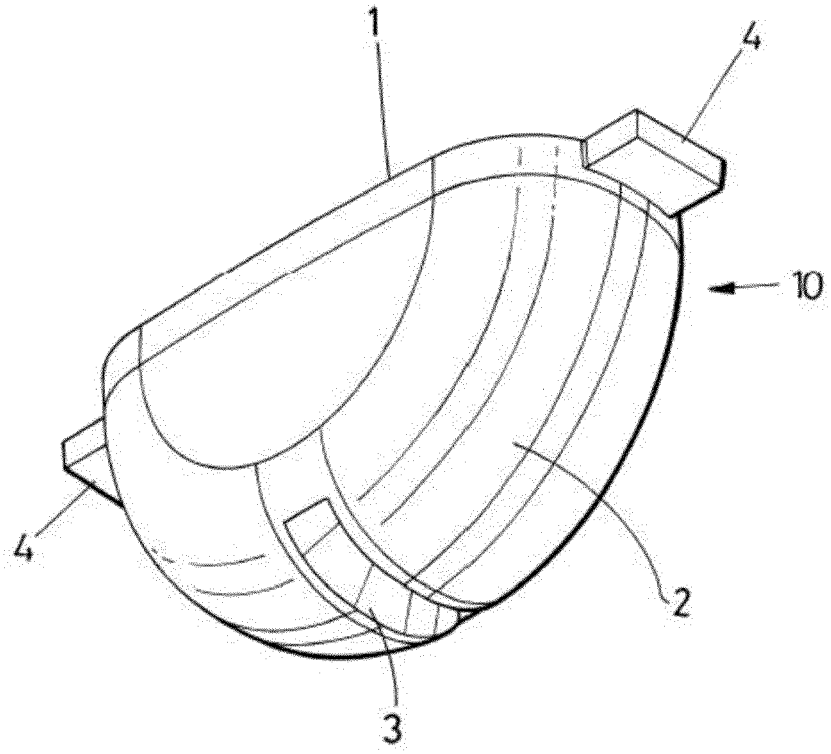

FIG.1

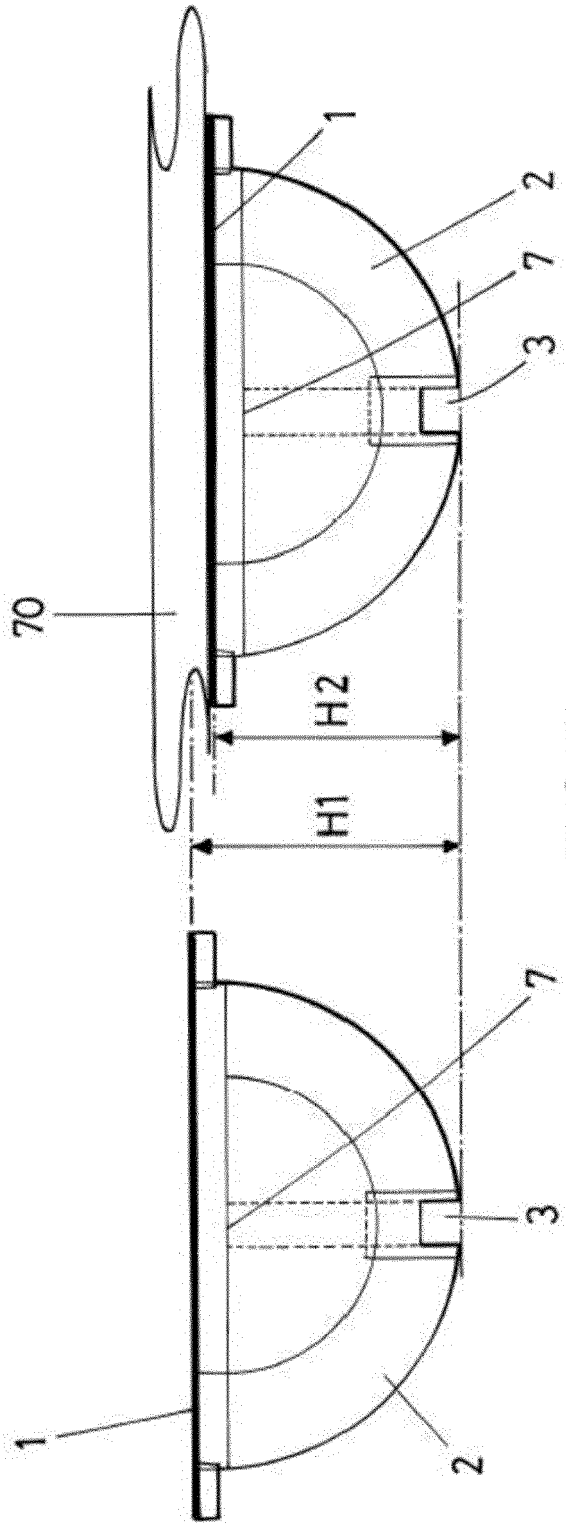

FIG.2

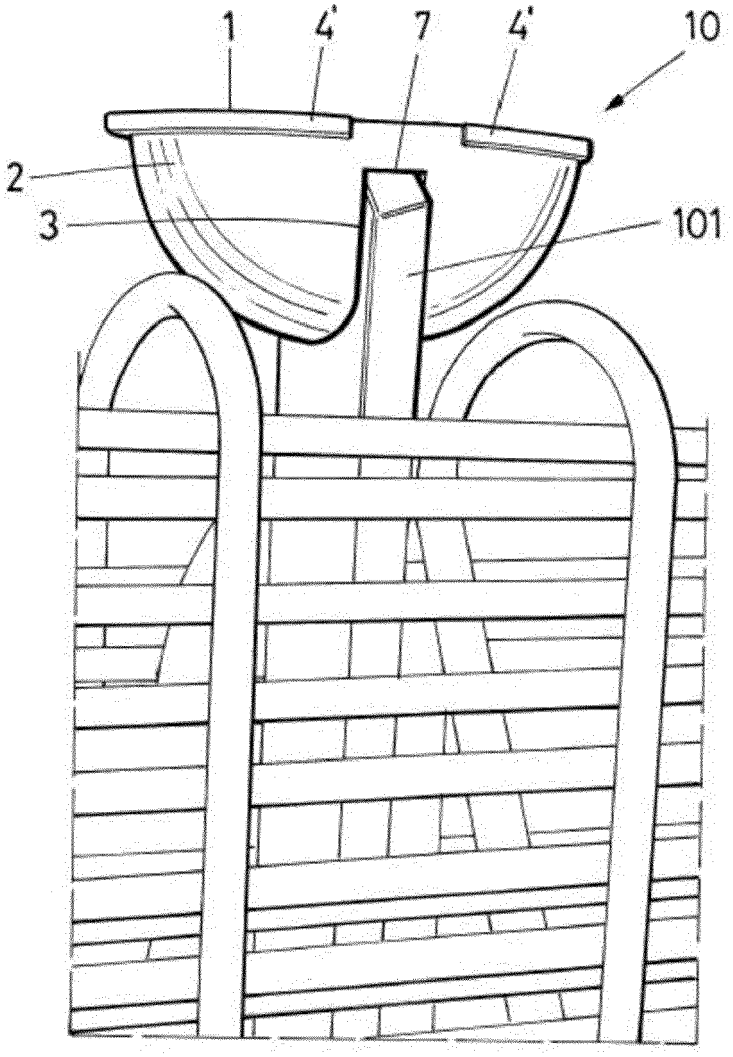

FIG. 3

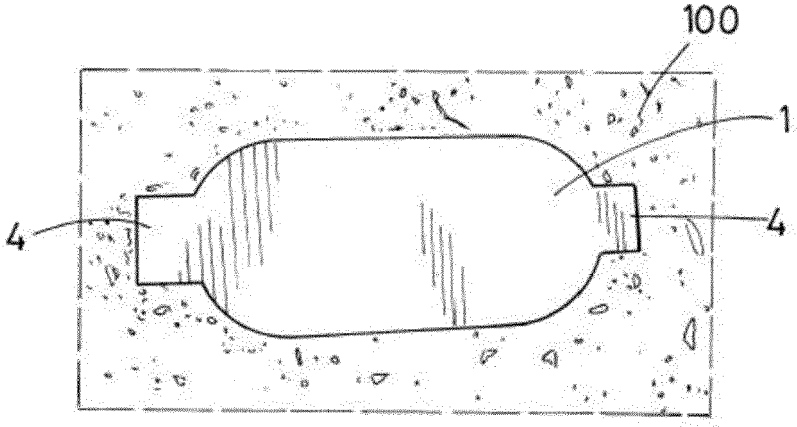

FIG.4

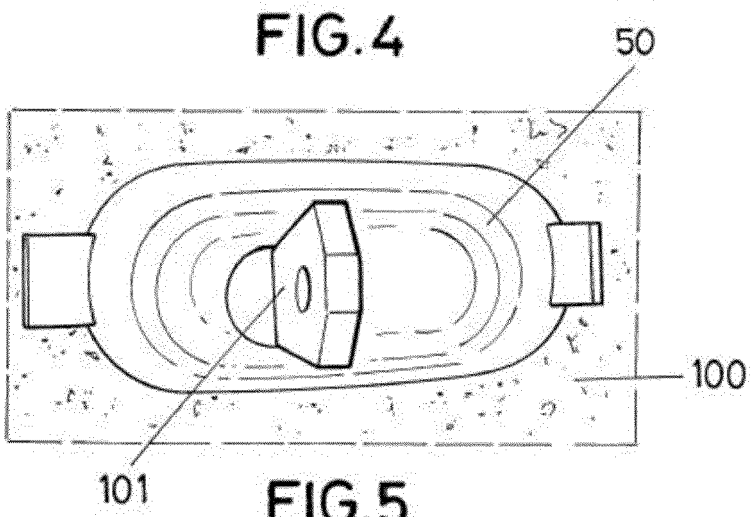

FIG.5

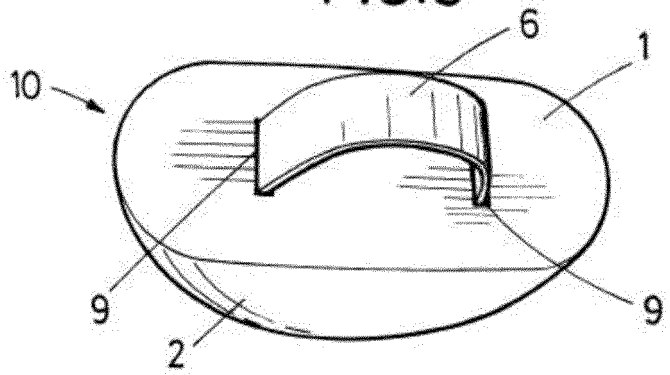

FIG.6

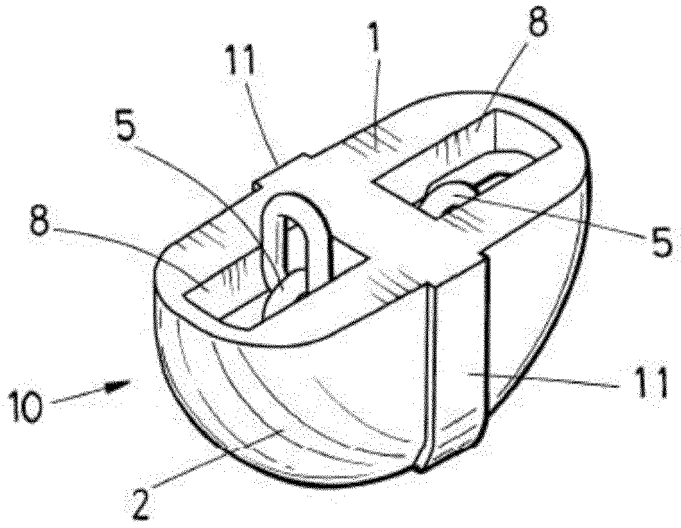

FIG. 7

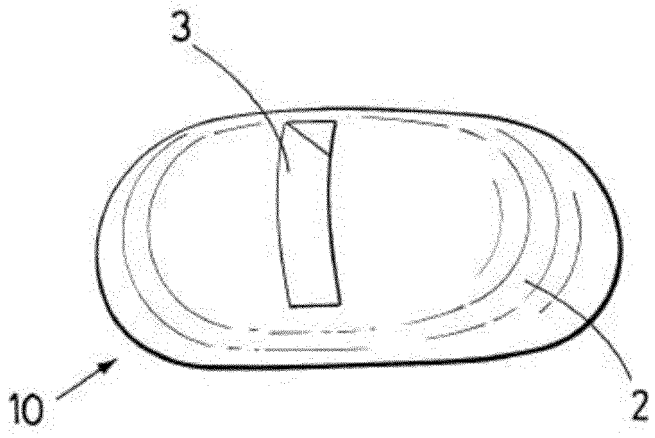

FIG. 8

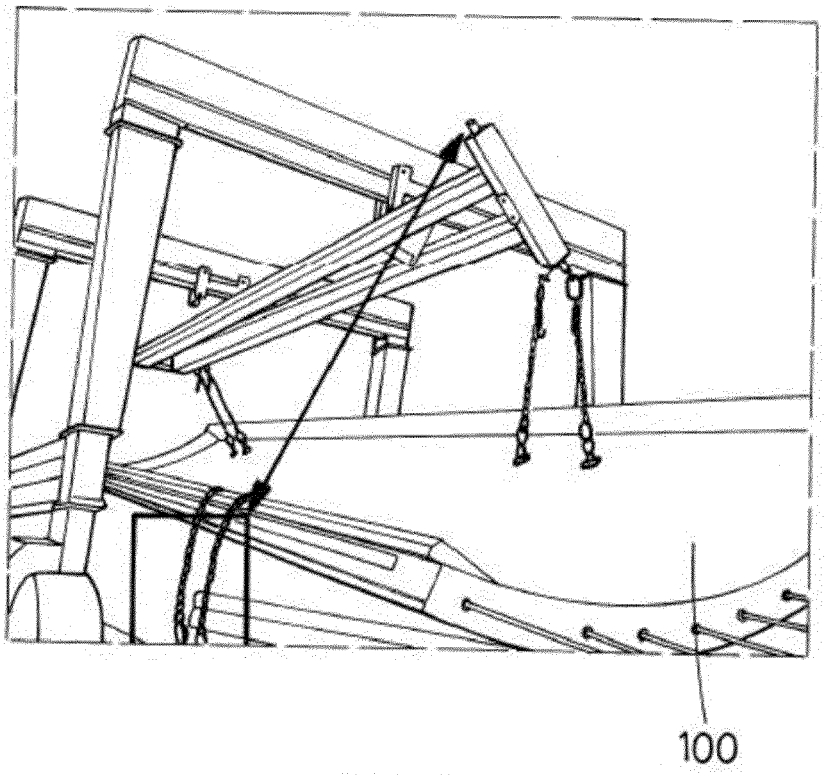

FIG.9

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EUROPEAN SEARCH REPORT

Application Number
EP 23 38 2420

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A	BECHIR H ET AL: "On Poisson's functions of compressible elastomeric materials under compression tests in the framework of linear elasticity theory", ACTA MECHANICA, SPRINGER VIENNA, VIENNA, vol. 230, no. 7, 13 April 2019 (2019-04-13), pages 2491-2504, XP036806210, ISSN: 0001-5970, DOI: 10.1007/S00707-019-02407-W [retrieved on 2019-04-13] * page 1, line 7 *	1	TECHNICAL FIELDS SEARCHED (IPC) E04G B28B B66C
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	6 September 2023	Baumgärtel, Tim

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

Application Number
EP 23 38 2420

DOCUMENTS CONSIDERED TO BE RELEVANT

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The present search report has been drawn up for all claims

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