



(11) **EP 1 809 810 B9**

(12) **CORRECTED EUROPEAN PATENT SPECIFICATION**

(15) Correction information:
Corrected version no 1 (W1 B1)
Corrections, see
Claims FR 1, 7, 9, 16, 17
Numerous spelling errors of minor importance

(51) Int Cl.:
E01B 1/00 (2006.01) E01B 29/00 (2006.01)

(86) International application number:
PCT/GB2005/003991

(48) Corrigendum issued on:
15.09.2010 Bulletin 2010/37

(87) International publication number:
WO 2006/043038 (27.04.2006 Gazette 2006/17)

(45) Date of publication and mention
of the grant of the patent:
03.02.2010 Bulletin 2010/05

(21) Application number: **05794235.1**

(22) Date of filing: **18.10.2005**

(54) **RAILWAY TRACK CONSTRUCTION SHIM AND METHOD OF CONSTRUCTING RAILWAY TRACK**

EISENBAHNSCHIENENKONSTRUKTIONSZWISCHENSTÜCK UND VERFAHREN ZUR
KONSTRUKTION EINER EISENBAHNSCHIENE

CALE DE CONSTRUCTION DE VOIES DE CHEMIN DE FER ET PROCEDE DE CONSTRUCTION
DE VOIES DE CHEMIN DE FER

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GR HU
IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR**

(30) Priority: **19.10.2004 GB 0423237**

(43) Date of publication of application:
25.07.2007 Bulletin 2007/30

(73) Proprietor: **PANDROL LIMITED**
Addlestone,
Surrey KT15 2AR (GB)

(72) Inventors:
• **CHAPMAN, Lee, Michael**
Tankersley,
Barnsley S75 3AE (GB)
• **CANDEL, Bruno, M., B.**
F-59552 Lambres Lez Douai (FR)

(74) Representative: **Fenlon, Christine Lesley et al**
Haseltine Lake LLP
Lincoln House, 5th Floor
300 High Holborn
London WC1V 7JH (GB)

(56) References cited:
EP-A- 1 310 594 EP-A- 1 310 596

EP 1 809 810 B9

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] The present invention relates to railway track construction shims according to the preamble of claim 1 and a method of constructing railway track according to the preamble of claim 17.

[0002] A common method of non-ballasted (slab) railway track construction is the so-called 'top down' method. The track is constructed above a concrete base that has generally been prepared by civil engineering contractors to a relatively coarse tolerance. The track contractor's job is to install the rails above this base with the correct gauge, rail inclination, track cant and vertical and horizontal alignment. In the top down method railway fixing baseplates are set out along the track at the correct spacing and are clipped to the rails using the rail fastening system. The rails are then attached to jigs at intervals, and the jigs are adjusted so that the rails are in the required positions. The anchoring systems that will be used to hold the baseplates down to the track base are suspended from the baseplates. The concrete which will form the track base is then poured up underneath the baseplates and allowed to set. Finally, the jigs are removed and the anchors tightened.

[0003] EP 1 310 594 A1 and EP 1 310 596 A1 disclose a method of building a railway track on a concrete slab in which rails pre-mounted on their tie plates are suspended above the location at which a concrete slab is to be poured. The position of the rails is then adjusted to move the bottom plate of temporary tie plates, disposed under the base of each tie plate, accurately to the location at which the tie plates must rest. Concrete slab is then poured up to the height of the temporary tie plates. The rails are raised, after which the temporary tie plates are removed. The rails are then positioned on the slab, with the tie plates fixed to the corresponding anchor members.

[0004] However, a number of problems can arise when these methods are used.

[0005] Firstly, it is undesirable that the baseplates be concreted directly to the base slab, because this makes subsequent adjustment of the vertical and lateral positions of the baseplates (for which provision is made in their design) more difficult because the baseplates first have to be broken away from the base concrete. Secondly, concrete can splash on to the baseplates, or - if too much is poured - lap up over the sides. Concrete contamination is sometimes addressed by wrapping each baseplate in polythene sheet before the concrete is poured and removing it afterwards, but in the extreme rather than being positioned on top of a flat surface, baseplates can end up recessed into a pocket of concrete from which moisture cannot easily escape.

[0006] To overcome these problems, two techniques are generally employed. In the first, a temporary installation shim is positioned under each baseplate before the concrete is poured, which is designed such that the concrete does not readily adhere to it. After the concrete has set, all of the baseplates are lifted and the temporary

shims are removed before the baseplate is fixed back down. An alternative is that a plastic construction shim is used below each baseplate, which remains in place as part of the track structure after construction. The shim is generally larger in plan view than the baseplate, and serves the dual purpose of allowing for subsequent adjustments and reducing the possibilities of concrete contamination of the baseplates. If the shim is made relatively thick, the accuracy to which the concrete needs to be poured can be reduced. In either case, the anchor bolts, which must be in place when the concrete is poured, pass through holes situated at appropriate positions in the shim.

[0007] However, a number of further issues arise in the top down construction method where either the temporary shim or the permanent construction shim is employed.

[0008] These are, firstly, that when concrete is poured under the shim, air or water contained within the concrete mixture tends to be exuded as it sets and can become trapped under the shim, so that when the concrete sets there can be voids or gaps under the shim. In the extreme, these can take up a large proportion of the surface area, and result in inadequate support of the baseplate in service. Techniques for selecting mixes of concrete, vibration patterns, and construction methods that reduce the occurrence of voids have been developed that reduce the extent of the problem, but these require expert knowledge and careful control, so the problem remains an issue.

[0009] Secondly, whether the temporary shim method or the permanent construction shim method is used, the shim needs to be held up against the underside of the baseplate during concrete pouring. Methods used to do this in the past have included sticking the shims to the baseplates with tape or glue, or alternatively using features provided in the anchor mechanism to tighten the shim against the underside of the plate. In this latter case, the anchor must be introduced from underneath the baseplate and shim, and some part of, or projection from, the anchor must be provided which is physically larger in dimension than the hole in the shim, so that they can be tightened together. The shim must not sag.

[0010] Finally, the anchor bolts need to be set perpendicular to the plane of the bottom of the baseplate during construction. This is particularly the case for baseplates that are designed to function with relative movement between the rail bearing plate and the anchor bolt. Here, if all of the bolts are not set perpendicular, the baseplate may not deflect as designed under traffic.

[0011] According to a first aspect of the present invention there is provided a construction shim for use in the construction of railway track using the top down method track building method, which shim comprises a plate having first and second major faces and at least one anchor hole, formed in that one of the first and second major faces which is to be uppermost when the shim is in use, for receiving an anchor member, wherein the anchor hole

is provided internally with an annular web of deformable material, the diameter of the annular web being smaller than that of the anchor member, such that on entry into the anchor hole the anchor member distorts the web and is held thereby.

[0012] Preferably, the annular web is formed adjacent to that one of the first and second major faces which is to be uppermost when the shim is in use. Desirably, the annular web, and more desirably also the plate itself, is formed of plastics material.

[0013] Preferably, the shim is equal to or greater than 10mm in thickness and the annular web is formed tapering to a minimum diameter at 3 mm below the uppermost face.

[0014] Desirably, there are at least two such anchor holes each having such an annular web and the anchor hole is a throughhole extending between the first and second major faces.

[0015] Desirably, there is at least one vent hole extending between the first and second major surfaces, the hole being open at both ends thereof and being formed so as to be able to draw up water through capillary action, and one of the first and second major surfaces, which is to be lowermost when the shim is in use, has formed thereon at least one channel, with which the said vent hole communicates, for directing air and/or water towards the said vent hole.

[0016] It has been found that when concrete is poured under a shim having such a vent hole and vibrated, as is normal practice, the or each channel collects air and water that is exuded from the mixture and directs them towards the or each vent hole, where the air is vented and the water is drawn up through capillary action to the uppermost surface of the shim, where it can escape. Tests have shown that this method can significantly reduce the size of individual voids and the total amount of voiding as compared to a standard flat surfaced shim, without the need for special techniques or mixes.

[0017] Preferably, there are at least two such channels which intersect one another at at least one intersection point and the vent hole is located at the at least one intersection point. More preferably, there are a plurality of such channels which intersect one another at at least one intersection point (preferably several) and there are a plurality of vent holes located respectively at at least some of the intersection points.

[0018] Desirably, the or each channel is linear and the channels are formed so as to intersect one another perpendicularly. Preferably, the or each channel extends across the shim from edge to edge thereof and has a semicircular cross-section.

[0019] A shim embodying the present invention is provided with at least one anchor hole for an anchor member, preferably two or more, at positions corresponding to those in the baseplate. Each of the holes is larger than the corresponding anchor member, but is provided with a thin internal annular web with a hole of smaller diameter than the anchor member. The web distorts as the anchor

member is pushed through and locks on to the anchor member, holding the anchor member in position relative to the shim. When the shim is drawn up against the underside of the baseplate, the shim is held in position under the baseplate. If a serrated washer arrangement used with the anchor member is placed in position, it has also been found that the arrangement holds the anchor member firmly in position and perpendicular to the plane of the bottom of the baseplate as required. This applies even where the baseplate itself is inclined to produce cant of the track. The shim can be slid in under the baseplate and, where anchor studs are used, these can be introduced from above, reducing the height at which the baseplates need to be set above the base concrete when the studs are introduced compared to arrangements where the studs have to be fed in from below.

[0020] The webs are preferably positioned at the top edge of the anchor holes. This means that when concrete is poured it will fill the small gap between the anchor member and the larger diameter hole through which it passes. This is preferable to positioning the webs near the bottom surface, which would leave a small gap around the anchor member which could later fill with water seeping in from above.

[0021] According to a second aspect of the present invention there is provided a top-down method of building railway track employing a construction shim beneath a railway rail baseplate which is to form part of the railway track, in which method, after the shim has been brought into contact with the underside of the baseplate, the shim is held against the underside of the baseplate whilst concrete is poured beneath the shim, wherein the shim is a shim according to the first aspect of the present invention and is held against the underside of the baseplate by an anchor member inserted into the anchor hole in the shim, and a corresponding hole in the baseplate, a first part of the anchor member within the shim anchor hole being held by the said annular web and a second part of the anchor member extending through the baseplate anchor hole being held by anchor member securing means.

[0022] Preferably, the anchor member is inserted into the shim through the end of the shim anchor hole which is uppermost when the shim is in use.

[0023] Reference will now be made, by way of example, to the accompanying drawings, in which:

Figures 1 and 2 show respective bottom and top perspective views of a shim which does not embody the present invention, but is useful for understanding some optional features;

Figure 3 shows a perspective view of railway rail track in which a construction shim embodying the first aspect of the present invention has been used;

Figure 4 shows an enlarged side view, partially in cross-section of Fig. 3; and

Figures 5 and 6 show respective cross-sectional and perspective views of ringed part X in Fig. 4 (from which the anchor stud has been omitted for clarity).

Figs. 1 and 2 show a rectangular shim 1, having a top surface 1a and a bottom surface 1b, provided with an intersecting rectangular grid of channels 2 on its bottom surface 1b. The suggested spacing between the channels 2 is between 20mm and 50mm. In a shim of thickness around 10mm, the suggested section for the channels 2 is a half round section 6mm in diameter - thus 3mm deep. At the intersection of each pair of perpendicular channels 2 a vent hole 3 is provided running from the bottom surface 1b to the top surface 1a of the shim 1. Thus, there are a plurality of vent holes, each capable of venting air and drawing up water by capillary action, the size and number of the vent holes being limited only by the need to adequately support the baseplate with which the shim is to be used. For the purpose of drawing up water to the uppermost surface of the shim by capillary action, the diameter of each vent hole is determined by the thickness of the shim. For a shim of thickness 10mm, the diameter of the vent holes is preferably around 3mm. For a shim of thickness 4mm the diameter of the vent holes is preferably around 7.5 mm.

[0024] A shim 10 embodying the first aspect of the present invention will now be described with reference to Figs. 3 to 6, in which reference numeral 20 represents a railway rail baseplate, 30 represents a railway rail, 40 represents a railway rail fastening, 50 represents resilient rail pads, 60 represents a concrete slab and 70 represents an anchoring assembly. The anchoring assembly 70 is introduced from above and held in position by the shim 10, which is also held up against the bottom of the baseplate 20. The shim 10 is preferably also a shim having one or more channels 2 and vent holes 3 on its underside as described with reference to Figs. 1 and 2, but the channels and vent holes are not shown in Figs. 3 to 6.

[0025] Construction shim 10, for use in the top down track building method, remains part of the permanent structure after construction. It is preferably made from moulded plastics material. It provides a conforming surface on which the railway baseplate 20 sits, and facilitates adjustment of the vertical level of the baseplate 20 after construction by allowing for the addition or removal of additional shims (not shown) between the top of the construction shim 10 and the bottom of the baseplate 20. It allows for lateral adjustment of the position of the baseplate 20, which is usually achieved with a combination of a slotted hole 21 (not shown) in the baseplate 20 with serrated teeth that mate with a similarly serrated washer 22, or by an eccentric bush arrangement (not shown). Accordingly, the construction shim 10 must be longer than the baseplate 20 itself by at least the range of lateral adjustment provided, so that the baseplate 20 remains

seated on the shim 10 over the full range of adjustment. However, the shim 10 is usually made at least 40mm larger than the baseplate 20 in both length and width, so that on construction at least 20mm protrudes around all sides of the baseplate 20. This assists in ensuring that concrete does not so easily splash onto the baseplate 20 and contaminate it. The shim 10 is made sufficiently thick that it does not sag significantly under its own weight. Typically, the shim 10 is 10-12mm thick. With a shim 10 of this thickness, the accuracy with which it is necessary to pour the concrete is less than if no shim 10 is present.

[0026] The shim 10 is formed with at least one anchor hole 11, preferably more than one, for receiving the anchoring assembly 70. Inside the rim of the anchor hole 11 a thin annular web 12 of deformable material is formed. Typically, the anchor hole 11 has a diameter of 24.2 mm, whereas the web 12 has a diameter of 23 mm (the nominal diameter of the anchor stud 71 being 24mm).

[0027] In this embodiment, the anchoring assembly 70 comprises an anchor stud 71 which is screw-threaded at both ends 71a, 71b, between which there is a non-screw-threaded portion 71c which is gripped by the web 12 when the anchor stud 71 is inserted into the anchor hole 11. Part 71a of the anchor stud 71 carries a nut 72. Below the nut 72 are flat steel washers 73, spring steel disk washers 74 and a nylon insulating bush 75. Parts 72 to 75 are protected from dirt contamination and corrosion by a cap 76. Please note that this type of anchoring assembly 70 is not essential to the present invention.

[0028] A construction shim embodying the present invention may be used in a variant on the top down method described above in which the immediate support of the baseplate is by a thinner layer of grout poured immediately under the construction shim 10 rather than concrete.

Claims

1. A construction shim for use in the construction of railway track using the top down method track building method, which shim comprises a plate (10) having first and second major faces (1a, 1b; 10a, 10b) and at least one anchor hole (11), formed in that one (10a) of the first and second major faces (10a, 10b) which is to be uppermost when the shim is in use, for receiving an anchor member (71), **characterised in that** the anchor hole (11) is provided internally with an annular web (12) of deformable material, the diameter of the annular web (12) being smaller than that of the anchor member (71), such that on entry into the anchor hole (11) the anchor member (71) distorts the web (12) and is held thereby.
2. A shim as claimed in claim 1, **characterised in that** the said annular web (12) is formed adjacent to the

said one (10a) of the first and second major faces (10a, 10b) which is to be uppermost when the shim is in use.

3. A shim as claimed in claim 1 or 2, **characterised in that** the annular web (12) is formed of plastics material. 5
4. A shim as claimed in claim 3, **characterised in that** the plate (10) is formed of plastics material. 10
5. A shim as claimed in claim 4, **characterised in that** the shim is equal to or greater than 10mm in thickness.
6. A shim as claimed in claim 5, when read as appended to claim 2, **characterised in that** the annular web (12) tapers to a minimum diameter at 3 mm below the said one face (10a). 20
7. A shim as claimed in any one of claims 1 to 6, **characterised in that** there are at least two such anchor holes (11) each having such an annular web (12).
8. A shim as claimed in any one of claims 1 to 7, **characterised in that** the said anchor hole (11) is a throughhole extending between the first and second major faces (10a, 10b). 25
9. A shim as claimed in any one of claims 1 to 8, **characterised in that** there is at least one vent hole (3) extending between the first and second major surfaces (1a, 1b), the hole (2) being open at both ends thereof and being formed so as to be able to draw up water through capillary action; 30
and wherein one (1b) of the first and second major surfaces (1a, 1b), which is to be lowermost when the shim is in use, has formed thereon at least one channel (2), with which the said vent hole (3) communicates, for directing air and/or water towards the said vent hole (3). 40
10. A shim as claimed in claim 9, **characterised in that** there are at least two such channels (2) which intersect one another at at least one intersection point and the said vent hole (3) is located at the said at least one intersection point. 45
11. A shim as claimed in claim 10, **characterised in that** there are a plurality of such channels (2) which intersect one another at at least one intersection point. 50
12. A shim as claimed in claim 11, **characterised in that** there are a plurality of vent holes (3) located respectively at at least some of the intersection points. 55
13. A shim as claimed in any one of claims 9 to 12, **characterised in that** the or each channel (2) is linear.

14. A shim as claimed in any one of claims 10 to 12, or claim 13 when read as appended to any one of claims 10 to 12, **characterised in that** the said channels (2) are formed so as to intersect one another perpendicularly.
15. A shim as claimed in any one of claims 9 to 14, **characterised in that** the or each channel (2) extends across the shim from edge to edge thereof.
16. A shim as claimed in any one of claims 9 to 15, **characterised in that** the or each channel (2) has a semicircular cross-section.
17. A top-down method of building railway track employing a construction shim (10) beneath a railway rail baseplate (20) which is to form part of the railway track, in which method, after the shim (10) has been brought into contact with the underside of the baseplate (20), the shim (10) is held against the underside of the baseplate (20) whilst concrete is poured beneath the shim (10);
characterised in that the shim (10) is a shim as claimed in any preceding claim;
and **in that** the said shim (10) is held against the underside of the baseplate (20) by an anchor member (71) inserted into the anchor hole (11) in the shim (10), and a corresponding hole (21) in the baseplate (20), a first part (71c) of the anchor member (71) within the shim anchor hole (11) being held by the said annular web (12) and a second part (71a) of the anchor member (71) extending through the baseplate anchor hole (11) being held by anchor member securing means (22).
18. A method as claimed in claim 17, **characterised in that** the said anchor member (71) is inserted into the shim (10) through the end of the shim anchor hole (11) which is uppermost when the shim (10) is in use.

Patentansprüche

1. Konstruktionszwischenlage zur Verwendung beim Bau von Gleisstrecken mit Hilfe des Top-Down-Gleisbauverfahrens, wobei die Zwischenlage umfasst eine Platte (10) mit ersten und zweiten Hauptseiten (1a, 1b; 10a, 10b) und mindestens einer Verankerungsöffnung (11), die in derjenigen Seite (10a) der ersten und zweiten Hauptseiten (10a, 10b) ausgestaltet ist, die sich bei Gebrauch der Zwischenlage zuoberst befinden soll, und die ein Verankerungsbauteil (71) aufnimmt, **dadurch gekennzeichnet, dass** sich im Inneren der Verankerungsöffnung (11) ein Ringsteg (12) aus verformbarem Material befindet, dessen Durchmesser kleiner ist als derjenige des Verankerungsbauteils (71), so dass das Verankerungsbauteil (71) den Steg (12) beim Einlassen in

- die Verankerungsöffnung (11) verformt und es **dadurch** gehalten wird.
2. Zwischenlage nach Anspruch 1, **dadurch gekennzeichnet, dass** der Ringsteg (12) nächst der einen Seite (10a) der ersten und zweiten Hauptseiten (10a, 10b) ausgestaltet ist, die sich bei Gebrauch der Zwischenlage zuoberst befinden soll. 5
 3. Zwischenlage nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der Ringsteg (12) aus Kunststoffmaterial besteht. 10
 4. Zwischenlage nach Anspruch 3, **dadurch gekennzeichnet, dass** die Platte (10) aus Kunststoffmaterial besteht. 15
 5. Zwischenlage nach Anspruch 4, **dadurch gekennzeichnet, dass** sie größer gleich 10 mm dick ist. 20
 6. Zwischenlage nach Anspruch 5 als Anhang zu Anspruch 2, **dadurch gekennzeichnet, dass** sich der Ringsteg (12) 3 mm unter der einen Seite (10a) auf einen Minstdurchmesser verjüngt. 25
 7. Zwischenlage nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** mindestens zwei dieser Verankerungsöffnungen (11) jeweils einen solchen Ringsteg (12) aufweisen. 30
 8. Zwischenlage nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** die Verankerungsöffnung (11) zwischen der ersten und zweiten Hauptseite (10a, 10b) durchgeht. 35
 9. Zwischenlage nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** mindestens eine Entlüftungsöffnung (3) zwischen der ersten und zweiten Hauptseite (1a, 1b) verläuft, wobei die Öffnung (2) beiderseits offen ist, und sie derart ausgestaltet ist, dass sie Wasser durch Kapillarwirkung aufnehmen kann; und wobei auf einer Seite (1b) der ersten und zweiten Hauptseiten (1a, 1b), die sich bei Gebrauch der Zwischenlage zuunterst befinden soll, mindestens ein Kanal (2) ausgestaltet ist, mit dem die Entlüftungsöffnung (3) kommuniziert, so dass Luft und/oder Wasser zur Entlüftungsöffnung (3) geleitet wird. 40
45
 10. Zwischenlage nach Anspruch 9, **dadurch gekennzeichnet, dass** sich mindestens zwei dieser Kanäle (2) an mindestens einem Schnittpunkt schneiden und sich die Entlüftungsöffnung (3) an diesem mindestens einen Schnittpunkt befindet. 50
 11. Zwischenlage nach Anspruch 10, **dadurch gekennzeichnet, dass** sich mehrere solcher Kanäle (2) an mindestens einem Schnittpunkt schneiden. 55
 12. Zwischenlage nach Anspruch 11, **dadurch gekennzeichnet, dass** sich entsprechend mehrere Entlüftungsöffnungen (3) an zumindest einigen Schnittpunkten befinden.
 13. Zwischenlage nach einem der Ansprüche 9 bis 12, **dadurch gekennzeichnet, dass** der oder jeder Kanal (2) geradlinig verläuft.
 14. Zwischenlage nach einem der Ansprüche 10 bis 12 oder Anspruch 13 als Anhang zu einem der Ansprüche 10 bis 12, **dadurch gekennzeichnet, dass** die Kanäle (2) so ausgestaltet sind, dass sie sich senkrecht schneiden.
 15. Zwischenlage nach einem der Ansprüche 9 bis 14, **dadurch gekennzeichnet, dass** der oder jeder Kanal (2) zwischen den Rändern der Zwischenlage verläuft.
 16. Zwischenlage nach einem der Ansprüche 9 bis 15, **dadurch gekennzeichnet, dass** der oder jeder Kanal (2) einen halbkreisförmigen Querschnitt aufweist.
 17. Top-Down-Verfahren zum Bau von Gleisstrecken unter Einsatz einer Konstruktionszwischenlage (10) unter einer Schienen-Grundplatte (20), die ein Teil der Gleisstrecke ausmachen soll, wobei bei diesem Verfahren die Zwischenlage (10) und die Unterseite der Grundplatte (20) zusammengebracht und aneinander gehalten werden, während Beton unter die Zwischenlage (10) gegossen wird; **dadurch gekennzeichnet, dass** die Zwischenlage (10) eine Zwischenlage nach einem vorhergehenden Anspruch ist; und dass die Zwischenlage (10) gegen die Unterseite der Grundplatte (20) durch ein Verankerungsbauteil (71) gehalten wird, das in die Verankerungsöffnung (11) in der Zwischenlage (10) und eine entsprechende Öffnung (21) in der Grundplatte (20) eingelassen ist, wobei ein erstes Teil (71c) des Verankerungsbauteils (71) in der Zwischenlagenverankerungsöffnung (11) durch den Ringsteg (12) gehalten wird, und ein zweites Teil (71a) des Verankerungsbauteils (71), das durch die Grundplattenverankerungsöffnung (11) verläuft, von Sicherungseinrichtungen (22) für das Verankerungsbauteil gehalten wird.
 18. Verfahren nach Anspruch 17, **dadurch gekennzeichnet, dass** das Verankerungsbauteil (71) durch dasjenige Ende der Zwischenlagenverankerungsöffnung in die Zwischenlage (10) eingelassen wird, das bei Gebrauch der Zwischenlage (10) zuoberst ist.

Revendications

1. Cale de construction pour usage dans la construction de voies de chemin de fer à l'aide du procédé de construction de voies inversé, laquelle cale comprend une plaque (10) ayant des première et seconde faces principales (1a, 1b ; 10a, 10b) et au moins un trou d'ancrage (11), formé dans l'une (10a) des première et seconde faces principales (10a, 10b) qui doit être sur le dessus lorsque la cale est en usage, afin de recevoir un élément d'ancrage (71), **caractérisée en ce que** le trou d'ancrage (11) est muni intérieurement d'une âme annulaire (12) de matériau déformable, le diamètre de l'âme annulaire (12) étant inférieur à celui de l'élément d'ancrage (71), de sorte qu'à l'entrée dans le trou d'ancrage (11), l'élément d'ancrage (71) déforme l'âme (12) et soit ainsi maintenu. 5
2. Cale selon la revendication 1, **caractérisée en ce que** ladite âme annulaire (12) est formée de manière adjacente à ladite une (10a) des première et seconde faces principales (10a, 10b) qui doit être sur le dessus lorsque la cale est en usage. 10
3. Cale selon la revendication 1 ou 2, **caractérisée en ce que** l'âme annulaire (12) est formée de matériau plastique. 15
4. Cale selon la revendication 3, **caractérisée en ce que** la plaque (10) est formée de matériau plastique. 20
5. Cale selon la revendication 4, **caractérisée en ce que** la cale a une épaisseur égale ou supérieure à 10 mm. 25
6. Cale selon la revendication 5, lorsqu'elle est lue en liaison avec la revendication 2, **caractérisée en ce que** l'âme annulaire (12) s'amincit vers un diamètre minimal à 3 mm en dessous de ladite une face (10a). 30
7. Cale selon l'une quelconque des revendications 1 à 6, **caractérisée en ce qu'il y a** au moins deux de ces trous d'ancrage (11), chacun ayant cette âme annulaire (12). 35
8. Cale selon l'une quelconque des revendications 1 à 7, **caractérisée en ce que** ledit trou d'ancrage (11) est un trou traversant s'étendant entre les première et seconde faces principales (10a, 10b). 40
9. Cale selon l'une quelconque des revendications 1 à 8, **caractérisée en ce qu'au moins un** trou d'échappement (3) s'étend entre les première et seconde surfaces principales (1a, 1b), le trou (2) étant ouvert à ses deux extrémités et étant formé pour pouvoir aspirer de l'eau par effet capillaire ; et dans laquelle, sur une (1b) des première et seconde surfaces principales (1a, 1b), qui est placée en dessous lorsque la cale est en usage, présente au moins un canal (2), avec lequel ledit trou d'échappement (3) communique pour diriger de l'air et/ou de l'eau vers ledit trou d'échappement (3). 45
10. Cale selon la revendication 9, **caractérisée en ce qu'il y a** au moins deux de ces canaux (2) qui se coupent l'un l'autre en au moins un point d'intersection et ledit trou d'échappement (3) est situé dans ledit au moins un point d'intersection. 50
11. Cale selon la revendication 10, **caractérisée en ce qu'il y a** une pluralité de ces canaux (2) qui se coupent l'un l'autre dans le au moins un point d'intersection. 55
12. Cale selon la revendication 11, **caractérisée en ce qu'il y a** une pluralité de trous d'échappement (3) qui sont placées respectivement dans au moins certains des points d'intersection.
13. Cale selon l'une quelconque des revendications 9 à 12, **caractérisée en ce que** le ou chaque canal (2) est linéaire.
14. Cale selon l'une quelconque des revendications 10 à 12, ou la revendication 13, lorsqu'elle est lue en liaison avec l'une quelconque des revendications 10 à 12, **caractérisée en ce** lesdits canaux (2) sont formés de manière à se couper l'un l'autre perpendiculairement.
15. Cale selon l'une quelconque des revendications 9 à 14, **caractérisée en ce que** le ou chaque canal (2) s'étend en travers de la cale d'un bord à l'autre de celle-ci.
16. Cale selon l'une quelconque des revendications 9 à 15, **caractérisée en ce que** le ou chaque canal (2) a une coupe transversale semi-circulaire.
17. Procédé inversé de construction de voies de chemin de fer employant une cale de construction (10) en dessous d'une plaque de base de rail de chemin de fer (20) qui va faire partie de la voie de chemin de fer, dans lequel procédé, après que la cale (10) a été amenée en contact avec le côté inférieur de la plaque de base (20), la cale (10) est maintenue contre le côté inférieur de la plaque de base (20) tandis que du béton est versé en dessous de la cale (10) ; **caractérisé en ce que** la cale (10) est une cale selon l'une quelconque des revendications précédentes ; et **en ce que** ladite cale (10) est maintenue contre le côté inférieur de la plaque de base (20) par un élément d'ancrage (71) inséré dans le trou d'ancrage (11) de la cale (10), et un trou correspondant (21) dans la plaque de base (20), une première partie

(71c) de l'élément d'ancrage (71) à l'intérieur du trou d'ancrage (11) de la cale étant maintenue par ladite âme annulaire (12) et une seconde partie (71a) de l'élément d'ancrage (71) s'étendant à travers le trou d'ancrage (11) de la plaque de base, qui est maintenu par un moyen de fixation (22) de l'élément d'ancrage. 5

18. Procédé selon la revendication 17, **caractérisé en ce que** ledit élément d'ancrage (71) est inséré dans la cale (10) à travers l'extrémité du trou d'ancrage de cale (11), qui est sur le dessus lorsque la cale (10) est en usage. 10

15

20

25

30

35

40

45

50

55

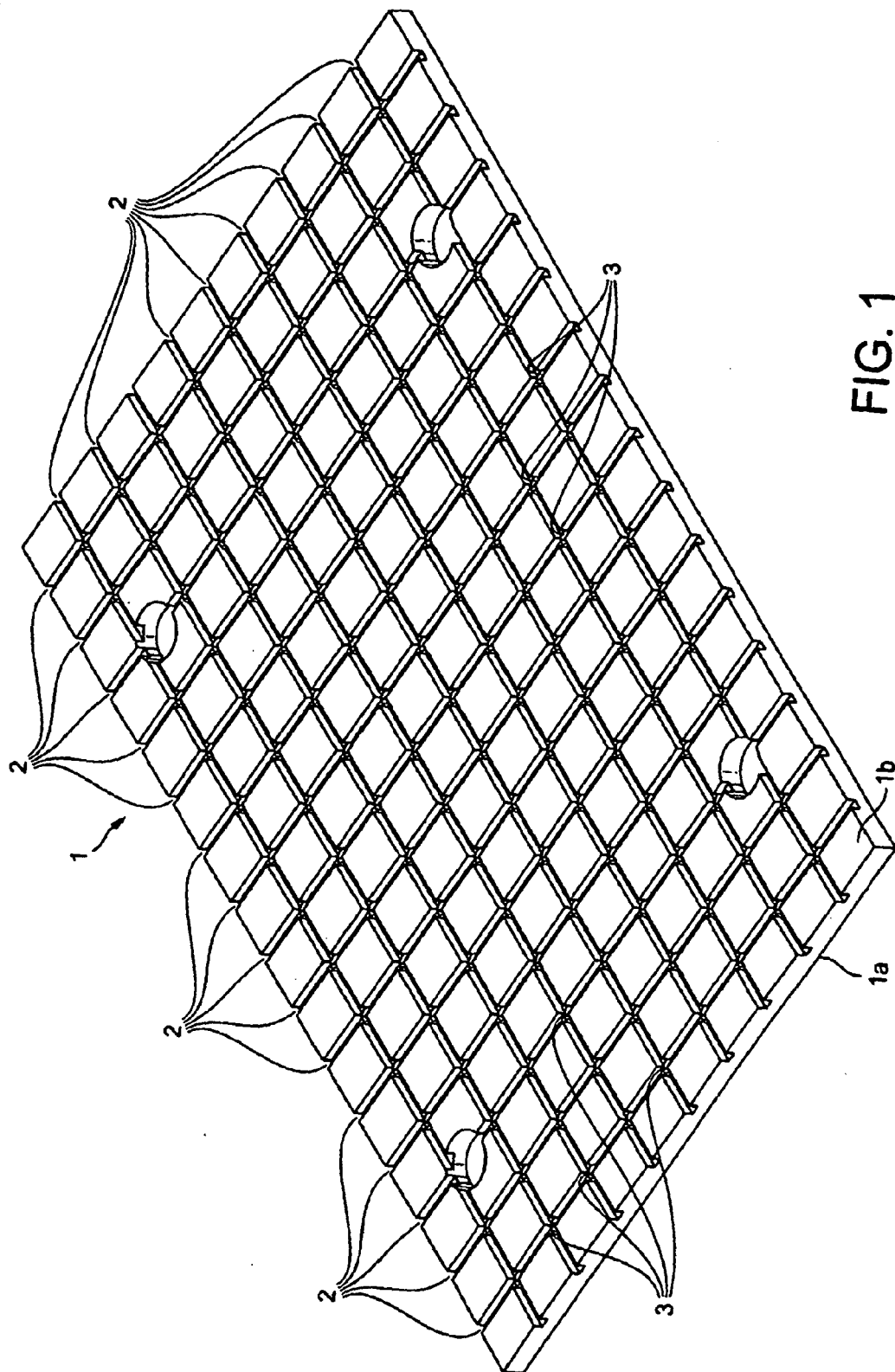


FIG. 1

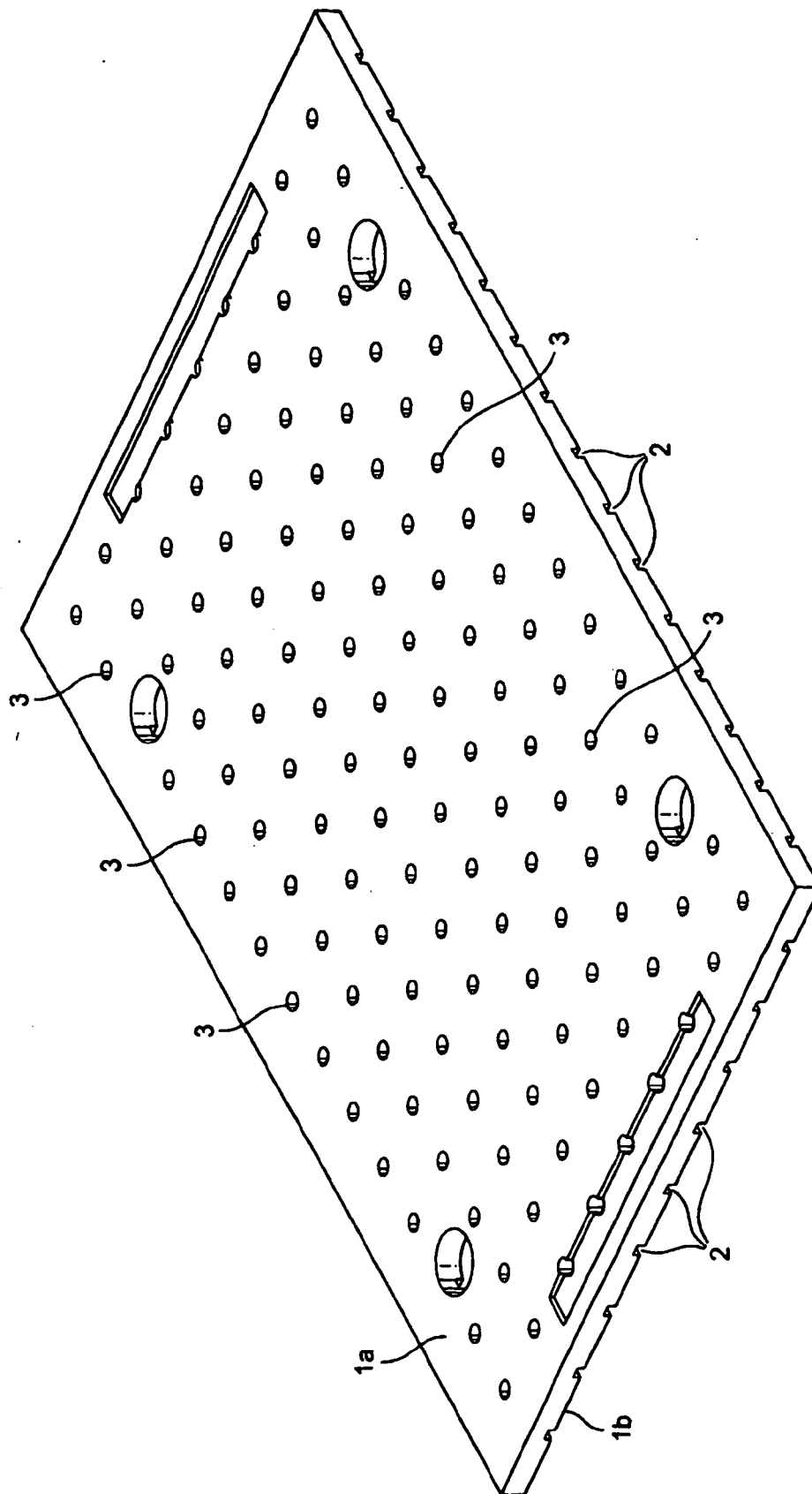


FIG. 2

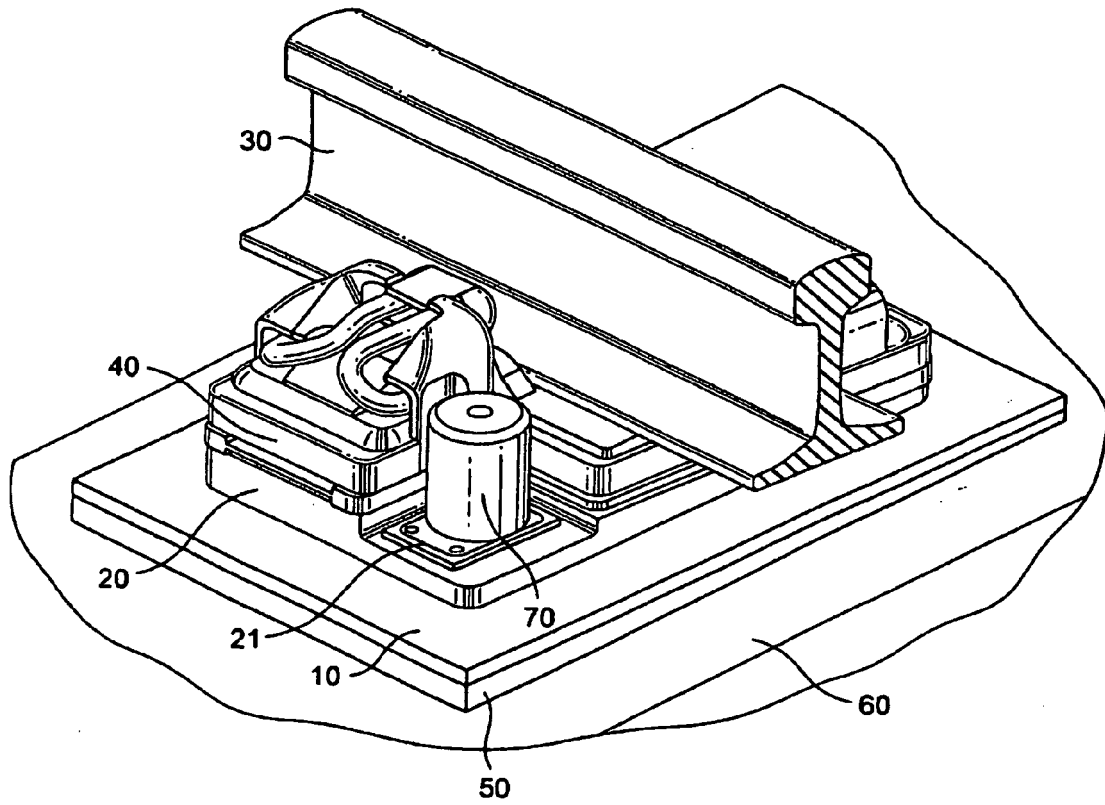


FIG. 3

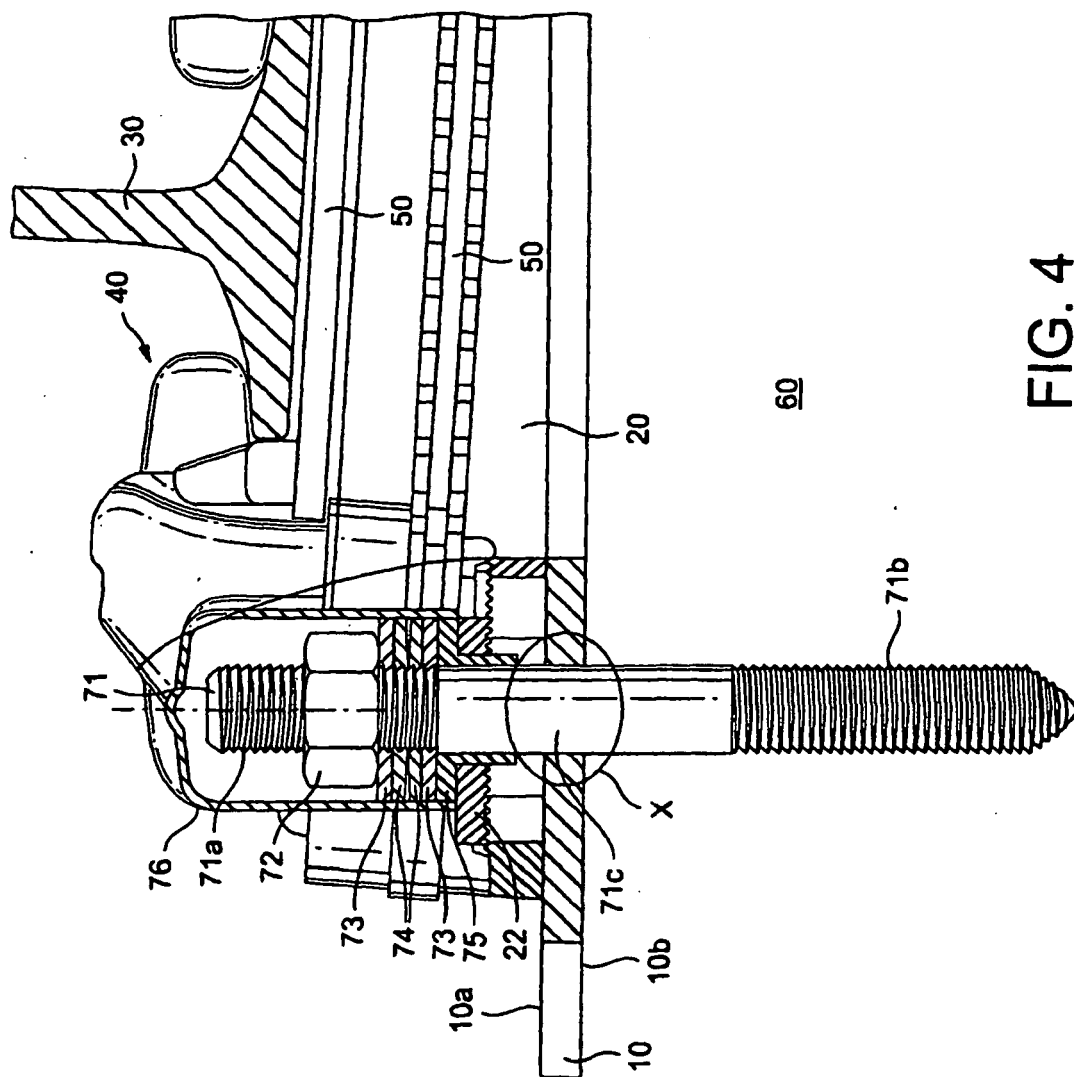


FIG. 4

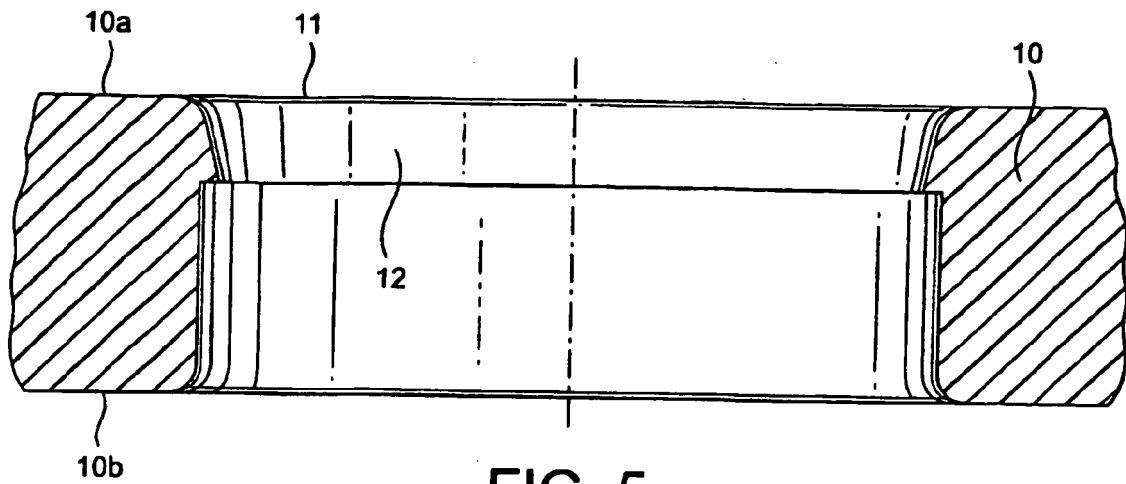


FIG. 5

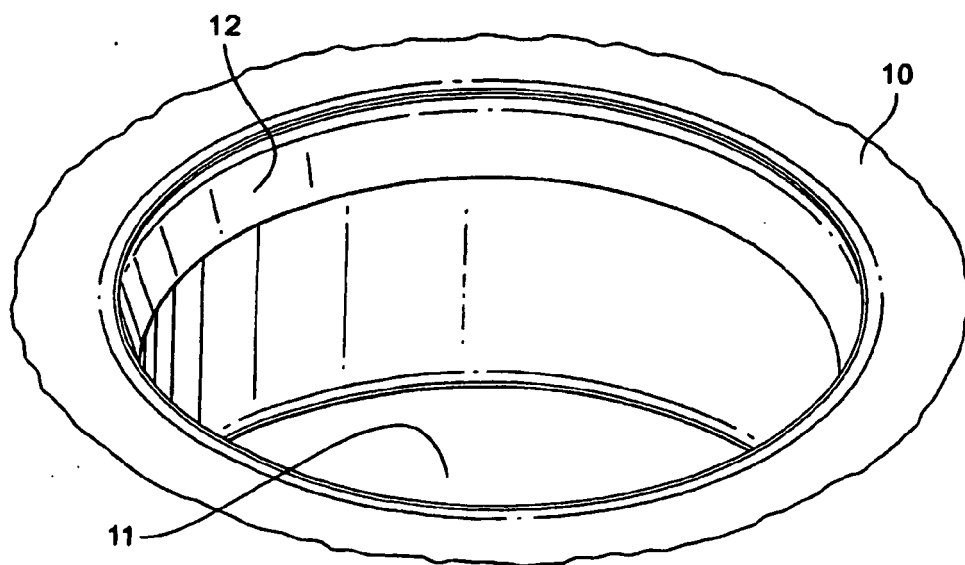


FIG. 6

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 1310594 A1 [0003]
- EP 1310596 A1 [0003]