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(54) **EXPANSION JOINT FOR PAVEMENT ITEMS AND RELATED MANUFACTURING AND ASSEMBLING METHOD**

DEHNFUGE FÜR PFLASTERUNGSOBJEKTE UND VERWANDTES HERSTELLUNGS- UND MONTAGEVERFAHREN

JOINT DE DILATATION DESTINE A DES ELEMENTS DE CHAUSSEE ET PROCEDES DE FABRICATION ET DE MONTAGE ASSOCIES

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## Description

### Technical Field

[0001] The present invention relates, in general, to expansion joints to be used for joining pavement items of roads, bridges, viaducts, runways, parking areas and similar structures. In particular, the present invention relates to expansion joints shaped so as to connect, for instance, pairs of pavement items comprised of concrete slabs coated with bituminous material; such expansion joints being arranged for compensating possible strains of pavement items due, for instance, to temperature changes.

### Background Art

[0002] It is known that pavement items of roads, bridges, viaducts, runways, parking areas and similar structures, that, from now on, will be simply referred to as pavement elements, pavement infrastructures or infrastructures, are subject to thermal strain and that the junction, typically between pairs of pavement elements, is obtained by means of expansion joints, i.e. by means of joints having the feature of elastically adapting to the mutual strain of pavement elements.

[0003] Expansion joints are known, for instance, from publications GB\_1439157, GB\_1510622, and US-A-5,338,130 having the feature to elastically adapt to the mutual strain of pavement elements.

[0004] The known joints comprise resilient material, for instance rubber shaped in various ways for compensating strains of pavement elements, and reinforcing or anchor elements made of metal and located at the joint ends; each reinforcing element, typically, comprises at least one anchor slot for allowing to anchor, through suitable bolts associated to the pavement and anchor elements, the expansion joints to respective concrete slabs of pavement elements.

[0005] According to the background art the reinforcing elements typically have "L" shaped cross-section and are completely enclosed or embedded in the resilient material.

[0006] The preferred solution to embed the reinforcing elements into the resilient material is dictated on one side by the need to protect the reinforcing elements from the corrosion due to external agents, such as humidity, gas or corrosive liquids, etc. and on the other part it is based on the prejudice that there is no technical advantage in putting into contact the reinforcing elements with pavement elements.

[0007] As a matter of fact, the Applicant has found that the known solution of embedding reinforcing elements in the deformable resilient material involves a set of problems.

[0008] First of all, the anchor slots and the bolts (nuts, washers and shanks) are, however, subject to corrosion phenomena, as they are not protected at all.

[0009] Moreover, interposing rubber between the reinforcing elements made of metal, for instance steel, and the concrete slab, makes the whole joint structure not sufficiently integral with the body of the same pavement element, thus causing joint loosening and consequent deterioration of the joint.

[0010] In brief the Applicant has found that the corrosion phenomena of the anchor areas together with the insufficient rigidity of connection between joint and infrastructures are apt to cause early loosening of the bolts that fasten joints to pavement elements. This phenomenon makes it necessary, as easily comprehensible, to resort to frequent special maintenance of expansion joints with consequent interruption of use of the joints and of the pavement elements involved. The above described problem is particularly remarkable as, in the majority of cases, expansion joints are used for infrastructures, for instance roads, motorways or railway links that are of particularly intensive use, whereby any maintenance with consequent interruption, even a partial one, of the use of infrastructures brings about not only maintenance costs but, also, costs in terms of discomfort or non-use.

### Disclosure of the Invention

[0011] Object of the present invention is, therefore, a road expansion joint that allows to avoid the problems of frequent special maintenance of the expansion joints above described.

[0012] A further object of the present invention is a manufacturing and installation method apt to drastically increase the reliability in time of the installed joints.

[0013] The object is achieved by means of the expansion joint for joining pavement elements of roads, bridges, viaducts, runways, parking areas and similar structures as claimed.

[0014] The present invention relates also to a method for making and mounting the expansion joint according to the present invention.

[0015] Claims are an integral part of the teaching of the present invention.

[0016] According to a preferred embodiment the expansion joint of the present invention comprises at least one resilient element and reinforcing or anchor elements made of corrosion-proof composite material and fastened externally to the resilient element.

[0017] According to a further feature of the present invention, the anchor elements comprise an external anchor surface arranged to be rigidly fastened to a corresponding anchor surface provided on the infrastructures to be joined.

[0018] According to still another feature of the present invention, the anchorage between joint and infrastructure is made by interposing a resin having adhesive function between anchor elements and infrastructure.

### Brief Description of Drawings

**[0019]** These and further features and advantages of the present invention will appear more clearly from the following detailed description of a preferred embodiment, provided by way of non-limiting examples with reference to the attached drawings, in which components designated by same or similar reference numerals indicate components having same or similar functionality and construction and wherein:

Fig. 1a shows a first embodiment of the expansion joint according to the present invention;

Fig. 1b shows the first embodiment of the joint of Fig. 1, in use;

Fig. 2a shows a second embodiment of the expansion joint according to the present invention, in use; and

Fig. 2b shows another version of the second embodiment, in use.

### Best mode for Carrying Out the Invention

**[0020]** The description that follows discloses two embodiments of expansion joints with the simple aim to illustrate possible different versions of such joints depending on the entity of the variation of the strain sustainable by the joints during use.

**[0021]** Obviously, the described examples are not exhaustive of all possible embodiments.

**[0022]** With reference to Fig. 1a, according to a first embodiment, an expansion joint (joint) 10 for pavement elements (infrastructures) 20 (Fig. 1a, 1b) comprises a resilient element 11, and, preferably, at least one pair of anchor elements or reinforcing elements 12 fastened to the resilient element 11 and arranged to allow anchoring the joint 10 to at least one pair of pavement elements 20 by means of suitable fastening elements 15, for instance bolts.

**[0023]** According to this first embodiment of the joint 10, the resilient element 11, for instance made of rubber, comprises, in two opposite areas at the ends of the joint 10, respective connection elements 111 having one or more cavities 112 shaped for housing fastening elements (bolts) 15; bolts 15 comprise, for instance, nuts 151, washers 153 and threaded shanks 155, adapted to fasten, in a known way, joint 10 to pavement elements 20. The resilient element 11 further comprises, in its central area, a strain element 114, for instance an element having saw-toothed cross-section with a determined width "l" at rest; the strain element 114 is shaped so as to modify, in use, its width "l'", according to the dimensional variation of pavement elements 20 in the direction of the width "l", and to sustain, therefore, the strain of infrastructures 20.

**[0024]** Anchor elements 12 have, respectively, in all the different preferred embodiments, an "L" shaped cross-section, are firmly glued on or fastened to the base

of the two connection elements 111 and have visible external surfaces 12a.

**[0025]** Still more preferably, the external surface 12a of the anchor elements 12 is shaped so that, in use, is in tight and firm contact with the infrastructure 20 as a result of the anchorage or fastening of the joint 10 to the infrastructure 20, as it will be disclosed later on in detail. Each anchor element 12 comprises at least a slot 121 in correspondence of cavity 112 and, preferably, is fastened to the resilient element 11, in a known way, by means of pressing and vulcanisation.

**[0026]** Each anchor element 12 is arranged to co-operate with threaded shanks 155, for instance fastened in a known way to respective pavement elements 20, so as to allow anchoring of the joint 10 to pavement elements 20 by means of nuts 151 and washers 153.

**[0027]** According to a second embodiment the joint 10 comprises a resilient element 110 (Fig. 2a and 2b), this too being preferably made of rubber, and, besides a pair of anchor or reinforcing elements 12 having shape and characteristics equivalent to those already described in connection with the first embodiment, further reinforcing elements, 120a, 120b and 120c, arranged to at least reinforce the joint 10, as it will be disclosed later on in detail.

**[0028]** According to this second embodiment the resilient element 110 comprises two connection elements 111, equivalent to those already described in the first embodiment, and, on a first face, for instance the top face of the resilient element 110, one or more intermediate elements, for instance in Fig. 2a and 2b three top intermediate elements (top elements) 115a, 115b and 115c, separated, in the example, by means of four top grooves 115 having width "ls", and, for instance, triangular shape. The resilient element 110 further comprises, on a second face, for instance the bottom face, one or more lower intermediate elements, for instance in Fig. 2a and 2b one lower intermediate element 118c, separated, in the example, from the connection elements 111 by means of two lower grooves 118 having width "li", and, for instance, triangular shape.

**[0029]** Top and lower grooves, 115 and 118, as easily comprehensible to a technician in the field, are arranged to co-operate for modifying the widths "ls" and "li" according to the dimensional variation of infrastructures 20 in the direction of widths "ls" and "li" and to sustain, therefore, the strain of infrastructures 20.

**[0030]** According to the example of Fig. 2a and 2b, the top elements located at the end of the joint 10, respectively 115a and 115b, comprise, respectively, the top reinforcing elements (top reinforcement) 120a and 120b, while the lower intermediate element 118c comprises the lower reinforcing element 120c.

**[0031]** In particular, in the example of Fig. 2a the top reinforcing elements 120a and 120b and the lower reinforcing element 120c are provided embedded into the resilient element 110, whereas in the example of Fig. 2b the top reinforcing elements and 120a, 120b and the lower reinforcing element 120c are provided fastened to or,

in particular, glued on the resilient element 110 so that the surface of the reinforcing elements, 120a, 120b, 120c, is left at sight on the top face and, in particular, on the lower face.

**[0032]** Obviously, also in such an embodiment, the reinforcing elements 120a, 120b, 120c are fastened to the resilient element 110, preferably in a way equivalent to that already described, i.e. by means of pressing and vulcanisation.

**[0033]** The reinforcing elements 120a, 120b, 120c are adapted, in both the described configurations, as easily comprehensible to a technician in the field, to confer robustness to the joint so that it does not break or bend as a consequence of mechanical stresses due to moving loads on the joint itself.

**[0034]** In all embodiments, each reinforcing element or at least each anchor element 12 is made of composite material, for instance material obtained by combination of materials as, for instance:

- reinforced thermosetting polymer, and
- fibre glass or fibre of another type or
- reinforced thermoplastic polymer, and
- fibre glass or fibre of another type .

**[0035]** In the preferred embodiment, the composite material is shaped by means of hot-moulding starting from a basic composite material made of the substances mentioned above. Advantageously, such a composite material has the peculiar feature of ensuring the highest mechanical strength to reinforcing elements, for instance at least equivalent to that of the metallic material, and high resistance to corrosion due for instance to external agents such as humidity, gas or corrosive liquids, etc.

**[0036]** Obviously, according to further embodiments, the composite material can also be obtained by combination of other materials, but, according to the preferred embodiment, it is expedient that the material has the feature of ensuring the highest mechanical strength, for instance at least equivalent to that of the metallic material, and high resistance to corrosion due to external agents, such as humidity, gas or corrosive liquids, etc.

**[0037]** In the following description, reference to a composite material for manufacturing at least the anchor elements is to be understood as a reference to a composite material having the above suggested features.

**[0038]** Each infrastructure 20 to which the joint 10 is to be anchored comprises, at the ends to be joined, for instance, a concrete slab (slab) 21 having a visible surface 21a, shaped for anchoring the joint 10 thereto, and a threaded shank 155 fastened to the slab 21 and arranged so as to allow fastening of the joint to the slab.

**[0039]** The infrastructure 20 further comprises, in the described embodiments, externally to the area where the joint 10 is positioned, layers of bituminous carpet, for instance two layers 22a and 22b, known per se, having different features as regards finishing and quality.

**[0040]** Preferably, between infrastructures 20 to be

joined there is also inserted, fastened in a known way to the infrastructures 20, an edge strip or flashing 18, typically made of rubber, arranged to allow water, for instance rainwater, to flow along the joint location.

**[0041]** The anchorage or installation of the joint 10, for instance to a pair of infrastructures 20, is carried out in the following way.

**[0042]** In a first step, preferably, a resin 28, for instance an anti-shrinkage resin, of known type, is coated on the surface 21a of the slab 21. Such a resin has, preferably, the purpose of working as an adhesive between the joint 10 and the infrastructure 20 besides that of contributing to maintain leveled the contact surface between anchor elements 12 and slab 21.

**[0043]** Obviously, in others embodiments the surface 21a of the slab 21 can be obtained sufficiently leveled, by using, for instance, fresh concrete, so as to allow a direct anchorage of the joint to the slab without using resin.

**[0044]** In a second step the joint 10, once the threaded shanks 155 are inserted into the joint slots 121, is anchored by means of washers 153 and nuts 151 to the pair of infrastructures 20. In such a step nuts 151 and washers 153 are fastened with the strength necessary to ensure that the joint 10 and the infrastructure 20 become rigidly joined.

**[0045]** In the end, in a third step cavities 112, in the position corresponding to the bolts 15, and possible interstitial areas 113 between layers of bituminous carpet 22a and 22b and the joint 10, are filled with a sealing material, for instance bi-component resins of known type.

**[0046]** Thanks to the manufacturing method of the joint 10 and to the installation method as described above, anchor elements 12, having the external surface 12a exposed externally at the base of the joint 10, are directly in contact with the surface 21a of the concrete slab 21 and rigidly fastened to it; fastening may be helped by the resin 28, if present, so that the joint 10 and the slab 21 realise a particularly rigid and firm junction and form, substantially, a single body.

**[0047]** As a matter of fact, contrary to the background art a rigid junction is obtained without any interposition of resilient material between anchor elements and slab surfaces, or, in other words, between the joint and the infrastructure. Moreover, being the anchor elements made of composite material, there is no risk of corrosion for the anchor elements.

**[0048]** Obviously, the joint 10, thanks to the presence of the resilient element, maintain unchanged its elasticity characteristics that are adapted to sustain the infrastructure strain.

**[0049]** In the second embodiment, or in general in embodiments similar thereto, reinforcing elements 120a, 120b, 120c (Fig. 2a, 2b) are preferably, made of composite material and fastened externally to the resilient element 110.

**[0050]** In such embodiments, the reinforcing element or the reinforcing elements, if fastened externally to the

base of the joint, have an external surface apt to come into contact with the visible surface 21a of the slab and contribute to confer rigidity to the junction between the infrastructure and the joint; such a configuration is apt to facilitate the operation of the resilient element of the joint and in any case it does not have any corrosion risk.

**[0051]** In summary, the Applicant has found that the joint 10 as described both in the first and in the second embodiment, allows to obtain, once installed, a surprising technical result because, by rendering the junction between joint and infrastructures more rigid, it prevents loosening of the bolts and, consequently, extends maintenance intervals remarkably.

**[0052]** The expansion joint has been described in two embodiments. Obviously, there are various possible embodiments of the joint as well as the various shapes of the resilient element arranged to compensate strains of the infrastructures to be joined.

**[0053]** In particular, the resilient element can have different shapes, as easily comprehensible to a technician in the field, according to the entity of the strains to be sustained by the joint, without departing from the scope of the invention as described and claimed.

**[0054]** Similarly, the shapes of the infrastructures in their end parts as well as the method of fastening the joint to infrastructures may be different from that described above, without departing from the scope of the invention as described and claimed.

**[0055]** Moreover, the reinforcing elements in the joint may be arranged in different ways. For instance, anchor elements 12 and reinforcing elements 120c, adapted to come into contact with the slabs of infrastructures, may be made of composite material, while the reinforcing elements 120a, 120b directed only to reinforce the joint may be made of metallic material and, preferably, embedded in the resilient element.

**[0056]** Obvious changes and variations to the above disclosure are possible, as regards dimensions, shapes, materials, components, connections, as well as details of circuitry, of the described construction and operation method without departing from the scope of the invention as defined by the claims that follow.

## Claims

1. Expansion joint for connecting pavement infrastructures (20) comprising

- a resilient element (11, 110) comprising, between at least two ends (111) having each an upper and lower flat surface, at least one strain element (114, 115) arranged to change its width according to dimensional variation of said pavement infrastructures (20),
- at least two anchor or reinforcing elements (12) fastened each to the lower flat surface of the corresponding ends (111) of said resilient ele-

ment (11, 110) and shaped so as to be anchored by means of bolts to respective anchor surfaces (21a, 28) of said infrastructures (20),

### characterised in that

- said at least two anchor elements (12)
- are made of composite material, and comprise each a flat lower surface (12a) arranged to be further anchored in direct and rigid contact to said anchor surfaces (21a, 28) of said infrastructures (20) by means of an adhesive resin.

2. Expansion joint according to claim 1 **characterised in that** said anchor elements (12) made of composite material ensure a mechanical strength equivalent to that of anchor elements made of metallic material and are resistant to corrosion due to external agents.

3. Expansion joint according to claim 1 or 2 **characterised in that** said anchor elements (12) made of composite material are obtained by moulding materials comprising the combination of substances chosen in the groups consisting of

- at least reinforced thermosetting polymer and fibre glass or fibre of another type, or
- at least reinforced thermoplastic polymer and fibre glass or fibre of another type.

4. Expansion joint according to any one of preceding claims, **characterised in that** said at least two anchor elements (12) comprise each

- at least one slot (121) shaped for allowing fastening of the joint (10) to said infrastructures (20) by means of bolts (15) .

5. Expansion joint according to any one of preceding claims, **characterised in that** it comprises

- one or more further reinforcing elements (120a, 120b, 120c) that are made of composite material, are fastened to said resilient element (11, 110) and are arranged to confer robustness to said joint (10).

6. Expansion joint according to any one of preceding claims, **characterised in that** said anchor surfaces (21a, 28) of said infrastructures (20) comprise

- at least one surface (21a) of a concrete slab (21).

7. Method for manufacturing an expansion joint to be anchored to anchor surfaces (21a, 28) of pavement infrastructures (20), **characterised by** the steps of

- providing a resilient element comprising, between at least two ends having each an upper

- and lower flat surface, at least one strain element (114, 115) arranged to change its width according to dimensional variation of said pavement infrastructures (20),
- providing at least two anchor or reinforcing elements (12) made of composite material,
  - fastening said at least two anchor elements (12) to the lower flat surface of the corresponding ends (111) of said resilient element (11, 110), said at least two anchor elements (12) being shaped so as to be anchored by means of bolts to respective anchor surfaces (21a, 28) of said infrastructures (20),
  - providing a lower flat surface to said at least two anchor elements (12) for further anchoring said at least anchor elements in direct and rigid contact to said anchor surfaces (21a, 28) of said infrastructures (20) by means of an adhesive resin.
8. Method according to claim 7 **characterised in that** said step of providing at least two anchor or reinforcing elements (12) made of composite material comprises the steps of
- moulding materials comprising the combination of substances chosen in the groups consisting of at least reinforced thermosetting polymer and fibre glass or another type of fibre, or at least reinforced thermoplastic polymer and fibre glass or another type of fibre.
9. Method according to claim 7 or 8, **characterised by** the further step of
- anchoring said joint to said infrastructures by means of said bolts and said adhesive resin.
10. Method according to claim 9, **characterised in that** said step of anchoring said joint to said infrastructures comprises at least the steps of
- coating the adhesive resin having adhesive function on said anchor surfaces (21a) of said infrastructures,
  - anchoring said lower surfaces (12a) of said at least two anchor elements (12) to said respective anchor surfaces (21a) of said infrastructure (21) through said adhesive resin (28).
11. Method according to any one of claims 7 to 10 **characterised in that** said step of fastening said at least two anchor elements (12) to the corresponding ends (111) of said resilient element 811, 110) comprises the step of
- fastening by pressing and vulcanisation.

## Patentansprüche

1. Dehnfuge zur Verbindung von Fahrbahnstrukturen, mit einem elastischen Element (11, 110), das zwischen mindestens zwei Enden (111), jeweils eine obere und untere ebene Oberfläche, mindestens ein Dehnungselement (114, 115) aufweist, mit dem seine Breite entsprechend der Abmessungsänderung der Fahrbahnstrukturen (20) veränderbar ist,
  - mindestens zwei Verankerungs- oder Verstärkungselemente (12), die jeweils an der unteren ebenen Oberfläche der entsprechenden Enden (111) des elastischen Elements (11, 110) befestigt und so geformt sind, dass sie mit Bolzen an ihren jeweiligen Verankerungsflächen (21 a, 28) der Strukturen (20) verankerbar sind, **dadurch gekennzeichnet, dass**
  - die mindestens zwei Verankerungselemente (12)
  - aus Verbundwerkstoff hergestellt sind und jeweils eine ebene untere Fläche (12a) aufweisen, die zur weiteren Verankerung in direktem und steifem Kontakt mit den Verankerungsflächen (21 a, 28) der Strukturen (20) mittels eines Klebeharzes angeordnet sind.
2. Dehnfuge nach Anspruch 1, **dadurch gekennzeichnet, dass** die Verankerungselemente (12) aus Verbundwerkstoff hergestellt werden und eine mechanische Festigkeit gewährleisten, die jener von Verankerungselementen aus metallischem Werkstoff gleichwertig und gegen äußere Einflüsse korrosionsbeständig sind.
3. Dehnfuge nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die aus Verbundwerkstoff bestehenden Verankerungselemente (12) durch Gießen von Werkstoffen erhalten werden, die die Kombination von Substanzen aus den Gruppen enthalten, die aus:
  - mindestens verstärktem Duroplast und Glasfaser oder Faser anderer Art, oder
  - mindestens verstärktem thermoplastischem Polymer und Glasfaser oder Faser anderer Art bestehen.
4. Dehnfuge nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die mindestens zwei Verankerungselemente (12) jeweils:
  - mindestens einen Schlitz (121) aufweisen, der so geformt ist, dass er die Befestigung der Fuge (10) an den Strukturen (20) mittels Bolzen (15) erlaubt.

5. Dehnfuge nach einem der vorhergehenden Ansprüche,  
**dadurch gekennzeichnet, dass** sie aufweist:

- eines oder mehrere Verstärkungselemente (120a, 120b, 120c), die aus Verbundmaterial hergestellt sind, an dem elastischen Element (11, 110) befestigt und so angeordnet sind, dass sie der Fuge (10) Robustheit verleihen.

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6. Dehnfuge nach einem der vorhergehenden Ansprüche,  
**dadurch gekennzeichnet, dass** die Verankerungsflächen (21 a, 28) der Strukturen (20) mindestens eine Oberfläche (21 a) einer Betonplatte (21) aufweisen.

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7. Verfahren zur Herstellung einer an Verankerungsflächen (21 a, 28) von Fahrbahnstrukturen zu verankernden Dehnfuge,  
**gekennzeichnet durch** folgende Verfahrensschritte:

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- Bereitstellung eines elastischen Elements, das zwischen mindestens zwei Enden jeweils eine obere und untere ebene Oberfläche, mindestens ein Dehnungselement (114, 115) aufweist, mit dem seine Breite entsprechend der Abmessungsänderung der Fahrbahnstrukturen (20) veränderbar ist,

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- Bereitstellung mindestens zweier aus Verbundwerkstoff hergestellter Verankerungs- oder Verstärkungselemente (12),

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- Befestigung der mindestens zwei Verankerungselemente (12) an der unteren ebenen Oberfläche der entsprechenden Enden (111) des elastischen Elements (11, 110), wobei die mindestens zwei Verankerungselemente (12) so geformt sind, dass sie mittels Bolzen an den jeweiligen Verankerungsflächen (21 a, 28) der Strukturen (20) verankerbar sind,

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- Bereitstellung einer unteren ebenen Fläche an den mindestens zwei Verankerungselementen (12), um außerdem die wenigstens zwei Verankerungselemente in direktem und steifem Kontakt an den Verankerungsflächen (21 a, 28) der Strukturen (20) mittels eines Klebeharzes zu verankern.

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8. Verfahren nach Anspruch 7,  
**dadurch gekennzeichnet, dass** der Verfahrensschritt der Bereitstellung der mindestens zwei aus Verbundmaterial hergestellten Verankerungs- oder Verstärkungselemente (12) folgende Schritte umfasst:

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- Gießen von Werkstoffen, die eine Kombination von Substanzen aus den Gruppen enthalten, die

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mindestens aus verstärktem Duroplast und Glasfaser oder einer anderen Art Faser oder mindestens verstärktem thermoplastischen Polymer und Glasfaser oder Faser anderer Art bestehen.

9. Verfahren nach Anspruch 7 oder 8,  
**gekennzeichnet durch** folgenden zusätzlichen Schritt:

- Verankerung der Fuge an der Struktur mittels der Bolzen und des Klebeharzes.

10. Verfahren nach Anspruch 9,  
**dadurch gekennzeichnet, dass** der Verfahrensschritt der Verankerung der Fuge an der Struktur mindestens die Verfahrensschritte umfasst:

- Beschichten mit dem Klebeharz, das auf den Verankerungsflächen (21 a) der Strukturen adhäsive Funktionen hat,

- Verankerung der unteren Flächen (12a) der mindestens zwei Verankerungselemente (12) an den jeweiligen Verankerungsflächen (21a) der Struktur (21) durch das Klebeharz (28).

11. Verfahren nach einem der Ansprüche 7 bis 10,  
**dadurch gekennzeichnet, dass** der Schritt der Befestigung der mindestens zwei Verankerungselemente (12) an den entsprechenden Enden (111) des elastischen Elements (11, 110) folgenden Schritt umfasst:

- Befestigung durch Pressen und Vulkanisierung.

## Revendications

1. Joint de dilatation destiné à raccorder des éléments de chaussée (20) comportant :

- un élément élastique (11, 110) comprenant, entre au moins deux extrémités (111) présentant chacune une surface supérieure et inférieure plane, au moins un élément soumis à contrainte (114, 115) agencé en vue de modifier sa largeur selon la variation en dimension desdits éléments de chaussée (20),

- au moins deux éléments d'ancrage ou de renforcement (12) fixés, chacun, à la surface inférieure plane des extrémités correspondantes (111) dudit élément élastique (11, 110) et configurés de façon à être fixés au moyen de boulons à des surfaces d'ancrage respectives (21a, 28) desdits éléments (20),

**caractérisé en ce que**

- lesdits au moins deux éléments d'ancrage (12)

- sont constitués de matériau composite, et comportent, chacun, une surface inférieure plane (12a) agencée pour être, de plus, fixée selon contact direct et rigide aux dites surfaces d'ancrage (21a, 28) desdits éléments (20) au moyen d'une résine adhésive. 5
2. Joint de dilatation selon la revendication 1, **caractérisé en ce que** lesdits éléments d'ancrage (12) constitués de matériau composite assurent une résistance mécanique équivalente à celle des éléments d'ancrage constitués de matériau métallique et sont résistants à la corrosion due à des agents extérieurs. 10
3. Joint de dilatation selon la revendication 1 ou 2, **caractérisé en ce que** lesdits éléments d'ancrage (12) constitués de matériau composite sont obtenus par moulage de matériaux comportant la combinaison de substances choisies dans les groupes composés de 20
- au moins un polymère thermodurcissable renforcé et de fibres de verre ou de fibres d'un autre type, ou
- au moins un polymère thermoplastique renforcé et de fibres de verre ou de fibres d'un autre type. 25
4. Joint de dilatation selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdits au moins deux éléments d'ancrage (12) comportent, chacun, 30
- au moins une fente (121) configurée pour permettre la fixation du joint (10) aux dits éléments (20) au moyen de boulons (15). 35
5. Joint de dilatation selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'il** comporte 40
- un ou plusieurs élément(s) de renforcement supplémentaire(s) (120a, 120b, 120c) qui sont constitués de matériau composite, qui sont fixés au dit élément élastique (11, 110) et qui sont agencés en vue de conférer de la robustesse au dit joint (10). 45
6. Joint de dilatation selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdites surfaces d'ancrage (21a, 28) desdits éléments (20) comprennent 50
- au moins une surface (21a) d'une dalle de béton (21). 55
7. Procédé permettant de fabriquer un joint de dilatation à fixer à des surfaces d'ancrage (21a, 28) d'éléments de chaussée (20), **caractérisé par** les étapes comportant de :
- fournir un élément élastique comprenant, entre au moins deux extrémités présentant, chacune, une surface supérieure et inférieure plane, au moins un élément soumis à contrainte (114, 115) agencé en vue de modifier sa largeur selon une variation de dimensions desdits éléments de chaussée (20),
- fournir au moins deux éléments d'ancrage ou de renforcement (12) constitués de matériau composite,
- fixer lesdits au moins deux éléments d'ancrage (12) à la surface inférieure plane des extrémités correspondantes (111) dudit élément élastique (11, 110), lesdits au moins deux éléments d'ancrage (12) étant configurés de façon à être fixés au moyen de boulons aux surfaces d'ancrage respectives (21a, 28) desdits éléments (20),
- fournir une surface inférieure plane aux dits au moins deux éléments d'ancrage (12) pour fixer, de plus, lesdits au moins deux éléments d'ancrage en relation de contact direct et rigide aux dites surfaces d'ancrage (21a, 28) desdits éléments (20) au moyen d'une résine adhésive.
8. Procédé selon la revendication 7 **caractérisé en ce que** ladite étape consistant à fournir au moins deux éléments d'ancrage ou de renforcement (12) constitués de matériau composite comprend les étapes comportant le fait de :
- mouler des matériaux comportant la combinaison de substances choisies dans les groupes constitués d'au moins un polymère thermodurcissable renforcé et de fibres de verre ou d'un autre type de fibre, ou au moins un polymère thermoplastique renforcé et de fibres de verre ou un autre type de fibre.
9. Procédé selon la revendication 7 ou 8, **caractérisé par** l'étape supplémentaire comprenant de
- fixer ledit joint aux dits éléments au moyen desdits boulons et de ladite résine adhésive.
10. Procédé selon la revendication 9, **caractérisé en ce que** ladite étape d'ancrage dudit joint aux dits éléments comprend au moins les étapes comportant le fait de :
- recouvrir de la résine adhésive ayant une fonction adhésive lesdites surfaces d'ancrage (21a) desdits éléments,
- fixer lesdites surfaces inférieures (12a) desdits au moins deux éléments d'ancrage (12) aux dites surfaces d'ancrage respectives (21a) dudit



élément (21) par l'intermédiaire de ladite résine adhésive (28).

11. Procédé selon l'une quelconque des revendications 7 à 10, **caractérisé en ce que** ladite étape de fixation desdits au moins deux éléments d'ancrage (12) aux extrémités correspondantes (111) dudit élément élastique (11, 110) comporte l'étape de
- fixation par pression et vulcanisation.

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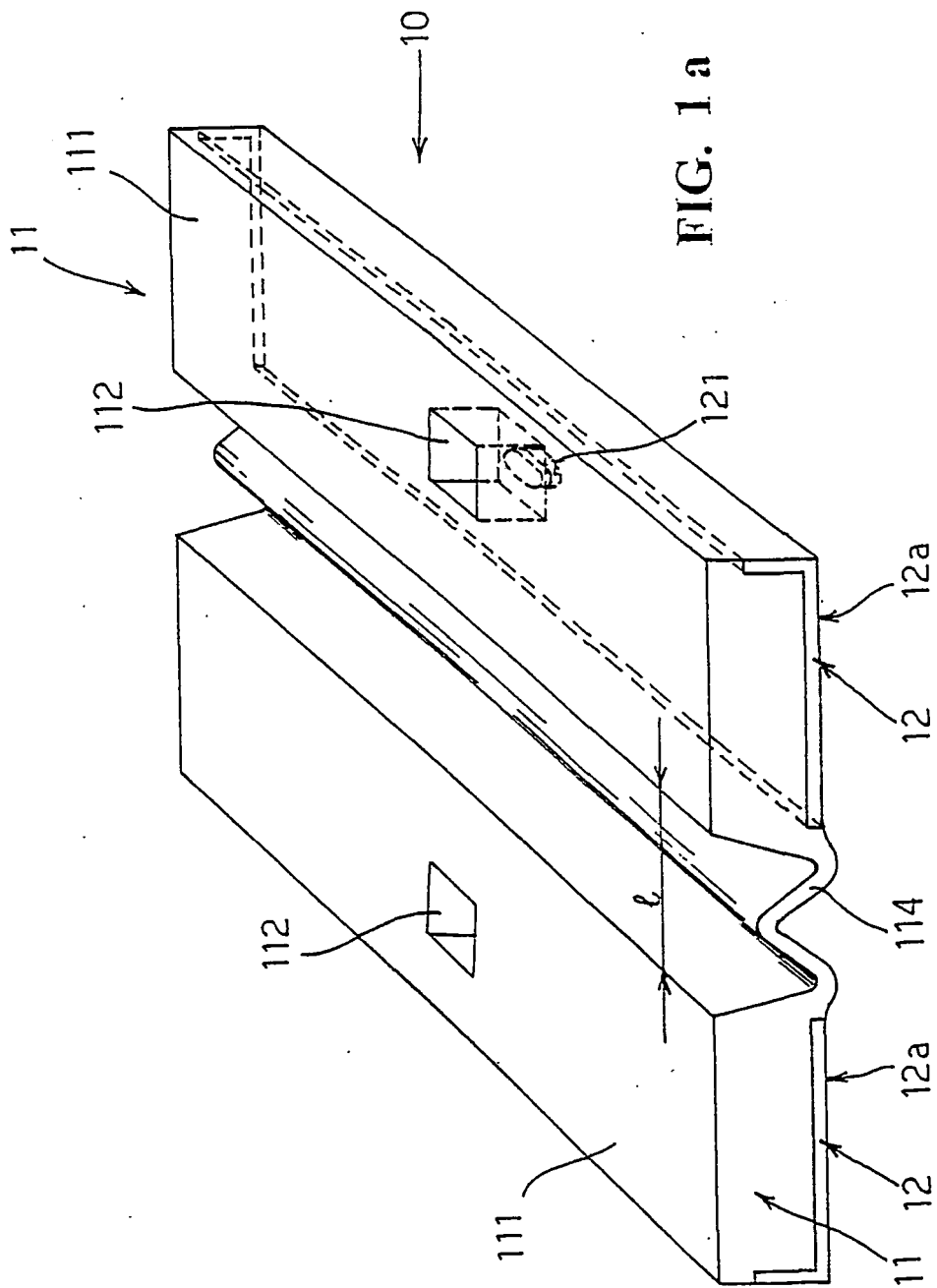
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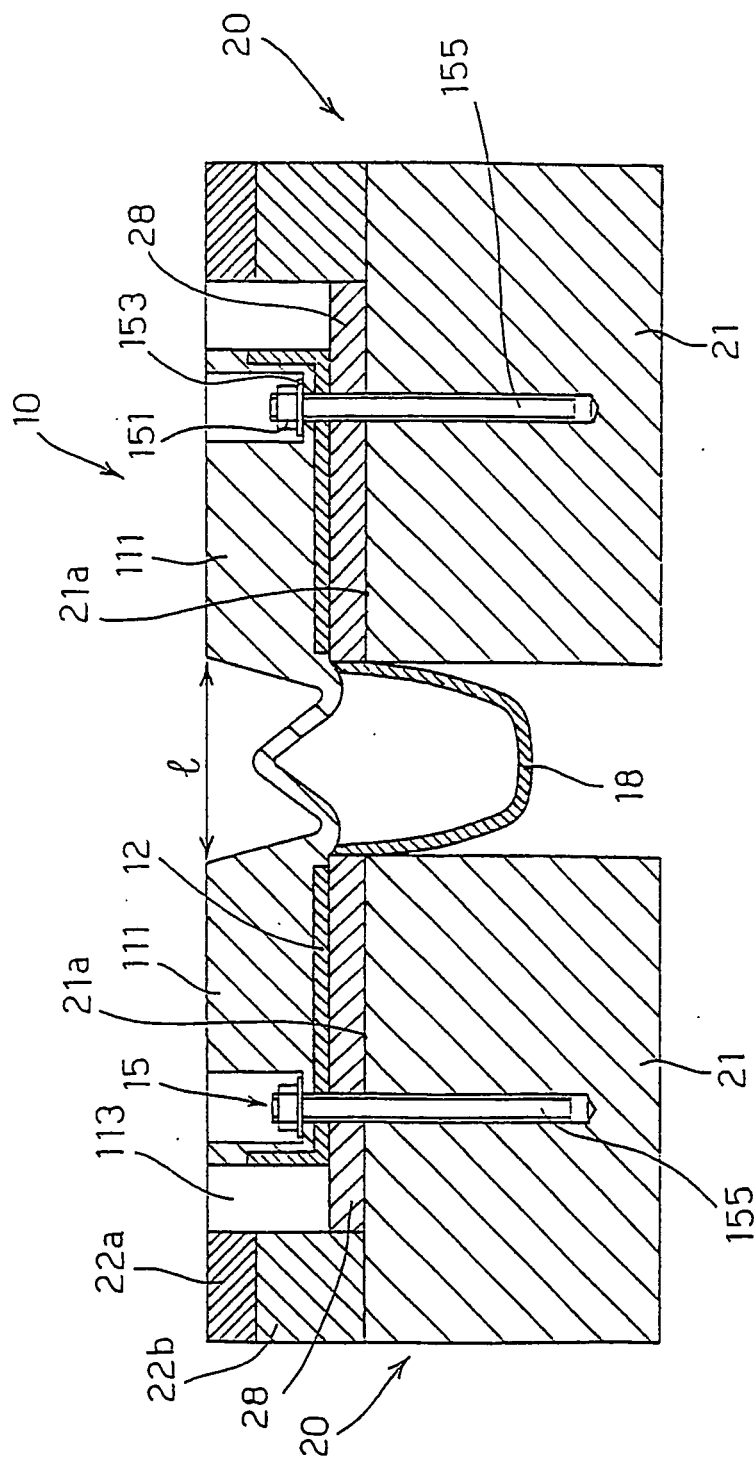


FIG. 1 b

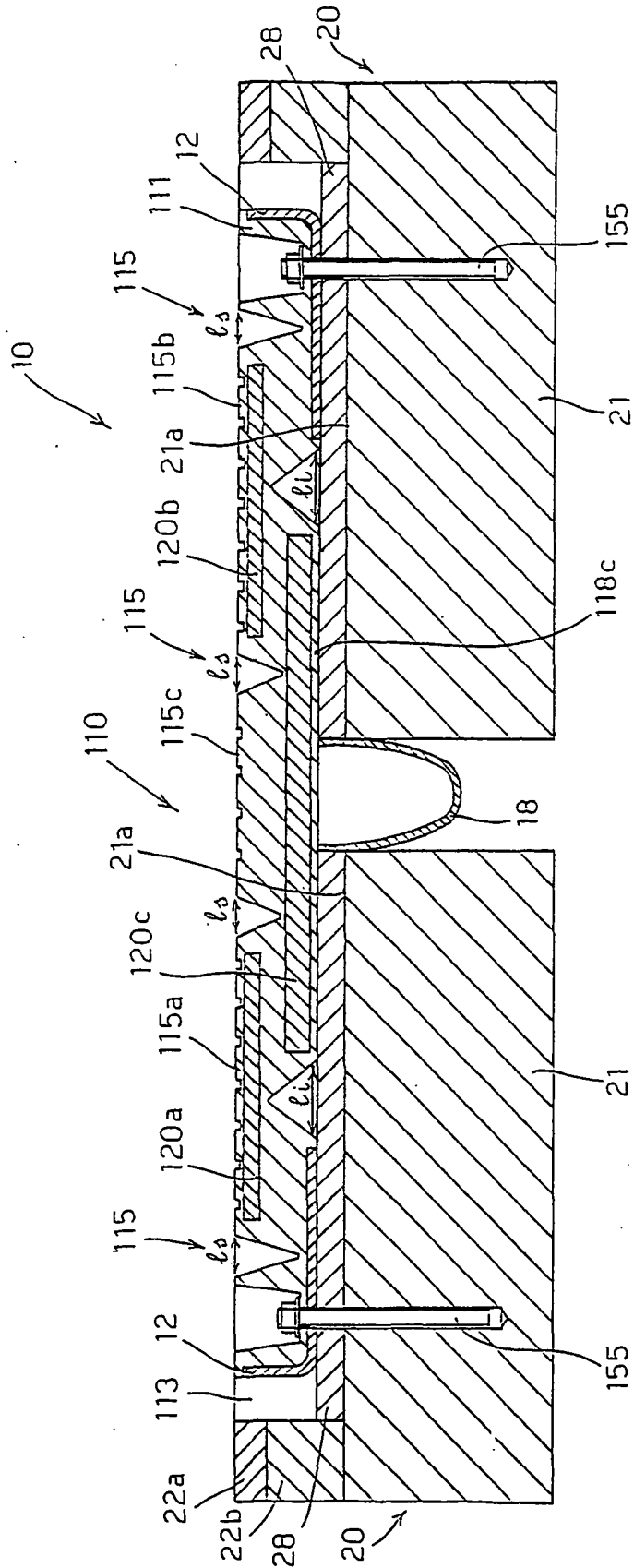


FIG. 2 a

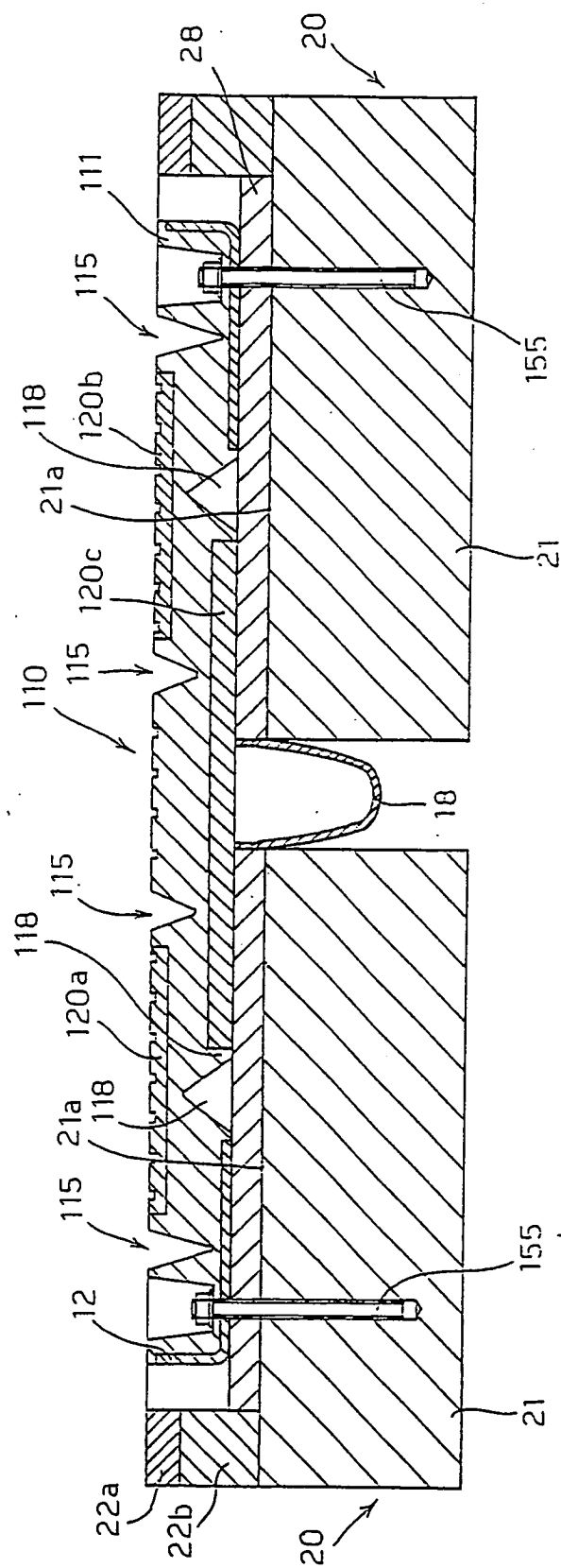


FIG. 2 b

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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