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Koster

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[54] **SPANNING JOINTS**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **404/69**; 14/16; 52/396

[51] **Int. Cl.** **E01c 11/02**

[58] **Field of Search** 404/69, 47, 68, 64, 65, 404/66; 14/16; 52/396

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[57] **ABSTRACT**

The invention relates to apparatus for spanning expansion joints in public roads, consisting of marginal bodies, which are anchored in the joint margins in an opposed arrangement, are disposed adjoining the upper surface of the road and the joint and are made of metal and rubber sections connected together by vulcanisation, also comprising a lateral groove in each case, which is open in the direction of the joint, for the sealing accommodation of the fixture members of an elastic expansion body covering the joint.

8 Claims, 5 Drawing Figures

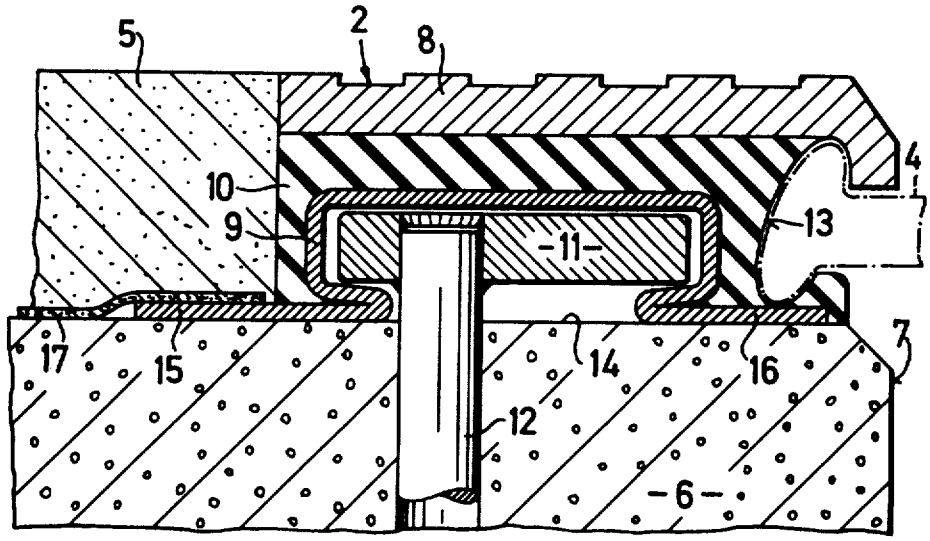


Fig.1

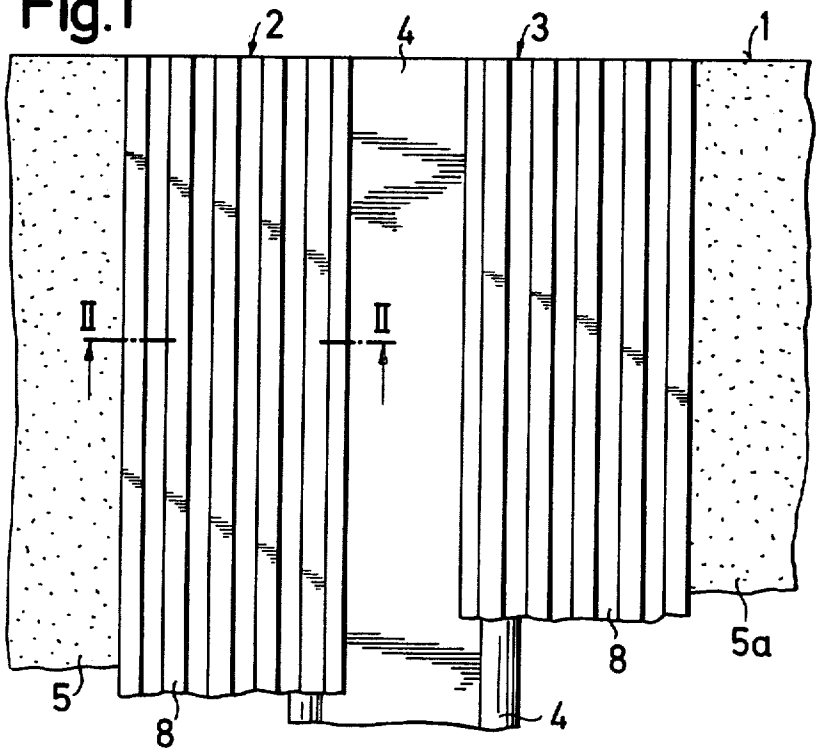
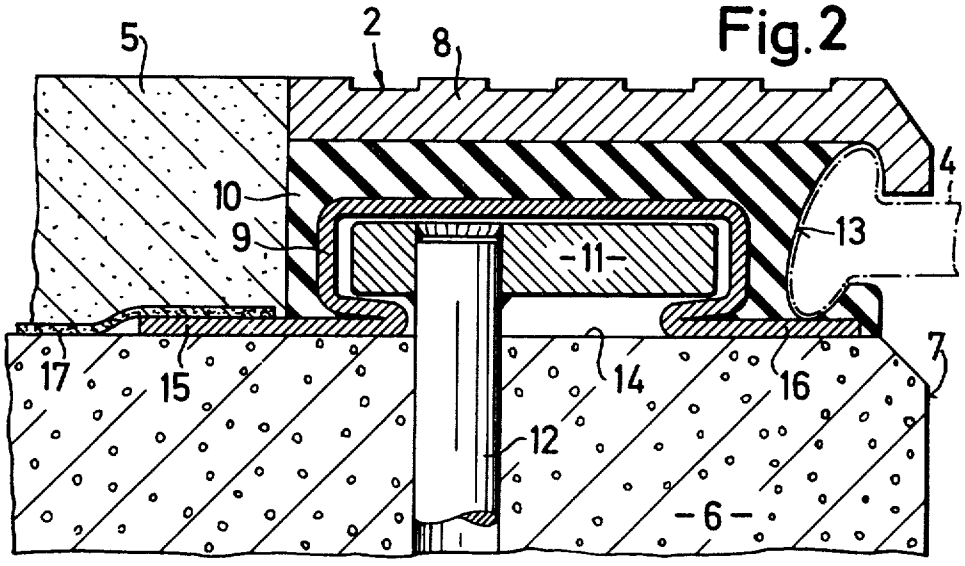


Fig.2



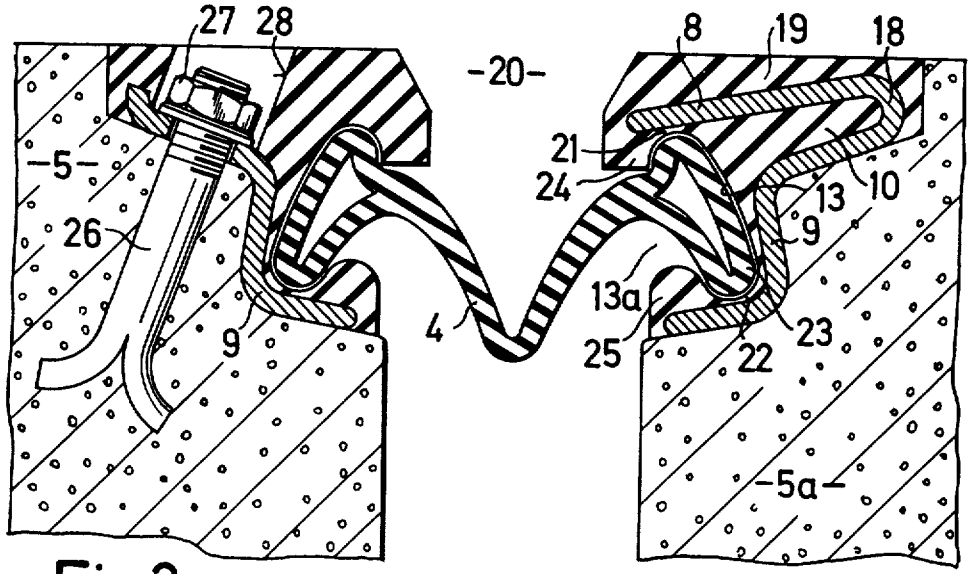


Fig.3

Fig.4

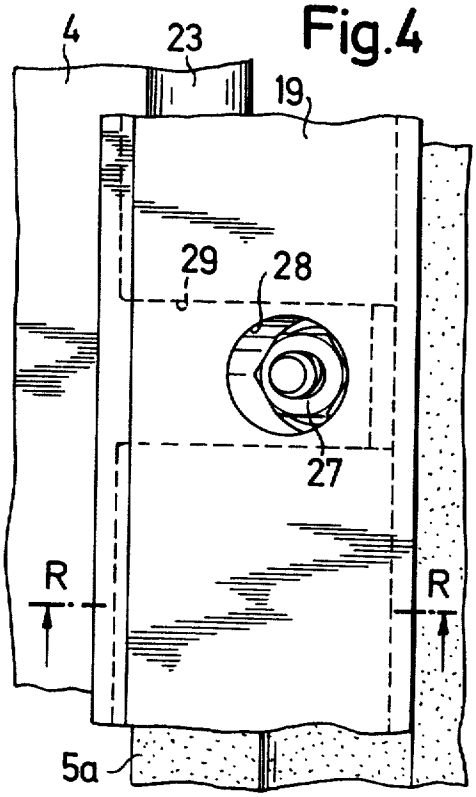
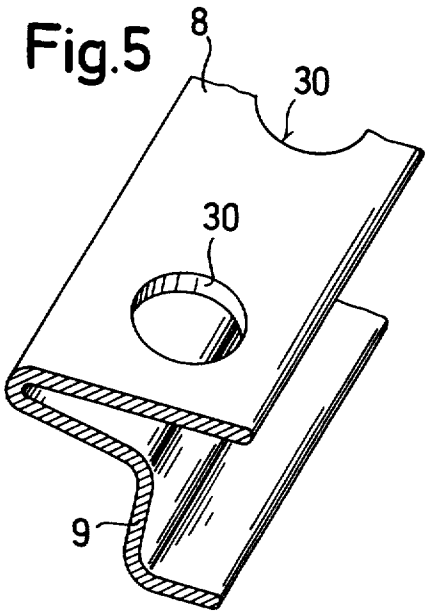


Fig.5



SPANNING JOINTS

In a known device of this type (W. Koster, Fahrbahnubergange-Roadway crossings, Developments 1965 to 1968, Bauverlag G.m.S.H., Wiesbaden-Berlin, Page 14, Diag. 300) the marginal bodies consist of steel profiles of C-shaped cross-section and are provided with an anchoring rib, in the grooves of which an expansion body is inserted at top and bottom along its opposed lateral margins. This construction is particularly advantageous for heavy traffic loads. Owing to the considerable height of the structure and its robust construction, it is only of restricted suitability for small construction joints, subject to slight stress, for example, in the interior of buildings or pavements.

The need for elastic joint transitions for damping the impact of wheels, was taken into account (cf. ibid. Page 20, Diag. 305), in that joint transitions were provided comprising compound constructions made of metal plates and neoprene expansion elements. In these composite constructions there are difficulties in attaining the necessary flexibility for adaptation to different joint positions without reduction in stability. Mounting of these composite constructions is also difficult, since, for their fixture, they must be held in the joint margins with stress deformation of the neoprene material. If the construction is damaged it must be replaced on both joint margins.

A further known construction (French Patent No. 2128107) consists of separate marginal bodies which are each connected to the marginal edges, a plate spanning the joint being connected to one marginal body and disposed so as to be capable of sliding movement on the opposed marginal body, in the manner of a cover-plate. This known construction is subject to abrasion and does not provide a water-tight covering for the joint interstice.

A further known construction (Civil Engineering-ASCE, January, 1972, Page 36) utilises marginal bodies, substantially consisting of rubber blocks, which are connected to each other by means of an elastic expansion body covering the joint, the fixture members for the expansion body thereby being secured in grooves in the marginal bodies, which are open in the direction of the joint. There is a risk of loosening of the connection if heavy vehicles travel over the construction. This type of connection is always at risk, owing to deformation of the rubber parts under stress.

The invention is based on the aim of providing a spanning device, which damps the impact of traffic, is of durable construction and is also adapted to withstand great stress, trouble-free anchorage being attained simultaneously with small constructional height. This aim is attained, according to the invention, in that the marginal bodies each comprise an elastomeric intermediate layer on the under-surface of which then is provided a metal mounting, said mounting being anchored in the joint margin, and on the upper surface of the intermediate layer there is provided a metal plate, the groove being at least in part defined by the intermediate layer, metal mounting and metal plate.

In a preferred embodiment of the invention the groove is constructed in a known manner with undercuts extending adjacent its aperture and transversally thereto, the outer areas of the undercuts being directly or indirectly adjacent the metal plate on one side and the metal mounting on the other.

According to the invention, a very firm seal for the fixture members of the expansion body in the insertion groove is attained. Arching of the regions of the marginal bodies adjacent the insertion groove is eliminated by the groove being defined by the metal plate and metal mounting on both sides, so that the expansion body is effectively prevented from being torn out. The metal plate and metal mounting simultaneously provide reinforcement of the marginal bodies, and the elastic properties of the marginal bodies, which damp the impact of wheels, are not impaired.

It is advantageous, for reasons of wear and tear, to dispose the metal plate in such a manner that it adjoins the upper surface of the roadway. In many cases of application, particularly for low traffic loads, it is advantageous to apply a further covering layer of wear-resistant elastomeric material on the metal plate. In order to attain the most continuous and therefore smoothest possible transition to the road surface, on travelling over the covering layer, it is advantageous if the thickness of the covering layer increases from the edge of the roadway covering, adjoining the marginal body in question, as far as the joint interstice. This can advantageously be effected if the metal plate is disposed or constructed so as to extend downwards at an inclined angle from the roadway covering in the direction of the joint interstice.

If desired the metal mounting and metal plate may be connected to each other at their edges adjacent the roadway covering. Such a connection should have a resistance to bending corresponding to the elasticity of the elastomeric intermediate layer.

The metal plate can be fully embedded in the intermediate layer. By this construction, a standard marginal body is obtained, which is defined in the downward sense by the metal mounting and its intermediate layer is connected to the covering layer in one piece.

Specific embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a partial plan view of a covered joint;

FIG. 2 is a section taken along the line II—II of FIG. 1, on an enlarged scale;

FIG. 3 shows a further embodiment, in section, cut transversally relative to the lingitudinal sense of the joint;

FIG. 4 shows part of the embodiment according to FIG. 3 in plan view, and

FIG. 5 shows part of the metal insert according to FIG. 3 on an enlarged scale.

FIG. 1 shows, in plan view, part of the upper surface of a public road for example the roadway of a bridge. The joint covered by the spanning device extends vertically relative to the margin 1 of the roadway. The plan view shows the left-hand marginal body 2 of the joint, the right-hand marginal body 3 and the elastic expansion body 4, which covers the joint and is secured laterally in the two marginal bodies. The roadway coverings 5, 5*a*, made for example of a surfacing, are attached to the marginal bodies 2, 3 in the direction of the exterior.

The cross-section of the left-hand marginal body 2, shown in FIG. 2, illustrates the structure of a metal-rubber-composite construction, for which natural or synthetic rubber can be utilised. The marginal body 2 which is substantially of the same width as the roadway covering rests on a concrete foundation 6 of the joint margin. The concrete foundation is disposed adjoining

the joint on its right-hand margin 7. The joint interstice is covered by the elastic expansion body 4, of which only the right-hand half is shown by chain dotted lines. The structure of the right-hand joint margin, not shown, complementarily reflects the illustration according to FIG. 2.

The marginal body 2 consists of a metal plate, advantageously made of an aluminium alloy, adjoining the roadway surface. The metal plate is slightly profiled on its upper surface, in order to reduce the danger of slipping, particularly when the roadway is wet. Between the metal plate 8 and the metal mounting 9, constructed as a hollow bar and made of steel or an aluminium alloy, an intermediate layer 10 of elastomeric material is provided. The intermediate layer 10 is permanently connected to the metal plate 8 and a metal mounting 9, for example by vulcanisation or adhesive. A suitable rubber material for the layer 10 is a wear-resistant elastomer of constant temperature, such as styrenebutadiene rubber, butyl rubber or even natural rubber. The metal mounting 9 encloses an anchor bar 11, which is made of steel and is anchored at intervals in the concrete foundation 6 by means of bolts 12. The steel bolts 12 can be welded to the anchor bar 11, as shown in FIG. 2; they can, however, also be connected thereto by screws. To improve their fixture in the concrete foundation, pegs can be inserted therein; in the event of the concrete foundation 6 being formed by a concrete plate which is accessible from below, the bolts 12 can pass completely through this concrete plate and can be secured on the under surface of the concrete plate by a nut, not shown. It is advantageous for the bolts 12 to be secured eccentrically on the anchor bar 11, as shown in FIG. 2, so that this rail is spaced as far as possible from the margin 7 of the concrete foundation.

Owing to the structure of the marginal body, its mounting is, in particular, also simplified. Predetermined anchorage points no longer need be provided, since the marginal body is capable of displacement relative to the anchor bar. The anchor bar is preferably constructed as a through bar. Shorter members can also be provided in spaced arrangement, each such member being firmly connected to the concrete substructure by one or more bolts 12.

The metal mounting 9 comprises an interstice, which is open in the downward sense, for the passage of the securing bolts 12. The interstice is formed by bending round the wall parts which form the metal mounting. The wall parts adjoining the interstice, which are curved back, rest on the upper surface 14 of the concrete foundation 6. The ends 15, 16 of the curved members advantageously extend laterally beyond the metal mounting 9 and thus form a broad support surface on the concrete foundation 6. The end 15 of the curved member disposed on the interior of the joint extends under insulation 17 for the roadway covering 5.

The groove 13 for accommodation of the expansion body 4 is so constructed in the intermediate layer 10, that its upper part is defined by the metal plate 8 and its lower part by the metal mounting 9.

In the embodiment according to FIG. 3, the metal mounting 9 is constructed as an extruded or curved profile, integral with the metal plate 8. The metal mounting 9 and metal plate 8 are connected to each other by the curved piece 18. The intermediate layer 10 forms a uniform elastomeric body with the covering layer 19, the thickness of the covering layer 19 being gradually reduced, from the joint interstice 20 in the direction of the roadway surface 5a. At the point 21, the metal plate 8 defines the top of the groove 13 and at the point 22 the metal mounting 9 defines the bottom of the groove 13. The metal plate 8 and the metal mounting 9 are advantageously covered, in the vicinity of the points 21 or 22 and as is also the entire upper surface of the metal parts adjoining the groove, with a further elastomeric layer. For facilitating securing of the lateral fixture members 23 of the expansion body 4, the aperture 13*a* of the groove 13 is defined by parts made of elastomeric material on both sides, the upper projection 24 being formed by part of the intermediate layer 10 and the lower projection 25 by a separate application of elastomeric material on the metal mounting 9.

The right-hand joint margin according to FIG. 3 shows a section, taken along the line specified as R—R in FIG. 4. In the section of the left-hand joint margin shown in FIG. 3, an anchor bolt 26 is shown, on which the metal mounting 9 is firmly secured by means of nut 27 which is accessible from above. The nut 27 is disposed in a bore 28 in the marginal body and, in the vicinity thereof, the metal plate 8 comprises a recess 29, as illustrated in FIG. 4 by dash lines.

FIG. 5 shows a part of the combined metal plate 8 and metal mounting 9, apertures 30 being provided in the metal plate. Owing to these interruptions 30, the connection between the covering layer 19 or intermediate layer 10 and the metal parts is improved.

The metal parts of the construction, that is, the metal plate and metal mounting, can be produced by extrusion; the combination of metal plate and metal mounting into one member is particularly advantageous. The metal parts can also be produced from a one-piece hollow sheet metal profile by stamping and bending of strips, extending transversally relative to the longitudinal sense thereof.

Transport and mounting of the construction can be substantially simplified in that the metal members consist of short part-members, disposed in closely adjacent arrangement in the longitudinal sense. Thus the marginal member can be wound into rolls and transported. Owing to the flexibility, which is thus attained, it can be more easily handled during mounting operations and more easily adapted to irregularities during assembly. According to the dimensions selected in each case for engagement of the part-members made of metal and the sections of rubber which are formed between them, varying lengths of the marginal bodies can be detached, with the appropriate graduation, from a longer piece, in a simple manner.

What is claimed is:

1. In a device for spanning expansion joints in roads, comprising: marginal bodies of metal and elastomeric material anchored in the joint margins in an opposed arrangement and disposed adjoining the road surface and the joint, said bodies having a lateral groove with an aperture which is open in the direction of the joint for the sealing accomadation of members of an elastic expansion body covering the joint, the improvement in which each marginal body comprises an intermediate layer of rubber, on the underside of which is a metal mounting anchored in the joint margin; and on the upper surface of the intermediate layer there is a metal plate, the groove being defined at least in part by the

intermediate layer, the metal mounting and the metal plate.

2. In a device as claimed in claim 1, the improvement in which the groove is formed with undercuts adjacent its aperture and which extend transversely thereto, the outer areas of the undercuts being disposed adjacent the metal plate on one side and the metal mounting on the other.

3. In a device as claimed in claim 1, the improvement in which a layer of wear resistant, elastomeric material is applied to the metal plate.

4. In a device as claimed in claim 3, the improvement in which the thickness of the layer is reduced from the edge of the roadway covering adjacent the marginal body, in the direction of the joint, and the metal plate extends in a correspondingly inclined position.

5. In a device as claimed in claim 1, the improvement in which the metal mounting and the metal plate are connected together at their edges adjacent the roadway covering.

6. In a device as claimed in claim 1, the improvement in which the metal plate is completely embedded in the intermediate layer.

7. In a device as claimed in claim 1, the improvement in which the metal plate and/or the metal mounting have interuptions or perforations formed therein.

8. In a device as claimed in claim 1 the improvement in which the metal mounting is formed as a hollow bar which is downwardly open and encloses a longitudinally displacable anchor bar extending parallel to the joint.

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