United States Patent

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[33] **Italy**
[31] **13976-A/69**

[54] **EXPANSION RUBBER JOINT FOR ROADS AND BRIDGES**
9 Claims, 11 Drawing Figs.

[52] **U.S. Cl.** **94/18**
[51] **Int. Cl.** **E01c 11/10**
[50] **Field of Search** 94/18, 18.2

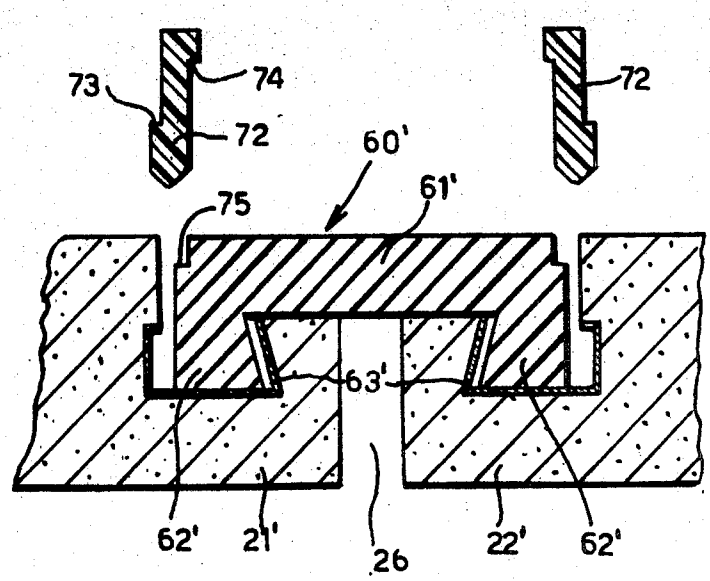
[56] **References Cited**

UNITED STATES PATENTS

2,198,084	4/1940	Jacobson	94/18
2,220,628	11/1940	Stedman	94/18
2,240,786	5/1941	Kinzer	94/18
3,018,703	1/1962	Fujihara	94/18
3,276,335	10/1966	Middlestadt	94/18
3,316,574	5/1967	Pare	94/18 X
3,324,774	6/1967	Boschi	94/18

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ABSTRACT: An expansion joint for road or bridge sections comprises a resilient strip straddling the gap between two adjacent sections, and beads along the edges of the strip running along the gap. The beads are received in the cavity of a channel, and are wedged in the channel by a resilient wedge member which prestresses the joint to prevent puckering of the edges of the strip when it is under traction.



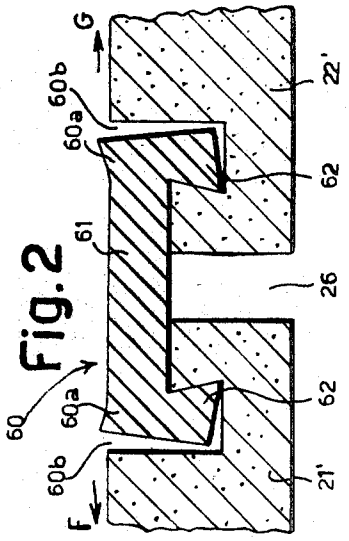


Fig. 2

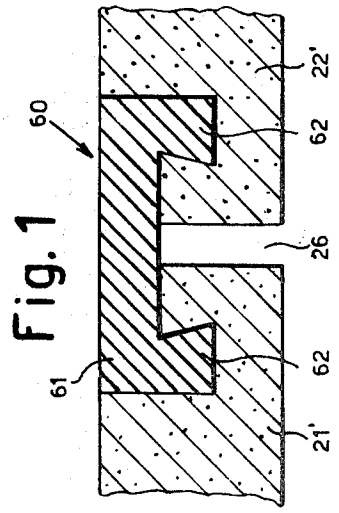


Fig. 1

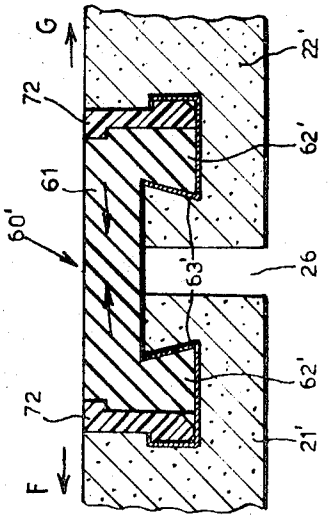


Fig. 5

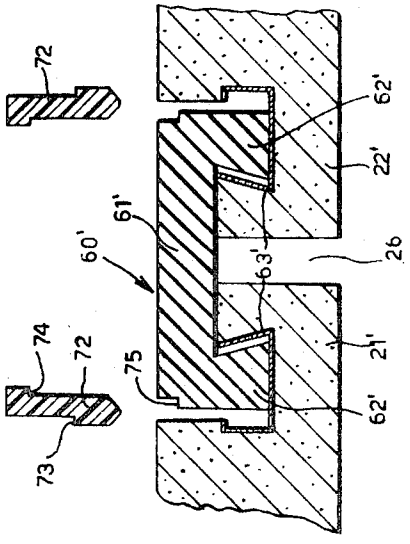


Fig. 4

Fig. 3

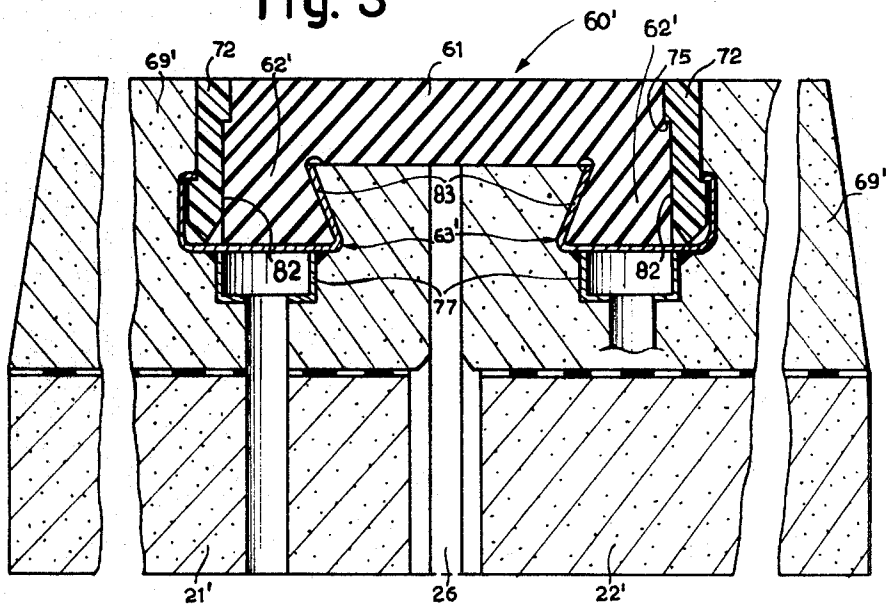


Fig.6

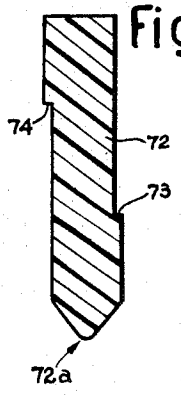


Fig.7

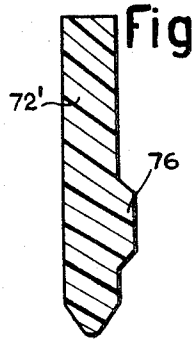


Fig.8

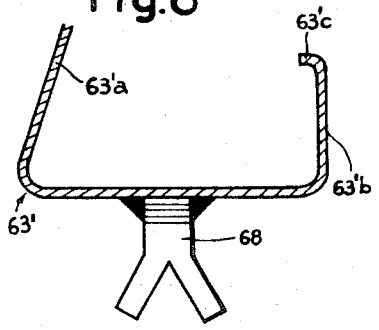
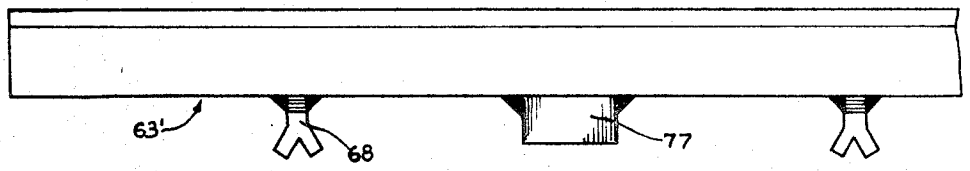


Fig.9



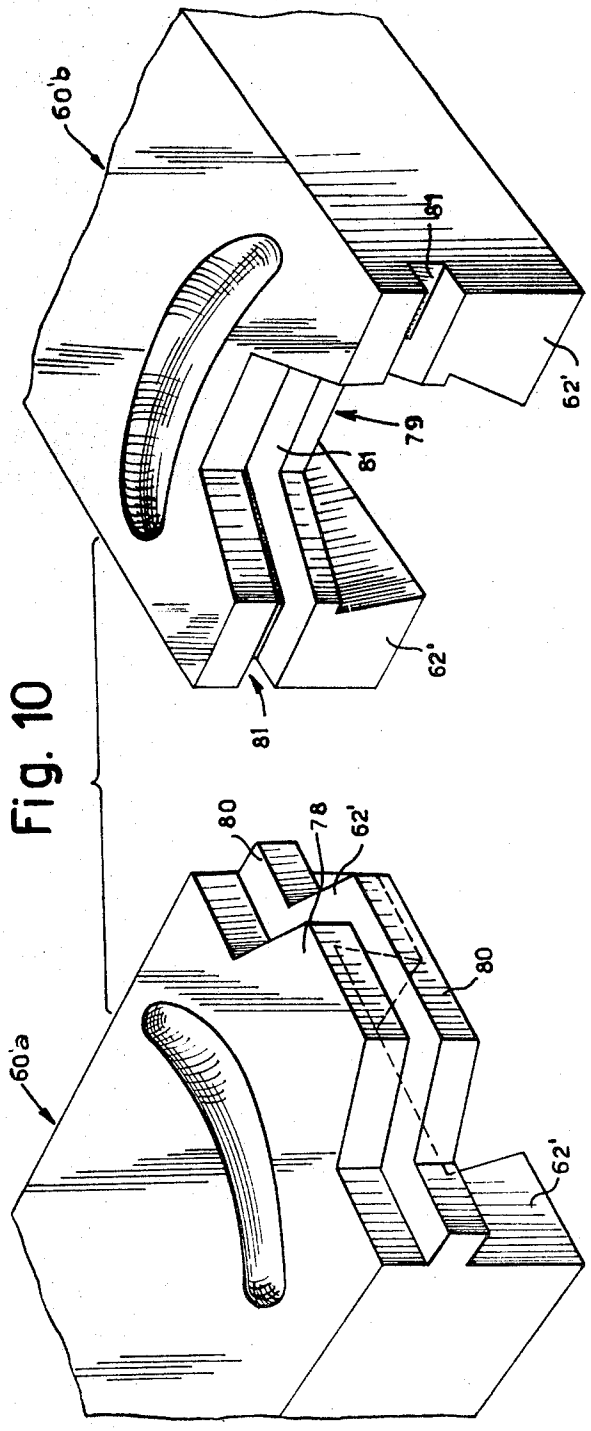


Fig. 10

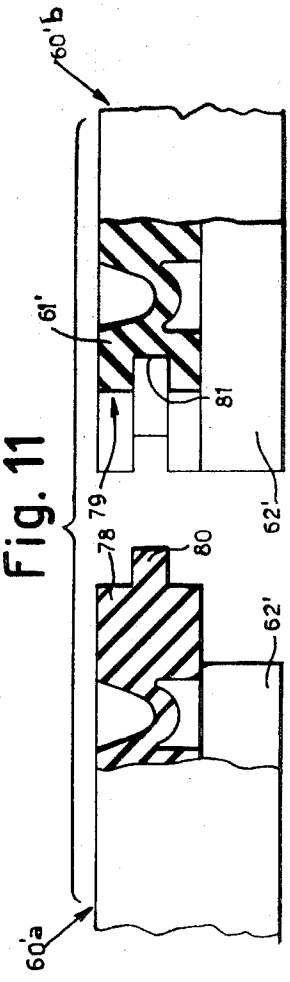


Fig. 11

EXPANSION RUBBER JOINT FOR ROADS AND BRIDGES

This invention relates to resilient expansion joints fitted between adjacent sections of reinforced concrete or other materials forming a road that is subject to expansion and contraction and is covered by a wear surface layer. The road may be on the ground or may be on a bridge or flyover or the like.

In the U.S. Pat. application Ser. No. 749,169 it has been proposed to provide an expansion joint comprising a resilient strip which straddles the gap between two adjacent road sections and has on each side of the gap, extending along the edge of the strip and projecting from its lower face, a bead of dovetail cross section which is engaged in a matching channel secured to the end of the section on which the bead lies.

Insertion of the beads into the channels takes place by resilient deformation of the beads, which are then rigidified and anchored to the channels by means such as bars or cables fitted into holes running along the length of the beads. A layer of surface material lies flush with the top face of the resilient strip, and abuts the edges of the strip.

When the two road sections interconnected by this joint are spaced further apart as a result of contraction, the resilient strip is subjected to tension stresses. Although such traction is admissible in the middle portion of the strip, it causes uneven deformation at the edges, lifting them from the underlying road sections and forming crevices into which foreign matter may penetrate, later preventing the joint from resuming its original shape when the traction conditions cease to exist.

This invention sets out to overcome or mitigate these drawbacks by providing a joint which resists irregular deformation under traction, and which is designed to prevent crevices or projections from being formed at the top face of the strip.

Essentially, the invention provides an expansion joint between two adjacent road sections that are separated by a gap, the joint comprising a resilient strip straddling the gap, a bead of generally dovetail cross section projecting from the lower face of the strip on each side of the gap and extending along the edge of the strip, a channel element secured to each road section and receiving the bead in its cavity, and a resilient wedge member received in each channel element alongside the bead and wedging the bead therein.

An embodiment of the invention is described below with reference to the accompanying drawings, in which;

FIG. 1 is a diagrammatic view in cross section of a previously proposed expansion joint between adjacent road sections, shown in an unstressed condition;

FIG. 2 is a view similar to FIG. 1 showing the joint under traction stress;

FIG. 3 is a cross-sectional view through a road showing an expansion joint according to the invention;

FIG. 4 is a diagrammatic view showing the joint of FIG. 3 during assembly;

FIG. 5 is a view similar to FIG. 4 showing the joint under traction stress;

FIGS. 6 and 7 are cross-sectional views on an enlarged scale of two forms of wedge member suitable for use in a joint of the type shown in FIGS. 3 to 5;

FIG. 8 is a cross-sectional view on an enlarged scale of a channel element used in the joint of FIGS. 3 to 5;

FIG. 9 is a side view on a smaller scale of the channel element of FIG. 8;

FIG. 10 is a perspective view of the matching ends of two elements of a modified resilient strip suitable for use in a joint of the type shown in FIGS. 3 to 5; and

FIG. 11 is a longitudinal cross-sectional view through the strip elements of FIG. 10, illustrating their interlocking.

FIGS. 1 and 2 show an expansion joint 60 of the general type disclosed in the above-mentioned U.S. Pat. application Ser. No. 749,169. Two adjacent road sections 21', 22', in practice usually slabs of reinforced concrete, are separated by a gap 26 which widens or narrows in accordance with changes in temperature. The gap 26 is straddled by a strip 61 of

resilient material such as rubber, provided on its opposite faces with transverse grooves (not illustrated) and having beads 62 extending from its lower face along its two opposite edges parallel to the gap 26. The beads are of dovetail cross section and are engaged in matching channels formed in or attached to the sections 21', 22'.

As shown in FIG. 2, when the two sections 21', 22 draw apart in cold weather as shown by the arrows F, G, the strip 61 is deformed under traction stresses and its edges 60*a* above the beads 62 are raised above the general road surface, forming undesirable projections.

Moreover, this drawing apart of the road sections tends to form crevices 60*b* between the strip 61 and the adjacent road surface. Foreign matter may penetrate into these crevices and prevent the joint from resuming its original shape when the traction ceases.

The invention sets out to avoid these drawbacks by providing, as seen in FIGS. 3 to 5, an expansion joint 60' with a resilient strip 61' having two beads 62' projecting from its lower face along two opposite edges. Each bead 62' is generally of dovetail cross section, and is more particularly a rectangular trapeze. The two beads are mirror images of each other.

The strip 61' straddles a gap between adjacent road sections 21', 22', with the beads 62' received in the cavities of two channel elements 63' that are fast with two prefabricated reinforced concrete elements 69' that are in turn secured to the sections 21', 22' in a known manner. Relatively to the gap between the sections 21', 22', each bead has an inner wall 83 that is obliquely inclined to the vertical, and an outer wall 82 that is substantially vertical.

Each bead 62' occupies only a part of the cavity of its channel element 63', being abutted and wedged therein by a resilient wedge member 72 comprising a strip of plastics such as polyester resin or the like. The wedge member 72 is shaped to hold the bead in the channel cavity and prestress the whole joint for traction forces. It projects above the channel element to be substantially at the same level as top face of the strip, which is itself level with the surface of the road.

As shown in FIG. 8, the channel elements 63' each have an oblique inner wall 63'*a* adapted to abut the correspondingly oblique inner wall 83 of the bead, and an outer wall 63'*b* that is substantially vertically inclined. The terms "inner" and "outer" are again used with reference to the position of the channel element relatively to the gap between the road sections 21', 22'. The outer wall 63'*b* has an inturned top edge 63'*c*.

In the embodiment shown in FIGS. 3 to 6, the resilient wedge member 72 has a pointed lower end 72*a* adapted to promote insertion into the channel element, and a shoulder 73 on its outer face, the shoulder being adapted to engage the inturned edge 63'*c* of the channel element. A further projection 74 on the inner face of the wedge member is adapted to engage in a notch 75 provided in the outer wall of the strip 61'.

According to a modification shown in FIG. 7, the resilient wedge member 72' has on its outer face a lateral projection 76 with sloping edges, adapted to be engaged in a matching slot in a channel member (not illustrated) which receives it.

The channel elements 63' are provided on their bottom surface with feet 68' for embodiment in the prefabricated elements 69', and with hollow cups 77 for clamping bars or the like which, in a known manner, secure the prefabricated elements 69' to the sections 21', 22'.

Assembly of the joint of the invention may take place as follows. First, the prefabricated elements 69' are secured to the sections 21', 22' at a position which is determined in accordance with prevailing temperature conditions. Attachment may take place by means of the above-mentioned bars or the like, or even by means of epoxy resin mortar. The strip 61' is then placed in position with the beads 62' fitted into the channel elements 63', as seen in FIG. 4. The wedge members 73 are thereupon forced into the clearances between the beads and the outer walls of the channel elements. As seen in FIG. 4, the wedge members are thicker than the clearances, and on

being forced into place they prestress the strip **61'** to avoid any undesirable traction stresses therein even when the two interconnected sections are drawn furthest apart. The wedge members, by virtue of their shape and close fit, moreover prevent abnormal distortions of the joint and raising of the top edges of the strip **61'**. By the interfitting of the above-mentioned shoulder **73** and projection **74** with the channel element and the strip, the wedge member moreover holds the bead safely in the channel element, preventing accidental release caused by vibrations and movements of the underlying structure.

Because of the elasticity of the joint, the wedge members may, if desired, be removed by means of suitable tools to facilitate replacement and renovation of the joint. Replacement may be effected by removing the strip and possibly the wedge members, the remaining components being left in position.

In order to facilitate assembly of the joint and allow replacement of the strip **61'** at localized portions where it may have worn, the strip may be composed of several shorter strips or elements **60'*a***, **60'*b*** (FIGS. **10** and **11**) which have interfitting formations to hold the composite strip securely together in the assembled joint.

As illustrated, one end of an element **60'*a*** is formed with a shaped central projection **78** adapted to fit into a matching notch or groove **79** in the abutting end of the adjacent element **60'*b***. The same end of the element **60'*a*** also has a continuous transverse projection **80** adapted to engage in a matching groove **81** cut in the abutting end of the element **60'*b***. The projection **78** fitting into the notch **79** prevents horizontal misalignment of the two strip elements relatively to each other, and vertical misalignment is prevented by the fitting of the projection **80** into the groove **81**.

The invention is not limited to the embodiments described and illustrated, its true scope being defined in the claims.

What I claim is:

1. An expansion joint between two adjacent road sections that are separated by a gap, the joint comprising a resilient strip straddling the gap, a bead of generally dovetail cross section projecting from the lower face of the strip on each side of the gap and extending along the edge of the strip, a rigid channel element secured to each road section and receiving the bead in its cavity, and a resilient wedge member received in each channel element alongside the bead and wedging the bead therein in a prestressed condition.

2. The expansion joint of claim **1** in which each bead has an oblique inner wall and a generally vertical outer wall, and each channel element has an oblique inner wall abutting the oblique inner wall of the bead received in the channel cavity and an outer wall with an inturned edge, the wedge member having a generally vertical inner face abutting the outer wall of the bead and having on its outer face a shoulder receiving the inturned edge of the outer wall of the channel element.

3. The expansion joint of claim **2** in which the outer wall of the channel element is substantially vertical and the wedge member has a substantially vertical outer face abutting the outer wall of the channel element.

4. The expansion joint of claim **2** in which the wedge member has a pointed lower end.

5. The expansion joint of claim **2** in which the edges of the strip above the bead are formed with a notch, the wedge member having a matching projection which extends into the notch.

6. The expansion joint of claim **1** in which the wedge member has on its outer face a projection with sloping sides, he channel element having an outer wall with a notch formed to receive the projection.

7. The expansion joint of claim **1** in which the strip is divided into a plurality of abutting strip elements provided with matching interengaging formations at their abutting edges.

8. The expansion joint of claim **7** in which the interengaging formations comprise a first matching projection and groove holding the elements against relative horizontal movement and a second matching projection and groove holding the elements against relative vertical movement.

9. The expansion joint of claim **1** in which the top surface of the wedge member projects above the channel element to lie substantially at the same level as the top face of the resilient strip.