United States Patent

[11] 3,555,981

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[33] **Italy**
[31] **20173A/67**

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[54] **EXPANSION JOINT FOR ROAD OR BRIDGE SPAN SECTIONS**
5 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **94/18**
[51] **Int. Cl.** **E01c 11/00**
[50] **Field of Search** 94/18

[56] **References Cited**

UNITED STATES PATENTS

3,270,474	9/1966	Driggers	94/18UX
3,324,774	6/1967	Boschi	94/18
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FOREIGN PATENTS

1,363,483	5/1964	France	94/18

Primary Examiner—Jacob L. Nackenoff
Attorney—Sughrue, Rothwell, Mion, Zinn and MacPeak

ABSTRACT: An expansion joint for interconnecting road bridge spans comprises a resilient (rubber) strip having dovetail section edge flanges which are fitted into dovetail channel elements, mountable on respective adjoining span sections, by backward bending of the strip to deform the beads. After fitting, the beads are rigidified by insertion of a bar or cable to prevent their release from the channel elements.

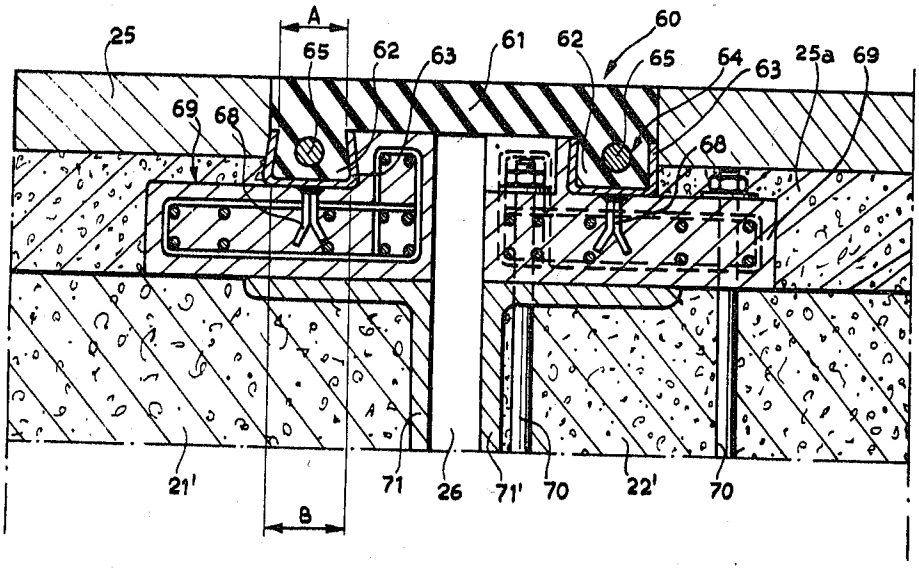


Fig-1

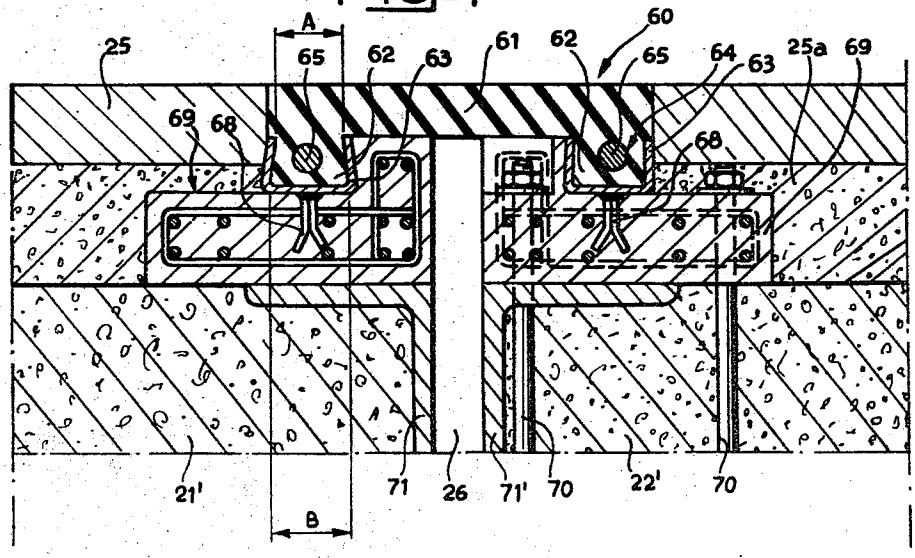

A
B
25
65
62
63
61
62
60
65
64
63
25a
69
69
68
68
21'
71
26
71'
70
22'
70

Fig-2

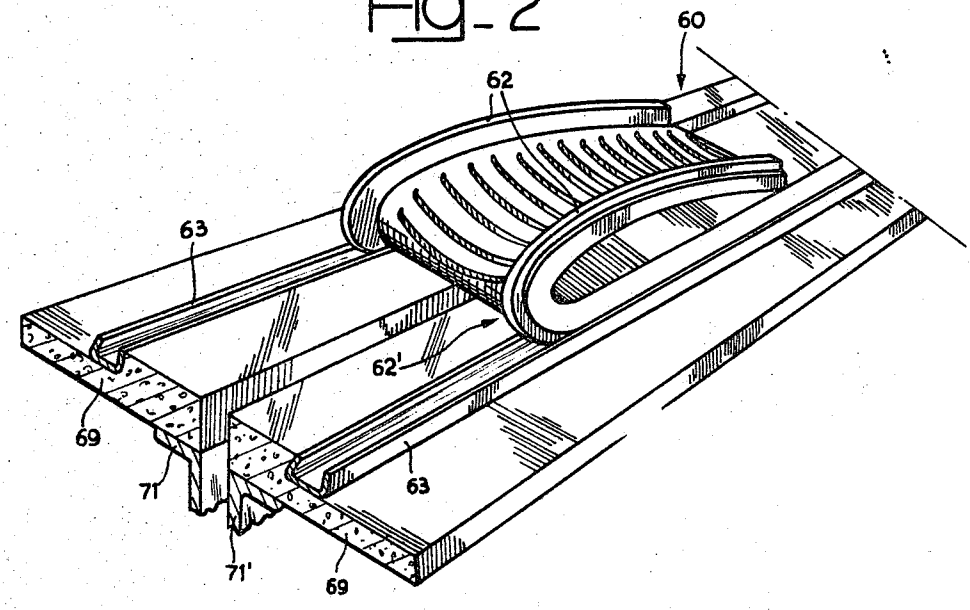

60
62
63
62'
69
71
71'
63
69

Fig-3

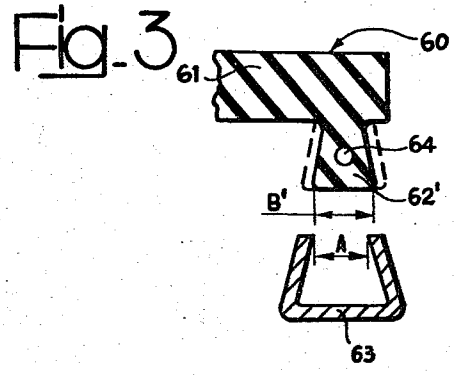


Fig-4

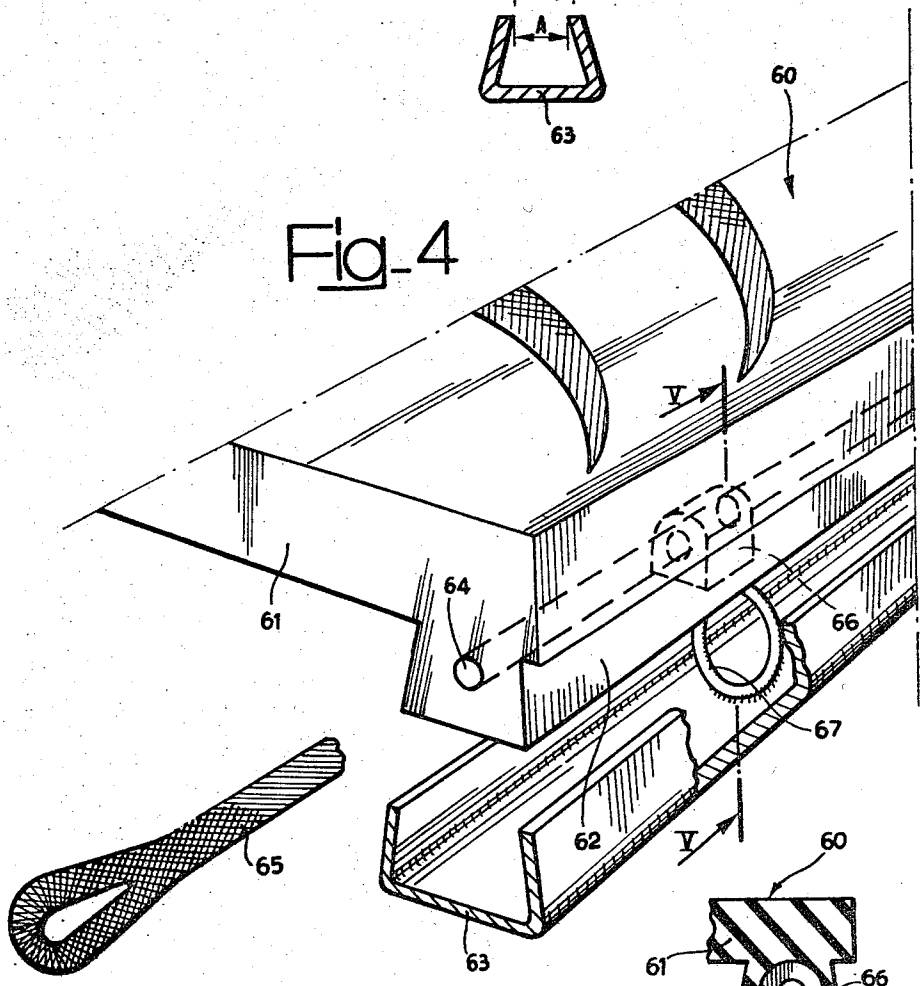
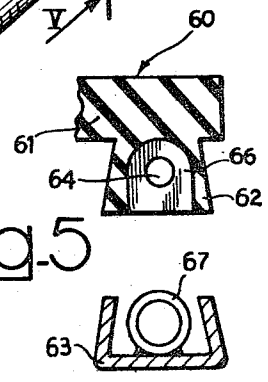


Fig-5



EXPANSION JOINT FOR ROAD OR BRIDGE SPAN SECTIONS

This invention relates to expansion joints for location between road or bridge span sections, more particularly adjoining bridge or flyover span sections forming a road, as disclosed by U.S. Application Ser. No. 460.160, now U.S. Pat. No. 3,324,774.

Such adjoining sections are subject to relative movement as a result of thermal expansion. A form of expansion joint for accommodating such relative movement is described in the above-mentioned U.S. Pat. No. 3,324,774, and comprises a flat resilient, usually rubber, strip spanning the gap between adjacent sections and anchored to the respective sections along the adjacent edges thereof.

An object of the invention is to provide a joint of the same general type having an improved means of securing the assembled joint to the respective road or span sections interconnected thereby, to permit replacement of the strip and to simplify construction and assembly of the joint.

A further object of the invention is to provide such a joint which is simple, tough and inexpensive in construction and which is easy and quick to assemble and disassemble.

The invention provides an expansion joint interconnecting adjoining span sections of a road or bridge, the joint comprising a strip of resilient material having a downwardly depending bead along each longitudinal edge, a securing element receiving and holding each such bead, means locking each bead in its securing element, and means connecting the securing elements in the adjoining span sections, the improvement that the beads are of dovetail section and the securing elements are channel members of matching dovetail section, the locking means comprising a longitudinally extending slidably removable rigidifying member received in a longitudinal bore in the bead, removal of the rigidifying member freeing the bead for removal from the channel member to allow replacement of the strip.

The joint according to the invention can be assembled and disassembled without disturbing the load-bearing structure of the adjoining road or span sections.

The invention will be more clearly understood from the following description, given by way of example only, with reference to the accompanying drawings, wherein:

FIG. 1 is a diagrammatic transverse cross-sectional view in a vertical plane perpendicular to the adjoining edges of two span sections, showing an expansion joint according to one embodiment the invention in its assembled condition;

FIG. 2 is a partial perspective view illustrating a step in the assembly of the joint of FIG. 1;

FIG. 3 is an exploded fragmentary cross sectional view of one edge of a joint strip, illustrating its fitting to a channel element upon assembly of the joint;

FIG. 4 is an exploded partial perspective view of a joint according to a modification of the embodiment of FIGS. 1 and 2; and

FIG. 5 is an exploded fragmentary cross section, taken on line V–V of FIG. 4.

Two adjoining span sections 21' and 22' of a road bridge, flyover, or the like comprise reinforced concrete girders having parallel adjacent edges capped by steel girders 71, 71' and separated by a gap 26. The gap 26 expands or contracts upon thermal contraction and expansion respectively of the span sections 21', 22'.

In the embodiment shown the span sections 21', 22' support a road comprising a surface layer 25 resting on a road foundation 25*a* which is in turn supported on the span sections 21', 22'.

An expansion joint 60 interconnects the two span sections 21', 22' and spans the gap 26. The joint 60 comprises a rubber strip 61 having opposite flat faces formed with transverse grooves. Along its longitudinal edges the strip 61 is formed with two downwardly-depending beads 62. Each bead 62 has a dovetail cross-sectional profile in the shape of a truncated isosceles triangle or symmetrical trapezium having a width A at its upper end and a substantially greater width B at its lower end.

To assemble the joint 60 the two beads 62 on the strip 61 are forced into two respective securing elements in the form of channel elements 63 previously secured to the two span sections 21', 22' to be interconnected. Each channel element 63 opens upwardly and has an internal dovetail cross-sectional profile matching that of the respective bead 62.

In order to facilitate insertion of the beads 62 into the channel elements 63 the strip 61 forming the joint 60 is bent over during fitting as shown in FIG. 2, so that at their curved regions 62' the beads 62 are disposed on the convex surface of the curved strip and are thereby elongated. This elongation is accompanied by a decrease in the cross-sectional area of each bead 62, sufficient to enable the bead to be inserted without difficulty into the respective channel element 63. FIG. 3 shows the cross section of the curved region 62' of one of the beads, illustrating the decreased width B' of its lower end, which is equal to or less than the width A of the open upper end of the respective channel element 63.

When the strip 61 is straightened out upon fitting to the span sections 21', 22' the beads 62 resume their initial sizes and shapes in the respective channel elements 63 and are firmly anchored by virtue of the matching dovetail shape of the beads 62 and the channel elements 63.

Each bead 62 is formed with a longitudinal bore 64, preferably of cylindrical shape, into which a metal elongated locking member 65 in the form of a cylindrical bar or a cable is inserted after assembly of the joint 60' to rigidify the bead 62 and lock it in its channel element 63. The members 65 increase the resistance of the two beads 62 to compression and thereby prevent substantial deformation of the beads 62, effectively locking the beads in the channel elements 63.

According to a modification, shown in FIGS. 4 and 5, the two beads 62 of the strip 61 are formed with spaced-apart transverse recesses 66 which intersect the respective longitudinal bores 64. The transverse recesses 66 open downwardly and are adapted to receive auxiliary retaining members in the form of rings 67 located within and secured, such as by welding, to the bottom of each respective channel element 63.

Upon insertion into the bores 64 the members 65 pass through the rings 67, improving the anchoring of the strip 61 to the two span sections 21', 22'.

The channel elements 63 are previously secured to the span sections 21', 22'. In the embodiment of FIGS. 1 and 2, the channel elements 63 are secured to respective prefabricated reinforced concrete edge members 69 by means of split anchoring pins 68 welded to the underside of each element 63 and embedded in said concrete members 69.

Where, as shown in FIG. 1, the girders 71, 71' of the span sections 21', 22' have upper planar surfaces, the prefabricated concrete members 69, with the channel elements 63 secured thereto, are subsequently secured releasably by means of bolts 70 to the upper surfaces of the span sections 21', 22' so that the members 69 rest on the upper surfaces of the girders 71, 71'.

This considerably simplifies assembly and fitting of the joint 60, dispensing with the need to pour cement, mortar or the like on making the joint, the joint 60 being secured to the span sections 21', 22' simply by fitting the bolts 70 and tightening respective nuts thereon.

A road surface is formed in a known manner on the span sections 21', 22' after forming the joint 60 by laying the foundation 25*a* on the span sections and then applying the surface layer 25, flush with the upper surface of the joint strip 61.

To disassemble the joint 60 the members 65 are removed from the bores 64 and the strip 61 then removed by pulling the beads 62, which are then free to deform, from the channel elements 63.

I claim:

1. In an expansion joint interconnecting adjoining span sections of a road or bridge, the joint comprising a strip of resilient material having a downwardly depending bead along

each longitudinal edge, a securing element receiving and holding each such bead, means locking each bead in its securing element, and means connecting the securing elements to the adjoining span sections, the improvements characterized in that (a) the beads have a dovetail cross section, (b) the securing elements are channel members of matching dovetail cross section, and (c) the locking means comprises a longitudinally extending slidably removable rigidifying member received in a longitudinal bore in the bead, removal of the rigidifying member freeing the bead for removal from the channel member to allow replacement of the strip.

2. Joint according to claim 1, including prefabricated reinforced concrete members to which the respective channel elements are secured, and including releasable attachment means for securing said concrete members to respective span sections to be interconnected.

3. A joint according to claim 1 wherein each bead has a series of spaced-apart transverse recesses intersecting the longitudinal bore, and wherein a series of spaced apertured retaining members are disposed within and secured to the channel element, each such retaining member extending into a transverse recess in the bead, the longitudinal rigidifying member passing through the apertures in the retaining members and being axially removable.

4. A joint according to claim 3, further including (a) prefabricated concrete members to which the respective channel elements are secured, and (b) releasable attachment means for securing the concrete members to the span members to be interconnected.

5. In an expansion joint interconnecting adjoining span sections of a road or bridge, the joint comprising a strip of resilient material having a downwardly depending bead along each longitudinal edge with a longitudinal cavity in each bead, a securing element receiving and holding each bead, means locking each bead in its securing element, and means connecting the securing elements to the adjoining span sections, the improvements characterized in that (a) the beads have dovetail cross section, (b) the securing elements are channel members of matching dovetail cross section, (c) the beads have spaced-apart recesses on their lower surfaces, (d) the base of the channel members have upwardly projecting, similarly spaced-apart retaining members in the form of rings, each retaining ring extending into a recess in the bead, (e) the longitudinal cavity in each bead being a cylindrical bore into which the spaced recesses extend, and (f) a removable locking member located in the bore to extend along its full length and to pass through each retaining ring to rigidify the bead and lock it in its channel element, (g) the locking member being removable axially from the bore to free the bead for removal from its channel member to allow replacement of the strip.