United States Patent [19]

Stog

[11] **3,854,835**

[45] **Dec. 17, 1974**

[54] **EXPANSION JOINT**

[75] Inventor: **Wilhelm Stog,** Waltrop, Germany

[73] Assignee: **W. Stog KG Industrie-und Rohrleitungsbau,** Waltrop, Germany

[22] Filed: **May 4, 1972**

[21] Appl. No.: **250,329**

[30] **Foreign Application Priority Data**

Nov. 9, 1971 Germany 2155651

[52] **U.S. Cl.** **404/68**

[51] **Int. Cl.** **E01c 11/12**

[58] **Field of Search** 404/47, 67, 68, 69, 66; 14/16; 52/396

[56] **References Cited**

UNITED STATES PATENTS

2,321,873	6/1943	Tate	404/47 X
2,969,831	1/1961	Eames	85/32 K X
3,055,279	9/1962	Rinker et al.	404/47
3,245,328	4/1966	Fassbinder	404/47
3,316,574	5/1967	Pare	404/47 X
3,520,236	7/1970	Sequaris	14/16 X
3,595,142	7/1971	Via	404/64 X
3,690,226	9/1972	Hein	404/68
3,720,474	3/1973	Stog	14/16 X

FOREIGN PATENTS OR APPLICATIONS

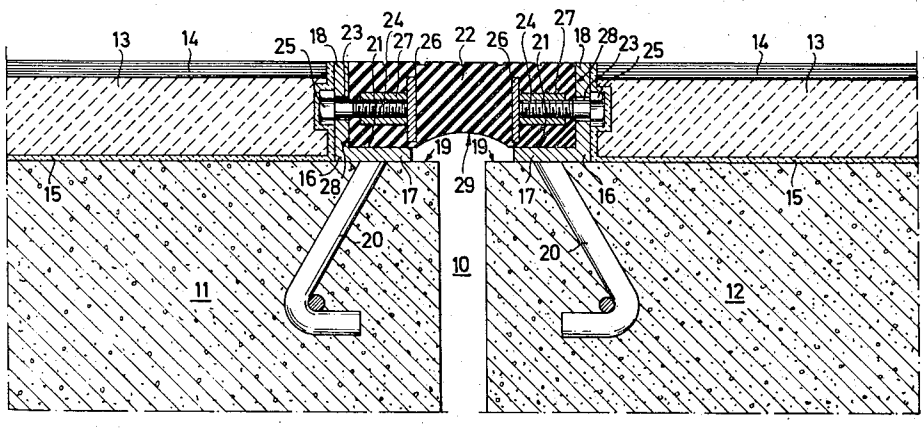
1,373,698	10/1964	France	52/396
1,363,483	5/1964	France	404/67

Primary Examiner—Roy D. Frazier
Assistant Examiner—Thomas J. Holko
Attorney, Agent, or Firm—Walter Becker

[57] **ABSTRACT**

An expansion joint for adjacent roadway sections having a gap therebetween to allow expansion of said sections, said joint comprising a plate structure, each of said plate structures having a support projection parallel to and spaced from said gap, said recessed sections supporting an expansion member consisting of a strip of elastic material, both sides of said strip surrounding ribs, said ribs each provided with at least one threaded bush, said bush having an axis arranged transversely to the expansion gap, said bushes each engaging with a tensioning bolt which bears freely and rotatably against a corresponding support projection. The under-side of said strip is provided with at least one arch-like recess running in the longitudinal direction of the strip between the two rows of retaining ribs.

8 Claims, 4 Drawing Figures



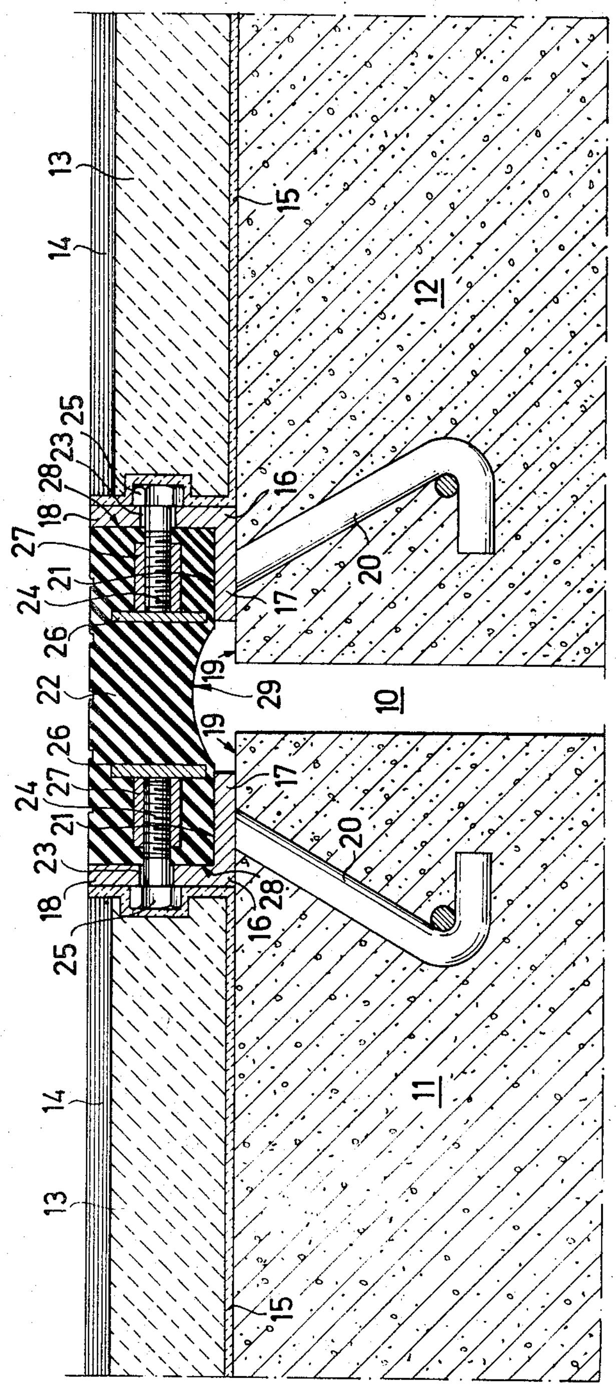


Fig. 1

Fig. 2

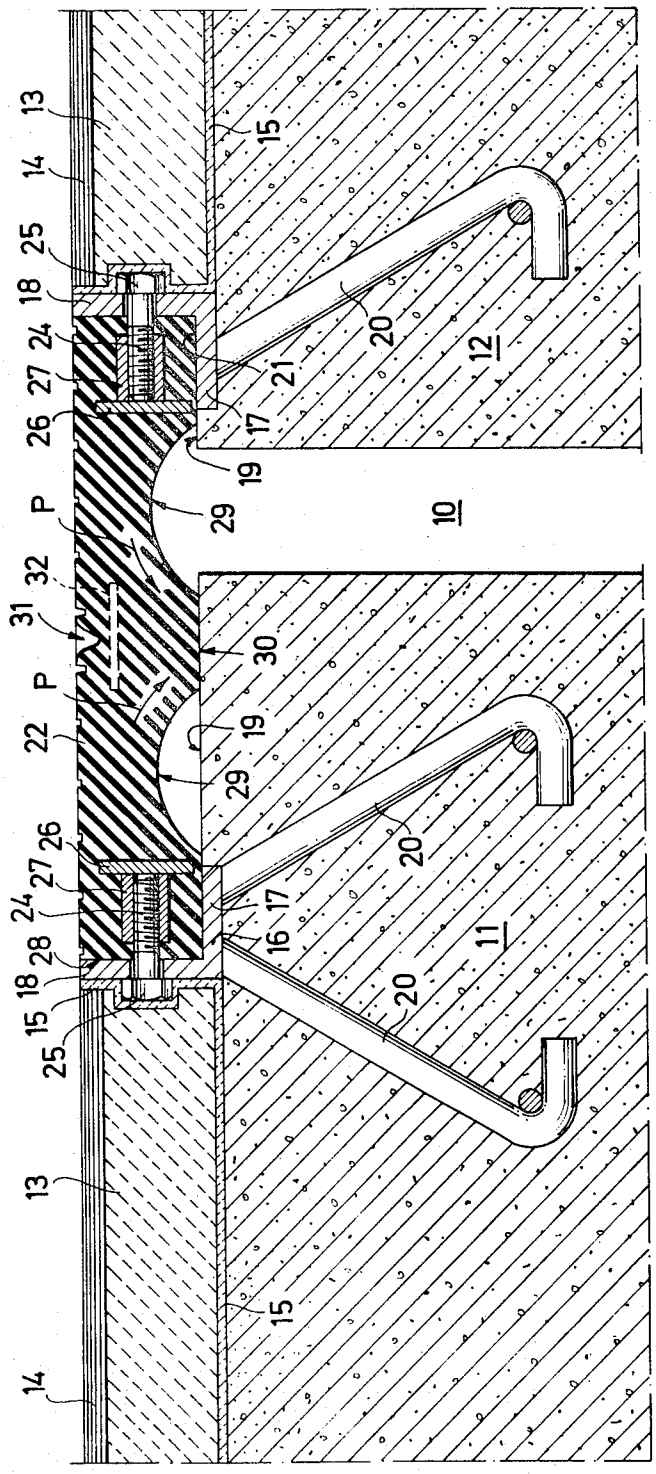

13
14
25
18
24
27
26
P
32
31
P
22
26
27
24
28
18
15
25
13
14
15
16
17
19
20
21
29
30
10
11
12

Fig. 3

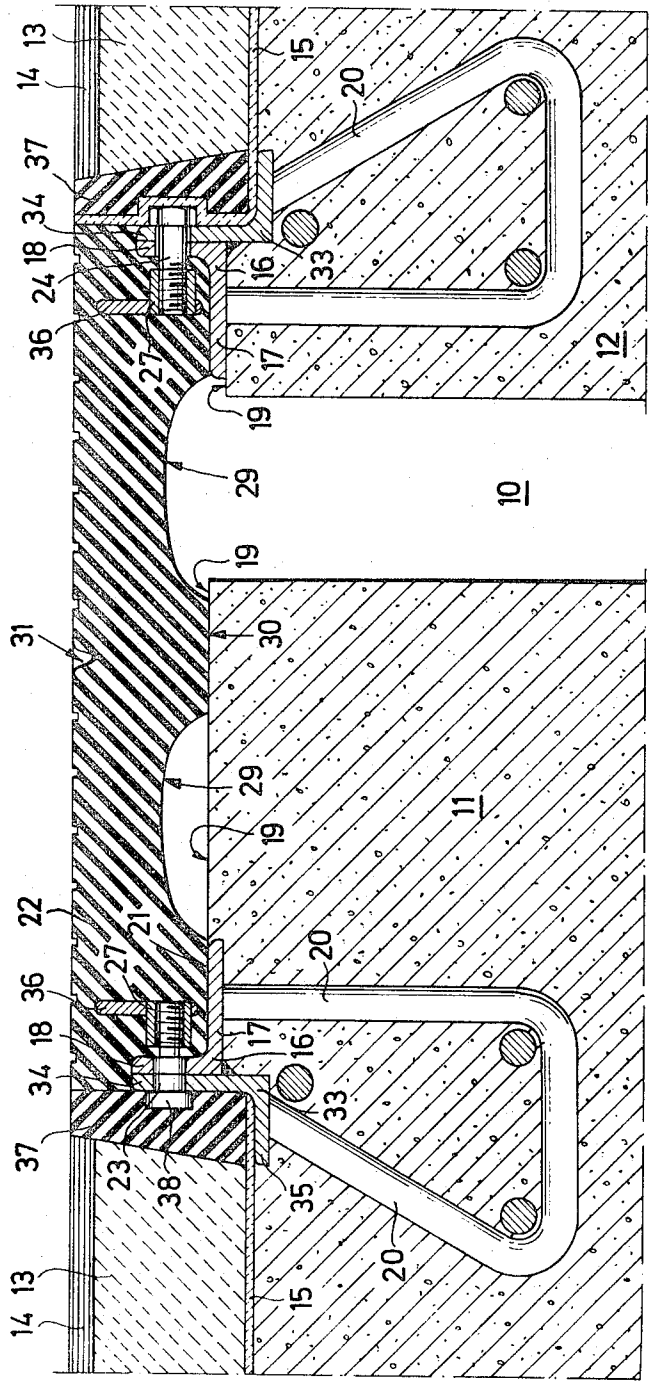
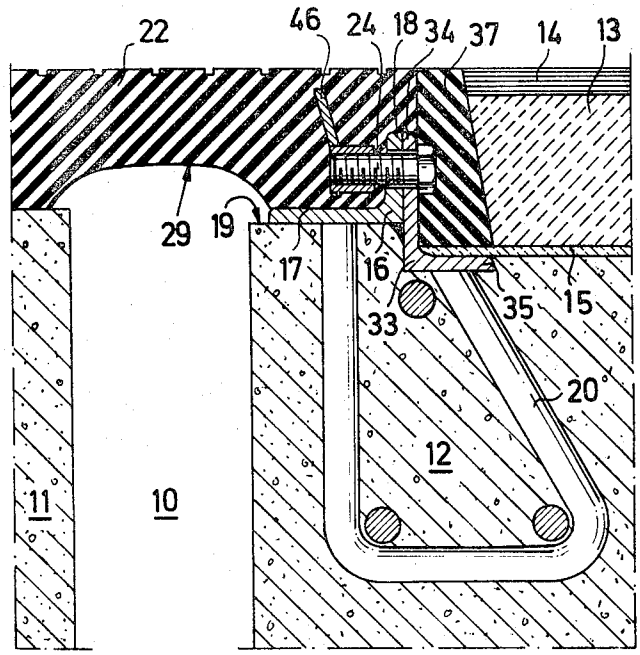

13
14
15
20
37
34
18
24
16
33
36
27
17
12
19
29
10
19
31
30
29
11
19
22
21
20
27
36
18
17
16
34
33
37
23
38
35
20
13
14
15

Fig. 4



EXPANSION JOINT

BACKGROUND OF THE INVENTION

For an expansion joint in structures, such as bridges, road, and carriageways, a joint insert of a band like strip of resilient material, such as rubber, is well known. The strip is mounted in recesses in the structure on both sides of the expansion joint by means of retaining ribs surrounded by the strip. In an insert of this type the retaining ribs form for example the web of a T-iron whose flange is bolted firmly to a plate, web and flange being mounted on the floor of the carriageway recesses on both sides of the expansion joint. With an arrangement of this type it is not possible to provide the joint strip with pretension throughout or at locally restricted places in order to obtain the desired behaviour of the joint insert in the event of movement of the two structural parts in relation to one another.

In order to ensure the tightness of the joint strip against adjacent castings, in this known construction there have been provided angle members which are bolted together with the T-irons in the joint insert and ensure a certain pre-tension of the sections of the joint insert which lie between the rigid retaining rib and the substantially vertical arm of the angle-iron. After bolting of the T-iron and the angle-iron the intermediate space between the joint strip and the carriageway is filled with sealing compounds. This joint cover represents a good water tightness in the area of the edges of the joint insert, but the cost of construction is considerable. In particular, great care is necessary during installation, and separate castings must be provided between the joint strip and the carriageway.

SUMMARY OF THE INVENTION

An object of the present invention is to improve a water-tight covering of this kind for expansion joints in structures. A further object is to eliminate the aforesaid disadvantages without higher construction costs even in quite wide joint covers for relatively moving structural parts. Yet a further object of the present invention is to prevent a bulging of the joint insert even when this is subjected to quite strong forces of compression.

Accordingly, the invention provides an expansion joint for adjacent roadway sections having a gap therebetween to allow expansion of said section, said sections being recessed along their adjacent edges to form a groove along both sides of said gap, said joint comprising a plate structure fixed to each section along the bottom of said groove, each of said plate structures having a support projection to and spaced from said gap, said recessed sections supporting an expansion member extending into said grooves, said expansion member consisting of a strip of elastic material, both sides of said strip surrounding ribs, said ribs each comprising a series of individual sections running in the longitudinal direction of the strip and each provided with at least one threaded bush, said bush having an axis arranged transversely to the expansion gap, said bushes each engaging with a tensioning bolt which bears freely and rotatably against a corresponding support projection in said groove.

The ribs retaining the strip of elastic material are adjustable to the support projections in such a way that the part of the joint insert lying between them can be provided with a certain pre-tension during installation.

This pre-tension ensures that the lateral edge of the joint strip does not lift away from its abutment even under extreme expansion conditions. Also, in one embodiment of the expansion joint the pre-tension can be set at different levels, since the retaining ribs consist of individual sections. A varying degree of pre-tension is advantageous, since experience shows that individual sections of the joint insert are continually subject to the strain of vehicle wheels, which is less often the case with the sections lying between them. The squeezing effect of the vehicle wheels also acts differently on the joint strip dependently on the direction of travel, and this can also be taken into account when setting the pre-tension.

A particularly simple construction of the cover can be achieved if the plate structures with the support projection in the structure recesses are angle-irons, having the horizontal flanges thereof mounted on the floor of the recess adjacent the expansion gap, and the vertical flanges having holes for the tensioning bolts to pass through.

A particularly favourable seal against the entry of water, dust, dirt or the like is achieved if the vertical flange extends up to the surface of the structure and forms a continuous bearing surface for the lateral edge of the joint strip.

In order to prevent the strip from bulging upwards under compression the retaining ribs can be arranged to be divergent towards the floor of the carriageway recess in relation to the vertical flange of the angle-iron. However, for this purpose also the underside of the strip can advantageously be provided with at least one arch-like recess running in the longitudinal direction of the strip between the two retaining ribs. In the event of structural components carrying out a movement in relation to one another the strip advantageously has a plurality of arch-like recesses and a corresponding number of support surfaces between them which rest on the floor of one of the two structure recesses. In the event of a compression of the joint insert the strip is in this way pressed downwards on to the floor of the carriageway recess and is thus provided with an additional securing of position, which is of crucial importance when subjected to rolling loads.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 shows an example of embodiment of the joint cover for largely non-moving structural parts;

FIG. 2 shows the joint cover in accordance with FIG. 1 for moving structural parts;

FIG. 3 shows a further embodiment of the joint cover; and

FIG. 4 shows a further embodiment of the tensioning members.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the FIGS., an expansion gap or joint **10** is provided between the two parts **11** and **12** or a structure such as a bridge, a roadway, a carriageway or the like. The foundation generally consists of concrete and has a covering **13** with an asphalt layer **14** which forms the road surface. The covering **13** consists generally of bitumen and rests on the foundation with an insulating plastics layer **15** between them. The layer **15** may be a glass-fibre-reinforced mat.

The layers 13, 14 and 15 do not extend right up to the expansion gap or joint 10, and in this way there are formed in the carriageway recesses for accommodation of the joint cover. Each structural part 11 and 12 has parallel to the expansion gap or joint 10 and angle-iron 16 which has a horizontal flange 17 and a vertical flange 18. The horizontal flange 17 is fixed to the floor 19 of the carriageway recess by being welded to an anchoring member 20 provided in the foundation. A free surface 21 of the flange 17 is formed flat as an application surface for the joint strip 22.

In the embodiment of FIG. 1 the vertical flange 18 of the angle-iron 16 extends up to the surface of the carriageway. Along its length it has several holes 23 through which the tensioning bolts 24 pass. A head 25 of the tensioning bolts 24 bears against the surface of the vertical flange 18 facing towards the bitumen layer 13.

Parallel to the vertical flanges 18 retaining ribs 26 are inset into the joint strip 22. The retaining ribs 26, which are only represented in cross-section in the drawing, consist of individual sections which are inserted into the joint strip 22 flush with one another and parallel to the expansion joint 10. Each section of the retaining ribs 26 advantageously has two threaded bushes 27 facing outwards and ending a short distance from the free side surfaces 28 of the joint strip 22. The tensioning bolts 24 are in engagement with the threaded bushes 27 in such a way that during installation of the joint strip 22 there can be exerted on its sections a pre-tension which lies between the retaining ribs 26 and the vertical flanges 18. In this way the surface 28 is pressed flat against the inward-facing surface of the vertical flange 18 and provides under all load conditions a tight seal against the entry of water, dampness, dust, dirt and the like. The retaining ribs 26 consisting of individual sections enable the joint strip to be delivered in long lengths, which can then be cut to to correct length by the construction workers. Special tools are not necessary for this, since only the resilient strip 22 between the sections of the retaining ribs 26 has to be divided up. In this way the strip can also be cut to size by mitring and can be laid without interruption over ledges.

The bolt heads 25 lie open, for setting of the pretension. They can then in accordance with FIG. 1 be covered by the insulating layer 15. Then the bitumen covering 13 and the asphalt layer 14 are laid as far as the layer 15 or the vertical flanges 18.

FIG. 2 shows the cross-section of a joint cover 22 for structural parts which move in relation to one another. Identical parts are provided with the same reference numerals. In contrast to FIG. 1, in this embodiment the joint strip 22 has two arch-like recesses 29 on its underside between the retaining ribs 26. The two recesses 29 run in the direction of the expansion joint 10. Between the recesses 29 there is formed a support surface 30 on the joint strip 22. The support surface 30 rests on the floor 19 of the recess of the carriageway 11.

On the upper surface of the joint strip 22, in the region of the support surface 30 between the recesses 29, there are provided slot-like recesses 31. These slot-like recesses 31 likewise run in the direction of the expansion gap 10 and are aligned with one another. They may for example be of the same length as the sections of the retaining ribs 26.

Also, immediately beneath the slot-like recesses 31 there may be inlaid into the joint strip 22 rigid plates 32, as is illustrated in FIG. 2 by means of a dashed line. The rigid plates 32 likewise consist of individual sections.

In the event of compression of the joint strip 22 the recesses 29 merely ensure that the strip is pressed in the direction of the support surface 30 in accordance with the arrow P, and is pressed by this surface firmly against the surface 19. The joint strip 22 therefore does not bulge evenly in the form of a dome, but merely forms a slightly undulating line during strong compression. If the strip in this form is subjected to rolling loads, then the strip is not pushed along its whole length from one position to another, since part of the movement is already taken up in the region of the support surface 30. In this way it is prevented that the side surfaces 28 are dragged too strongly away from the vertical flanges 18, so that even under extreme loads a proportion of the pre-tensioning is certain to remain, so that any entry of moisture or dirt is prevented.

Even if the strip expands it exhibits a tendency to press the support surface 30 against the surface 19.

The slot-like recesses 31 and/or the rigid plates 32 favour the deformation of the strip 22 in the direction of the arrows P during the compression. The slot-like recesses 31 on the top side of the strip also permit a compensation of forces in the surface region, especially in the case of longer strips for moving expansion joints, so that the surface acted on by the vehicle wheels is more resistant to aging.

In the embodiment in accordance with FIG. 3 there is likewise illustrated a cover for structural parts moving in relation to one another. No tensioning bolt is illustrated for the structural part 11, so that recess means 38 can be illustrated more clearly while for the structural part 12 a tensioning bolt 24 is shown. It is to be understood, however, that tensioning bolts are provided for both parts 11 and 12. The retaining ribs 36 in this embodiment have an aperture in which the threaded bushes 27 are inserted. Also, to the angle-iron 16 there is connected a further angle-iron 33 whose vertical flange 34 abuts against the vertical flange 18 of the angle-iron 16. A horizontal flange 35 of the angle-iron 33 lies somewhat lower than the horizontal flange 17 of the angle-iron 16 and is likewise connected to the anchor 20. The two vertical flanges 18 and 34 contain holes 23 for the penetration of the tensioning bolt 24. This arrangement is suitable for greater pre-tensionings and wider gaps. Also in this embodiment there is provided a wedge-shaped strip 37 of solid resilient material, which after tightening of the bolts 24 is inserted over these into the angle-iron 33. Corresponding recesses 38 can be provided for the heads 25 of the tensioning bolts 24. As is shown in the right-hand part of FIG. 3, the insulating plastic layer 15 can as in the preceding example of embodiment extend up between the wedge-shaped strip 37 and the angle-iron 33 to the surface of the carriageway. The vertical flanges 18 and 34 of the angle-irons 16 and 33, ending below the surface of the carriageway in this embodiment, are protected to a perticularly high degree. As in the preceding embodiments, after the wedge-shaped strip 37 has been placed in position the bitumen layer 13 and the asphalt layer 14 are laid as far as the strip 37.

FIG. 4 shows a modified form of embodiment of the mounting device, in which retaining ribs 46 are diver-

gent towards the floor **19** of the carriageway recess in relation to the vertical flange **18** of the angle-iron **16.** The inclined arrangement of the retaining ribs **46** ensures an even pre-tensioning. In the event of compression of the joint strip **22,** however, the latter is pressed more strongly against the substructure, i.e., the surfaces **19** and **21** of the horizontal flanges **17.** This leads to a further mounting of the strip in relation to the foundation.

The slot-like recesses **31** on the surface of the carriageway and also the dome-like recesses **29** on the underside of the joint strip **22** ensure that during pretensioning and also during "working" as a result of weather and mechanical effects, the sealing in the region of the surfaces **21** and **28** is maintained for the protection of the metal parts.

What is claimed is:

1. An expansion joint for adjacent roadway sections having a gap therebetween to allow expansion of said sections, said sections being recessed along their adjacent edges to form a groove along both sides of said gap, said joint comprising in combination a plate structure fixed to each section along the bottom of said groove, each of said plate structures having a support projection parallel to and spaced from said gap, said recessed sections supporting an expansion member extending into said grooves, said expansion member consisting of a joint strip of elastic material having free side surfaces, retaining ribs inset in said strip, said ribs each comprising a series of individual sections running in the longitudinal direction of the strip and each of individual sections being provided with at least one threaded bush, said bush having an axis arranged transversely to the expansion gap, said bushes each engaging with a tensioning bolt which bears freely and rotatably against a corresponding support projection in said groove, said plate structures having a support projection being fixed in the recessed sections comprising inlaid angle-irons having the horizontal flanges thereof mounted on the floor of the recess, adjacent the expansion gap, and vertical flanges of angle-irons having holes for the tensioning bolts to pass through, said retaining ribs being arranged to be divergent towards the floor of the recess in relation to the vertical flanges of the angle-iron.

2. An expansion joint as defined in claim **1,** said sections of the retaining ribs each having two outwardly facing threaded bushes which terminate at a short distance from the free side surfaces of the joint strip.

3. An expansion joint as defined in claim **1,** said vertical flanges extending up to the surface of the structure and forming a continuous bearing surface for the free side surface of the joint strip.

4. An expansion joint as defined in claim **1,** said threaded bushes each passing through an aperture in the retaining ribs.

5. An expasnion joint as defined in claim **1,** said retaining ribs running parallel to the vertical flange of the angle-iron.

6. An expansion joint for adjacent roadway sections having a gap therebetween to allow expansion of said sections, said sections being recessed along their adjacent edges to form a groove along both sides of said gap, said joint comprising in combination a plate structure fixed to each section along the bottom of said groove, each of said plate structures having a support projection parallel to and spaced from said gap, said recessed sections supporting an expansion member extending into said grooves, said expansion member consisting of a joint strip of elastic material having free side surfaces, retaining ribs inset in said strip, said ribs each comprising a series of individual sections running in the longitudinal direction of the strip and each of individual sections being provided with at least one threaded bush, said bush having an axis arranged transversely to the expansion gap, said bushes each engaging with a tensioning bolt which bear freely and rotatably against a corresponding support projection in said groove, said plate structures having a support projection being fixed in the recessed sections comprising inlaid angle-irons having the horizontal flanges thereof mounted on the floor of the recess, adjacent the expansion gap, and vertical flanges of angle-irons having holes for the tensioning bolts to pass through, a further angle-iron being connected to the said angle-iron, the vertical flanges of each of said angle-iron and said further angle-iron lying against one another and having a common hole for the tensioning bolts to pass through, and the horizontal flange of the further angle-iron lying lower than that of the first angle-iron and being anchored in the roadway sections.

7. An expansion joint as defined in claim **6,** between a surface coating of the structure and the joint insert strip there is provided a wedge-shaped strip of solid resilient material, which, optionally having an intermediate insulating plastic layer between the coating and the roadway sections, rests on the horizontal flange of the said further angle-iron.

8. An expansion joint as defined in claim **7,** said wedge-shaped strip having recesses for the heads of the tensioning bolts.

* * * * *