United States Patent

Wicks, III

[15] **3,699,853**

[45] **Oct. 24, 1972**

[54] **COMPOSITE EXPANSION JOINT**

[72] Inventor: **Harry O. Wicks, III,** Hamburg, N.Y.

[73] Assignee: **Acme Highway Products Corporation,** Buffalo, N.Y.

[22] Filed: **Feb. 16, 1971**

[21] Appl. No.: **115,519**

[52] **U.S. Cl.** **94/18**

[51] **Int. Cl.** **E01c 11/10**

[58] **Field of Search** 94/18; 14/16

[56] **References Cited**

UNITED STATES PATENTS

3,482,492	12/1969	Bowman	94/18
3,245,328	4/1966	Fassbinder	94/18

FOREIGN PATENTS OR APPLICATIONS

408,089	9/1966	Switzerland	94/18

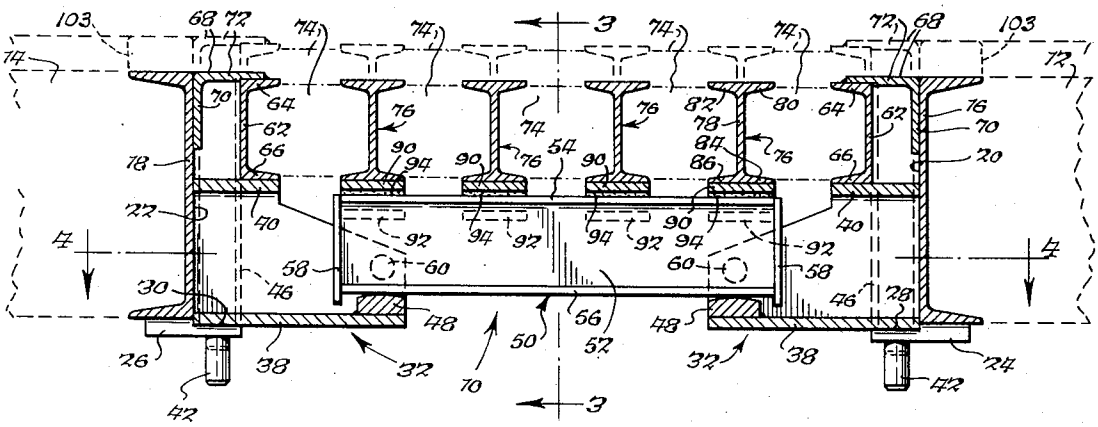
Primary Examiner—Jacob L. Nackenoff

Attorney—Christel & Bean

[57] **ABSTRACT**

A composite expansion joint assembly of alternating elastic sealing elements and rigid structural members slidably mounted on transversely extending support beams by tie-down brackets which limit vertical displacement of the structural members. The assembly is prefabricated as a unit and can be readily inserted into and removed from an expansion groove without the customary blocking out.

12 Claims, 5 Drawing Figures



PATENTED OCT 24 1972

3,699,853

SHEET 1 OF 3

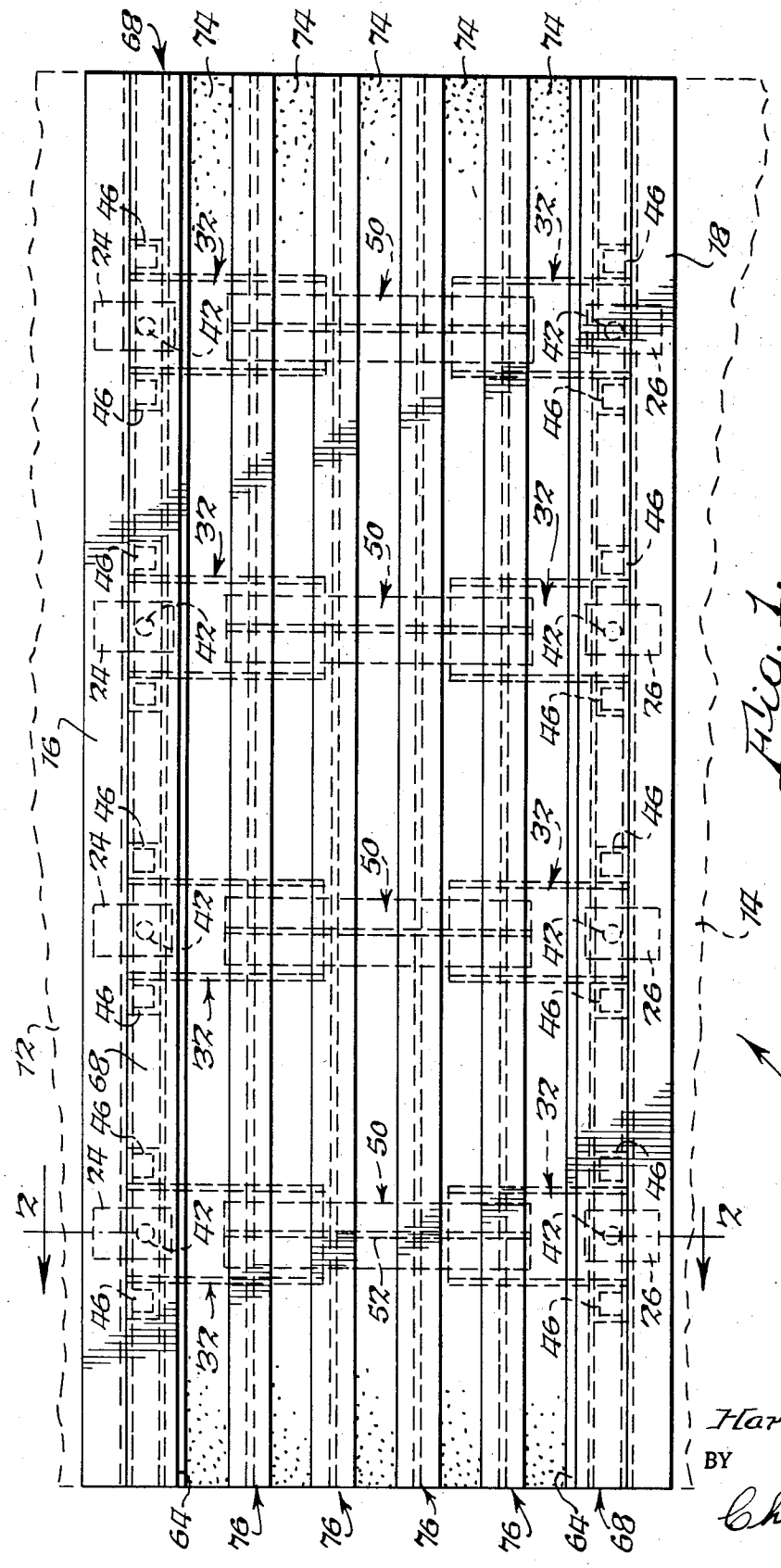


Fig. 1.

INVENTOR.
Harry O. Wicks III
BY
Christel & Bean
ATTORNEYS.

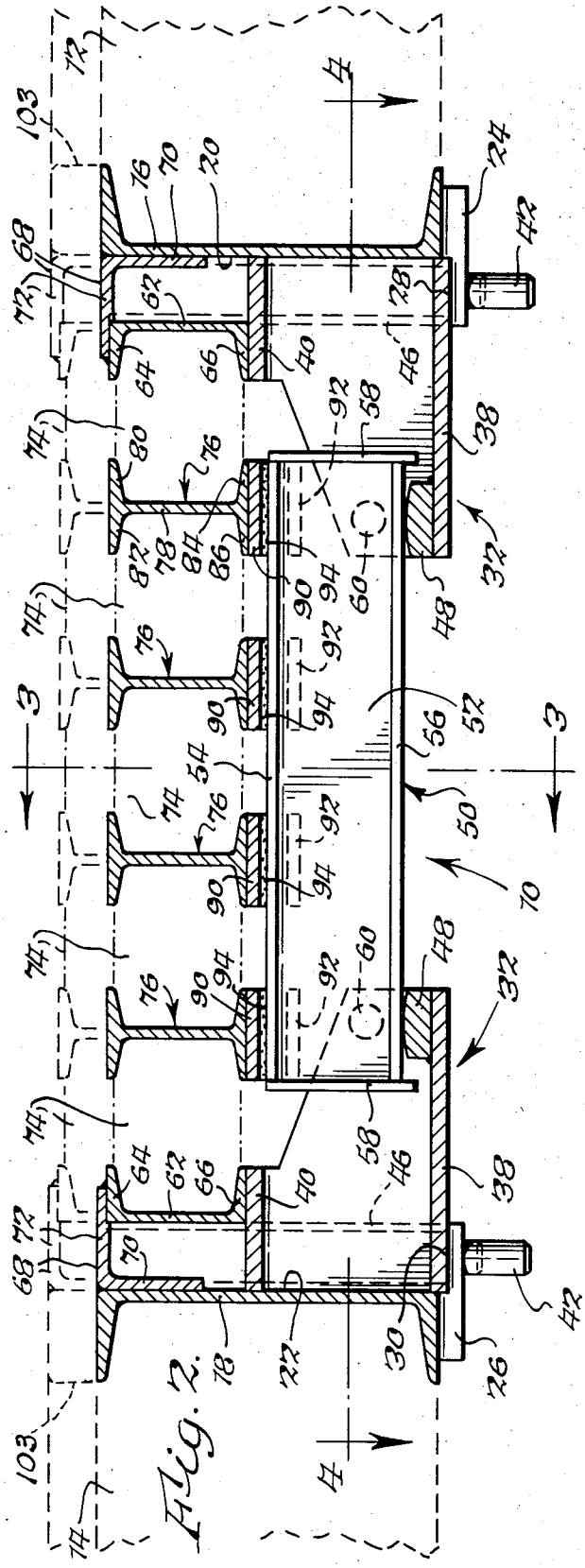


Fig. 2.

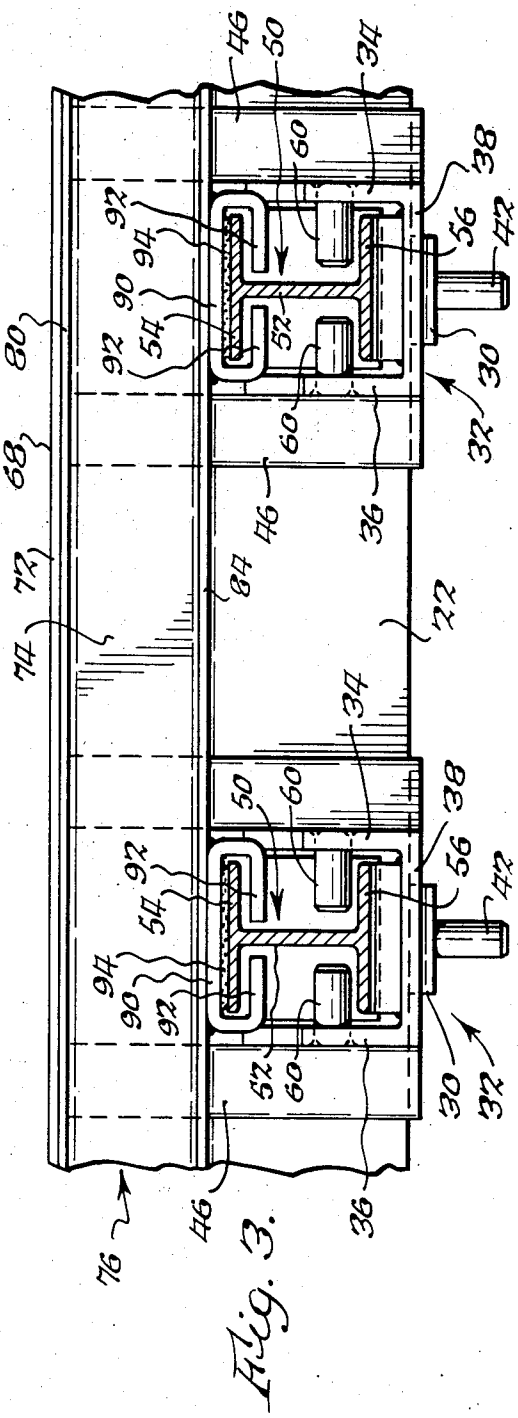


Fig. 3.

INVENTOR.
Harry O. Wicks III
BY
Christel & Bean
ATTORNEYS.

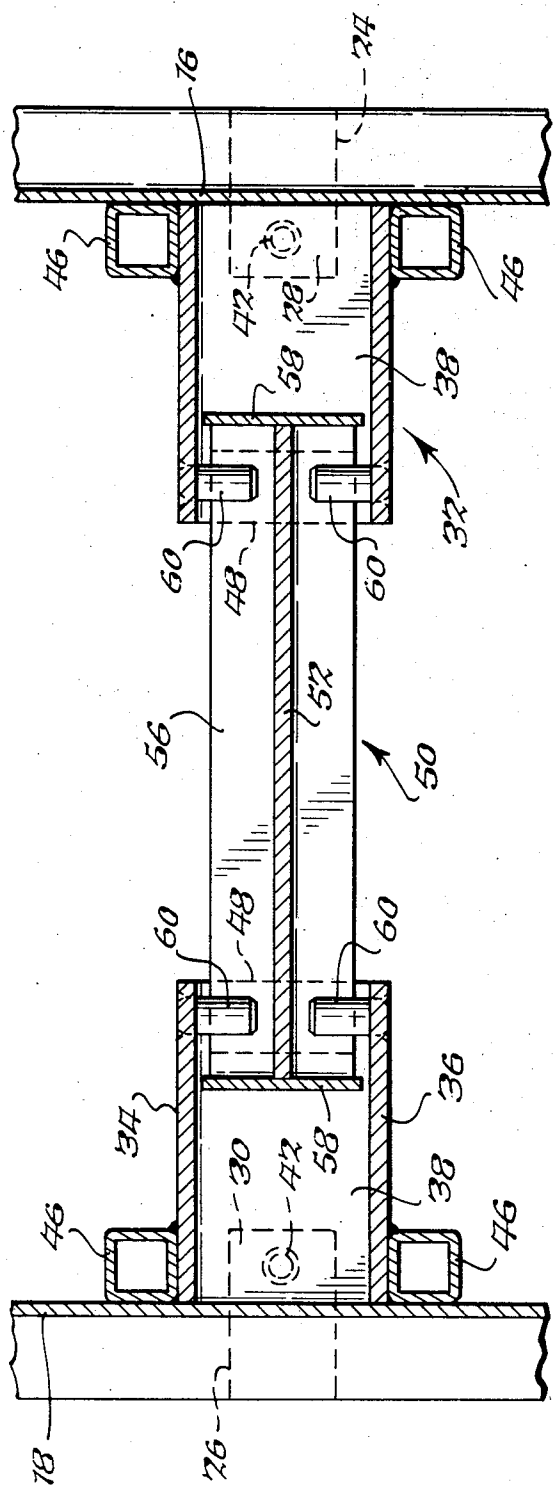


Fig. 4.

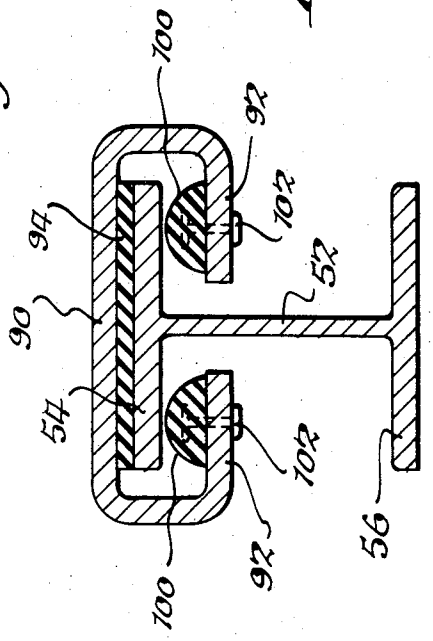


Fig. 5.

INVENTOR.
Harry O. Wicks II
BY
Christel & Bean
ATTORNEYS.

COMPOSITE EXPANSION JOINT

BACKGROUND OF THE INVENTION

This invention relates to expansion joints and, more particularly, to composite expansion joints of the type employed in pavement structures for accommodating large movements between adjacent pavement sections.

It has been known to utilize composite expansion joints in bridge structures and the like wherein the relative movement adjacent pavement sections in response to temperature changes is too great to be accommodated by a single seal unit. Such composite expansion joints normally consist of a series of laterally spaced elastic seals extending lengthwise of the expansion groove between adjacent pavement sections and separated by rigid structural members or plates. Thus, the composite joint assembly consists of alternating elastic and rigid members mounted between a pair of relatively movable pavement sections. Known composite expansion joints customarily are embedded in the adjoining pavement sections in such a manner that they are not readily removable, which poses a problem when repair and replacement are indicated, or when the pavement is resurfaced and the joint must be raised. In addition, the rebate or cutout formed in the pavement section to receive these known expansion joint assemblies often is made significantly larger than the upper portion of the assembly to accommodate certain of the base components, leaving spaces between the upper portions of the pavement section and the upper portion of the expansion joint. After installation, additional concrete or paving material must be poured to fill these spaces, thereby increasing the time and labor required for installation.

Also, in many of these prior composite expansion joint assemblies, the intermediate rigid members tended to shift vertically as traffic moves thereacross, causing distortion of the expansion joint assembly and creating undesirable noise.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved composite expansion joint assembly overcoming the above noted shortcomings.

It is another object of this invention to provide a composite expansion joint assembly which can be prefabricated and readily inserted and removed, as a unit, into and out of an associated expansion groove without the customary block out.

Still another object of this invention is to provide a composite joint the elevation of which can be readily adjusted to accommodate resurfacing.

It is a further object of the present invention to provide the foregoing composite expansion joint assembly with means for preventing or limiting vertical migration of the seal-holding, intermediate structural members constituting a part of the assembly, for quietness in use.

A composite expansion joint assembly of this invention is characterized by the provision of a plurality of resiliently yieldable sealing elements adjacent ones of which are supported in laterally spaced relation by structural I-beams which are slidably mounted on transversely extending support beams by means of tie down brackets limiting vertical displacement of the I-beams. The entire assembly is prefabricated prior to installation and can be slipped into and out of place between adjacent pavement sections which can be completed prior to installation.

The foregoing and other objects, advantages and characterizing features of the present invention will become clearly apparent from the ensuing detailed description of an illustrative embodiment thereof, taken together with the accompanying drawings wherein like reference numerals denote like parts throughout the various views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a composite expansion joint assembly of the present invention, shown disposed between a pair of pavement sections;

FIG. 2 is a transverse sectional view thereof on an enlarged scale, being taken about on line 2—2 of FIG. 1;

FIG. 3 is a fragmentary vertical sectional view thereof, on the same enlarged scale, taken about on line 3—3 of FIG. 2;

FIG. 4 is a fragmentary horizontal sectional view thereof, also on the same enlarged scale, taken about on line 4—4 of FIG. 2; and

FIG. 5 is a fragmentary, vertical sectional view showing a modified tie-down arrangement.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring to the drawings, there is shown in FIG. 1 a composite expansion joint assembly, generally designated **10**, constructed in accordance with this invention and installed in an expansion groove of substantial width between adjacent pavement sections **12** and **14** formed of concrete or any other suitable material. Pavement sections **12** and **14** are provided with edge channels **16** and **18** permanently anchored in a conventional manner to the respective pavement sections and which have opposed vertical faces **20** and **22** (FIG. 2) defining the lateral sides of the expansion groove in which expansion joint assembly **10** is installed. Joint assembly **10** extends across the width of the groove between faces **20** and **22** and for the full length of the groove transversely to the length of pavement sections **12** and **14**. Brackets **24** and **26** are welded or otherwise fixedly secured to the bottom flanges of edge channels **16** and **18**, and may be stepped, as shown, to provide reduced thickness portions **28** and **30** having openings therethrough for a purpose hereinafter explained.

Expansion joint assembly **10** comprises a plurality of tubular structural members **32** disposed in spaced pairs in an opposing, face-to-face relation along the lower portions of edge channels **16** and **18**. Tubular members **32** are built up from structural plates and have a pair of side walls **34** and **36**, a bottom wall **38**, and a top wall **40** of a lesser length than bottom wall **38**. Bottom walls **38** are supported on portions **28** and **30** of brackets **24** and **26** and have studs **42** extending through the openings in brackets **24** and **26** and projecting therebelow. Each tubular member **32** carries a pair of vertically extending box-like spacer members **46** welded or otherwise secured to the opposite side walls **34** and **36** of members **32**, for a purpose to be described.

Bearing blocks **48** are rigidly secured to bottom walls **38** of tubular members **32** and have rounded upper surfaces to slidably support the opposite ends of a support

beam 50 extending between each pair of opposed tubular members 32. A plurality of beams 50 are provided and extend transversely across the expansion groove in laterally spaced apart relation lengthwise of the groove, as shown in FIG. 1. Beams 50 support the anticipated loading on the expansion joint and are of a size and spacing dictated by the particular application. In the specific embodiment illustrated in FIG. 1, four such beams 50 are provided but it should be understood that the number of sealing members and beams can be varied, as required or desired.

Each support beam 50 comprises a web 52, an upper flange 54, a lower flange 56 and a pair of end plates 58. Lower flange 56 bears against bearing blocks 48 and is movable relative thereto during expansion and contraction of the joint upon contraction and expansion of pavement sections 12 and 14. Upward movement of beams 50 relative to tubular members 32 is limited by studs 60 (FIG. 4) projecting inwardly from side walls 34 and 36 of members 32 and engageable with bottom flange 56 of support beam 50. Movement of beam 50 in either direction is limited by engagement of end plates 58 with bearing blocks 48.

A pair of seal locking channels 62 extend lengthwise of the expansion groove and have upper flanges 64 and lower flanges 66 which latter are welded or otherwise fixedly secured to top walls 40 of tubular member 32.

A pair of angle members 68 also extending lengthwise of the expansion groove have vertical legs 70 which lie flush against surfaces 20, 22. At their upper ends, members 68 are welded or otherwise fixedly secured to edge channels 16 and 18, as clearly shown in FIG. 2, with the horizontally extending legs 72 of angle members 68 substantially co-planar with the upper flanges of edge channels 16 and 18 and flush with the upper surfaces of pavement sections 12 and 14, respectively. The horizontal legs 72 of members 68 overlie the upper flanges 64 of channels 62 and are welded thereto, the undersurface of legs 72 being stepped to receive flanges 64.

Channel members 62 engage against members 46 which space them from members 16, 18 and thereby provide added room for travel of beams 50 in members 32. In an expansion joint having fewer elastic seal elements and requiring less travel of its support beams 50 spacers 46 can be omitted and channels 62 can be welded directly to members 16 and 18.

A plurality of resiliently yieldable sealing elements 74 are disposed between seal locking channels 62 with the outermost sealing elements 74 received and positioned between flanges 64 and 66 of seal locking channels 62 as shown in FIG. 2. A plurality of I-beam members 76 also are positioned within the space defined by locking channels 62, there being an I-beam 76 interposed between each pair of adjacent sealing elements 74. Sealing elements 74 comprise tubular members of elastomeric material each having an internal supporting truss structure, such as shown, for example, in application Ser. No. 115,518, filed simultaneously herewith on Feb. 16, 1971 and assigned to the same assignee as the present application, and are secured to channels 62 and I-beam members 76 by a suitable adhesive, all in a manner well known in the art. Each I-beam member 76 is provided with a vertical web 78 and upper horizontal flanges 80 and 82 extending laterally outwardly on opposite sides of web 78. Lower horizontal flanges 84 and 86 extend laterally outwardly from opposite sides of web 78 at the lower end thereof. Flanges 80, 82, 84 and 86 receive and position the intermediate sealing element 74 in place.

It is a feature of my invention that I-beams 76 are held against unrestrained bouncing on beams 50. To this end, a plurality of tie-down brackets 90 are welded or otherwise secured to the bottom surfaces of I-beams 76 for limiting vertical displacement of I-beams 76. Such tie-down brackets 90 are spaced longitudinally along I-beams 76 at substantially equal distances corresponding to the distances between support beams 50 and are alined therewith. Brackets 90 overlie beams 50 and are of a generally C-shaped configuration having inturned legs 92 extending beneath the upper flanges 54 of support beams 50 to limit upward movement of beams 76 relative to beams 50. A relatively thin pad 94, formed of adiprene or other suitable anti-friction, resiliently yieldable material is secured to the web of each bracket 90 between it and upper flange 54 of support beam 50 to provide a cushioning effect between these two members thereby reducing noise therebetween cause by vehicle traffic on the pavement deck. The anti-friction characteristic of pads 94 facilitates sliding movement between brackets 90 and flange 54 of support beam 50. Tie-down brackets 90 are designed to severely limit vertical displacement of I-beams 76 relative to beams 50, without interfering with relative sliding therebetween. This prevents possible deterioration consequent upon unrestrained bouncing, and virtually eliminates the problem of noise. FIG. 5 shows a modified tie-down arrangement wherein cushioning pads 100 of resiliently yieldable material are secured to the upper surface of legs 92, as by rivets 102. Pads 100 are only slightly spaced from flange 54, and engage the underside thereof to further reduce shock and noise upon upward movement of beams 76.

A significant feature of this invention resides in the construction of expansion joint assembly 10 as a single unit which has a rectangular, box-like configuration enabling the unit to be lowered into place in a rectangular groove between edge channels 16 and 18 which latter can be conveniently anchored in the pavement sections 12 and 14 anytime prior to the installation of expansion joint assembly 10. The expansion joint unit can be completely fabricated at the factory or construction site prior to installation. As opposed to conventional expansion joint installations, it is not necessary to block out an excessively large area in the pavements sections to accommodate the expansion joint, nor is it necessary to fill in with additional paving material after installation, as is often required in prior known installations.

This single unit feature also enables expansion joint assembly 10 to be readily removed for repair or replacement, or to be elevated to a new level when the upper surfaces of pavement sections 12 and 14 are repaved, as illustrated by the broken line showing in FIG. 2. In order to raise expansion joint assembly 10, only the welds between angle members 68 and edge channels 16 and 18 need be removed, as by means of a welding torch. The entire assembly can then be completely removed, as a unit, from the expansion groove, or raised as a unit therein to the level desired

for a repaving operation. In the latter case, suitable shims (not shown) are placed on portions **28** and **30** of brackets **24** and **26** beneath structures **32** to support the elevated expansion joint assembly **10**, the joint being accessible from beneath in bridge structures and the like. Additionally, spacers could be attached to top flanges of channels **16** and **18**, as indicated at **103** in FIG. **2**, to comprise upward extensions of edge channels **16, 18**.

In use, sealing members **74** of composite expansion joint assembly **10** are compressed and expand to accommodate relative movement of pavement sections **12** and **14** toward and away from each other while maintaining pressure sealing engagement against channels **62** and I-beams **76** to prevent the entry of moisture, dirt particles, deleterious chemicals and the like into the joint. During movement of pavement sections **12** and **14** toward each other, tubular members **32** are displaced toward each other relative to support beams **50**, which ride on blocks **48**. Simultaneously, I-beams **76** move laterally toward each other with the padded tie-down brackets **90** sliding on support beams **50**. Sealing elements **74** are compressed between locking channels **62** and adjacent I-beams **76**, the joint movement of the composite expansion joint assembly of the present invention being the sum of the movements of sealing elements **74**. Assuming that a typical sealing element in the illustrative embodiment can be compressed two inches under maximum compression, the total movement in the illustrated expansion joint assembly will be ten inches. The number of sealing elements **74** and I-beams **76** can of course vary as dictated by the total movement required for a specific application.

Upon movement of pavement sections **12, 14** away from each other the reverse action occurs. I-beams **76** can move independently of one another relative to support beams **50**, being confined, however, between the opposite end plates **58** of beams **50** which beams also can move lengthwise independently of one another. It will be appreciated that the expansion joint assembly is shown fully expanded in FIG. **2**.

The composite expansion joint assembly of the present invention is capable of withstanding various forces imparted thereto, such as deflection, rotation and rocking.

From the foregoing, it is apparent that the objects of this invention have been fully accomplished. An improved composite expansion joint assembly is provided in a prefabricated construction which can be installed, as a unit, into a preformed expansion groove and which can be raised or removed therefrom as a unit. Also, the structural I-beams securing the sealing elements in a laterally spaced relation are tied down to the support beams by means of brackets which limit vertical displacement of such I-beams thereby insuring a substantially level deck surface. Pads are interposed between the brackets and beams to reduce noise resulting from overhead traffic loads.

One form of this invention having been disclosed in detail, it is to be understood that this has been done by way of illustration only.

I claim:

1. A composite expansion joint assembly comprising: edge members adapted to define the opposite sides of an expansion groove between pavement sections; a plurality of resiliently yieldable elongated sealing elements in side-by-side relation; an elongated rigid structural member interposed between each pair of adjacent sealing elements; support beams extending transversely of said rigid structural members and supporting the same for sliding movement relative thereto; means supporting said support beams adjacent the opposite ends thereof and for sliding movement relative thereto adjacent at least one end thereof; said rigid structural members, sealing elements, support beams and beam supporting means comprising a unit and being adapted for insertion as a unit into said expansion groove, and means for mounting said unit in said groove between said edge members with said beam supporting means extending inwardly into said groove from said opposite sides thereof and with said beams confined between the opposite sides of said groove as defined by said edge members, whereby said unit can be vertically displaced upwardly as a unit in said groove.

2. A composite expansion joint assembly according to claim **1** including means on said structural members engagable with said support beams for limiting vertical displacement of said structural members.

3. A composite expansion joint assembly according to claim **2** wherein said displacement limiting means comprise a bracket having a body portion secured to said structural member and at least one leg extending beneath a portion of said support beam.

4. A composite expansion joint assembly according to claim **3** including a friction reducing cushioning pad secured to said body and interposed between said body and said support beam.

5. A composite expansion joint assembly as set forth in claim **4**, together with a cushioning pad on said leg engagable with said support beam portion.

6. A composite expansion joint assembly according to claim **1** wherein said means supporting said support beams comprise paired support members having bearing blocks for supporting the opposite ends of one support beam.

7. A composite expansion joint assembly according to claim **6**, including means on said support beams and said support members coacting to limiting displacement of the former relative to the latter.

8. A composite expansion joint assembly according to claim **7** wherein said limiting means comprises end plates on said support beams engagable with stop means on said support members.

9. A composite expansion joint assembly according to claim **1** wherein said rigid, structural members are standard I-beams.

10. A composite expansion joint assembly according to claim **1**, wherein said beam supporting means comprises paired structural members adjacent the opposite end of each support beam, at least one of said structural members including a bearing block for supporting the adjacent end of a support beam for sliding movement relative thereto, together with locking channels mounted on said structural members and engaging said sealing members on opposite sides of said joint.

11. A composite expansion joint assembly according

locking members, an elongated rigid structural member interposed between each pair of adjacent sealing elements; support beams extending transversely of said rigid structural members and supporting the same for sliding movement relative thereto; means supporting said support beams adjacent the opposite ends thereof and for sliding movement relative thereto adjacent at least one end thereof; said rigid structural members, sealing elements, seal locking members, support beams and beam supporting means comprising a unit,

means for mounting said unit in said groove between said edge members with said beam supporting means extending inwardly into said groove from said opposite sides thereof and with said beams confined between the opposite sides of said groove as defined by said edge members, whereby said unit can be vertically displaced upwardly as a unit in said groove.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,699,853 Dated October 24, 1972

Inventor(s) Harry O. Wicks III

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In patent claim 11, line 1, after "according" insert --to claim 1, wherein said mounting means include support bracket means secured to said edge members and extending therefrom into said groove, said unit being seated on and supported by said bracket means.--

In patent claim 12, column 7, line 1 of the patent, before "locking" insert --12. A composite expansion joint assembly comprising: edge members adapted to define the opposite sides of an expansion groove between pavement sections, seal locking members extending lengthwise of said assembly, a plurality of resiliently yieldable elongated sealing elements in side-by-side relation between said--

Signed and sealed this 20th day of November 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.