United States Patent

Berchou

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[54] SEALING MEMBER

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

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

[58] **Field of Search** 94/18

[56] **References Cited**

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[57] **ABSTRACT**

An elongated resilient sealing member for use in an expansion joint comprising a top wall, a bottom wall and opposite sidewalls forming a tubular structure. The interior of the tubular structure is provided with a truss construction including a pair of intersecting crossbars extending from the top wall downwardly at an angle to either the intersections of the bottom wall with the sidewalls or to the bottom wall at points below such intersections. A pair of short bars extend downwardly at an angle, from the opposite sidewalls to the intersecting crossbars. These short bars in conjunction with the intersecting crossbars urge the bottom wall portions of the sealing member against adjoining support surfaces during compression to increase the interfacial surface contact area of the sealing member with such support surfaces.

6 Claims, 4 Drawing Figures

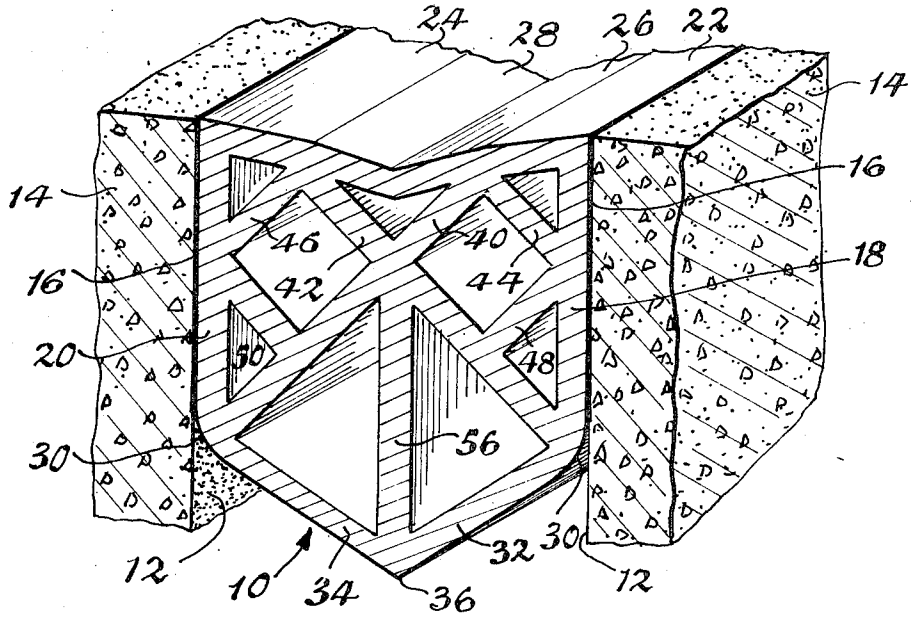
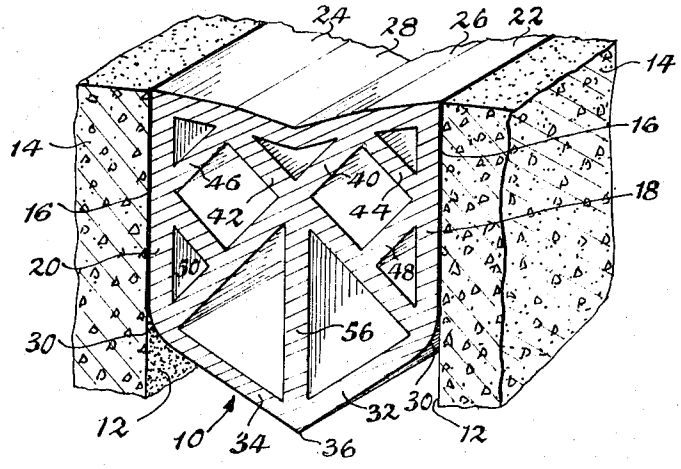


Fig. 1.



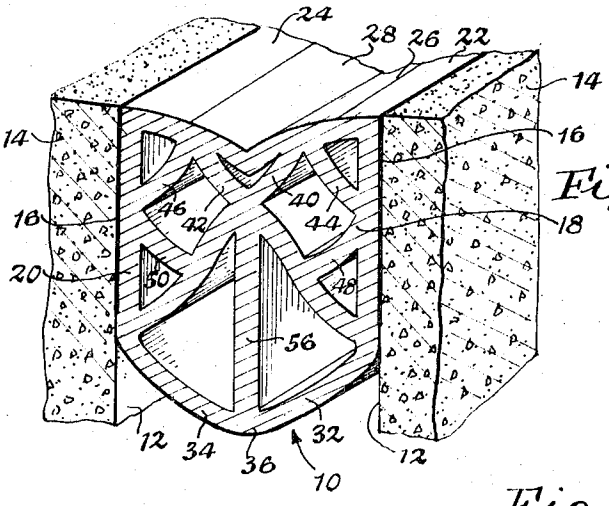
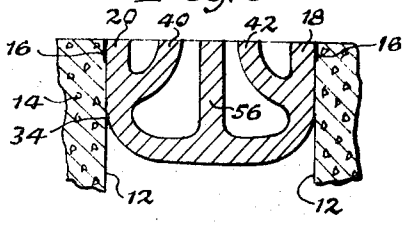


Fig. 2.

Fig. 3



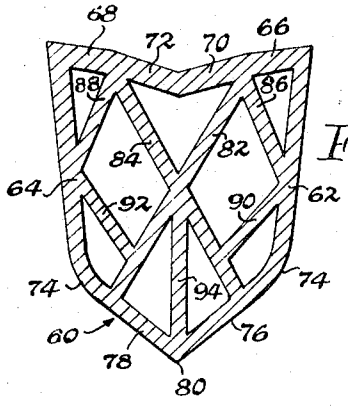


Fig. 4.

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SEALING MEMBER

BACKGROUND OF THE INVENTION

This invention relates to sealing members and, more particularly, to sealing members employed in expansion joints which are disposed in grooves formed between pavement blocks or slabs.

In the construction of highways, bridges, sidewalks, architectural concourses and the like in which pavement slabs of concrete or other building materials are used, provision must be made for the expansion and contraction of such slabs due to variations in temperature. Conventionally, grooves are provided between adjacent slabs to accommodate the expansion and contraction thereof. Such grooves are sealed to preclude the entry of liquids and solid materials therein and to prevent such foreign matter from passing through the grooves beneath the pavement. These grooves often are sealed by means of hollow, resilient, elastic strips which can be compressed when the groove is contracted due to expansion of the pavement material and which expand to seal the groove when the same is expanded due to contraction of the pavement material.

These known seals have generally planar vertical sidewall surfaces which are fixed in depth in accordance with a depth to width ratio established from long term field experience and repeated condition surveys of seal performance. This fixed depth of sidewall surface contact remains substantially constant during use of the sealing strip an expansion joint regardless of contraction or expansion of the same. Of course, the sidewalls of the sealing strip can be of any desired depth prior to insertion in the expansion joint. However, an increase in depth means additional sidewall material and additional support structure for maintaining the sidewalls in their proper orientation in use, thereby adding considerably to the costs of such sealing strips.

summary of the invention

It is an object of the present invention to provide an improved sealing member having an area of sidewall interfacial surface contact which increases during compression of the sealing member.

It is another object of this invention to provide the foregoing sealing member with a novel internal truss structure for translating compressive forces into lateral forces urging portions of the bottom wall of the sealing member into interfacial surface contact with adjoining slab surfaces.

It a further object of the present invention to provide a sealing member having a simple and novel internal truss structure for increasing the effective sealing contact of the sealing member during compression without a corresponding increase in materials or internal support structure.

Generally speaking, the sealing member of the present invention, as hereinafter described, comprises a pair of sidewalls, a top wall and a bottom wall forming a tubular structure. Interconnected crossbars are provided within the confines of the walls and are formed integral therewith to form an internal truss structure of a relatively simple design effective upon compression of the sealing member to exert laterally outwardly directed pressures against portions of the bottom wall for urging the same laterally against adjoining sidewall support surfaces.

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 drawing wherein like reference numerals denote like parts throughout the various views.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 is a perspective, transverse sectional view of a sealing member of the present invention, broken away to indicate an indeterminate length, and shown inserted in a groove formed between adjacent pavement slabs;

FIG. 2 is a transverse sectional view of the sealing member of FIG. 1, showing the sealing member in a further compressed state;

FIG. 3 is a fragmentary sectional view showing the sealing member of FIG. 1 in a still further compressed state; and

FIG. 4 is a transverse sectional view of a modified sealing member of this invention.

DESCRIPTION OF AN ILLUSTRATIVE EMBODIMENT

Referring now in detail to the drawing, there is shown in FIG. 1 an expansion joint comprising an elongated, resiliently yieldable sealing member, generally designated **10**, disposed in a groove defined between opposed faces **12** of adjacent pavement slabs **14**. Sealing member **10** is shown in a slightly compressed state just after being inserted between pavement slabs **14**. The insertion of sealing member **10** into the groove between slabs **14** is facilitated by the application of a thin layer of a suitable lubricant-adhesive **16** to faces **12**, which, when set, cements sealing member **10** in place.

Sealing member **10** is preferably composed of a resiliently yieldable elastomeric material, such as neoprene for example, or any other elastic material having similar properties of durability, sufficient compression and expansion capabilities, high abrasion resistance and capable of withstanding temperature extremes, sunlight, weathering, oxidation and deleterious chemicals. Sealing member **10** is formed of a unitary, one-piece construction and can take various outside dimensions to conform to the width of the grooves in which it is used and can be of any length to accommodate varying widths of pavements. Also, it should be understood that the sealing member of this invention has general utility in various expansion joint applications such as bridges, highways, sidewalks, architectural concourses, and the like.

Sealing member **10** comprises sidewalls **18** and **20** which are substantially parallel and straight from end to end. The upper edges of sidewalls **18** and **20** are connected to a top wall having downwardly sloping portions **22** and **24** which lead to portions **26** and **28** of increased slope forming a V-shaped recess which is so formed that when the sides of sealing member **10** are pressed toward each other, the top wall will fold downwardly into sealing member **10** to avoid extending above the top surface of the adjacent pavement slabs **14**. Sloping portions **22, 24, 26** and **28** can lie in inclined planes or they can be slightly curved within the purview of this invention. As used herein, the terms upper, lower, top, bottom, vertical, horizontal and the like are applied only for convenience of description with reference to the drawing and should not be taken as limiting the scope of this invention.

The lower edges of sidewalls **18** and **20** are connected as at junctures **30** to a bottom wall having downwardly sloping portions **32** and **34** which extend downwardly in converging relation and meet at juncture **36**. The juncture of intersection **30** of sidewalls **18** and **20** with bottom wall portions **32** and **34** can be angularly formed rather than curved, if desired, to form angular corners. Likewise, the upper intersection of sidewalls **18** and **20** with the top wall can be rounded, if desired. The top and bottom walls are integrally formed with sidewalls **18** and **20**, thus forming a tubular structure.

The interior of sealing member **10** is provided with an internal truss structure comprising a plurality of diagonally extending crossbars formed integral with the side, top and bottom walls and having spaces therebetween into which said crossbars can fold when sidewalls **18** and **20** are laterally compressed. These crossbars include a pair of long intersecting, inclined crossbars **40** and **42** extending downwardly at an angle from sloping portions **22** and **24** of the top wall adjacent the intersection thereof with portions **26, 28** to junctures or intersections **30** formed between sidewalls **20** and **18** and bottom wall portions **34** and **32** of the bottom wall. A pair of short bars **44** and **46** extend downwardly at an angle in diverging relation from the top wall adjacent crossbars **42** and **44** to sidewalls **18** and **20** intermediate the upper and lower ends

thereof. Bar 44 is generally parallel to bar 42, and bar 46 is generally parallel to bar 40. A pair of short bars 48 and 50 extend downwardly at an angle in converging relation from sidewalls 18 and 20 adjacent the lower ends of bars 44 and 46 to crossbars 42 and 40. Bar 48 is generally parallel to bar 40, and bar 50 is generally parallel to bar 42, and bars 48 and 50 intersect bars 42 and 40 approximately midway between the intersection thereof with each other and with corners 30. The overall effect of these diagonal crossbars is to translate downwardly directed vertical forces acting on the top wall of sealing member 10 to laterally directed forces acting outwardly against sidewalls 18 and 20.

An intermediate upright wall 56 is arranged approximately midway of sidewalls 18 and 20 in substantial parallelism therewith and extends from the juncture 36 of bottom wall portions 32 and 34 upwardly to the intersection of crossbars 40 and 42 so that intermediate wall 56 terminates short of the top wall and leaves a substantially triangular space therebetween into which the inner portions of the top wall can fold when sidewalls 18 and 20 are pressed toward each other during compression. Intermediate wall 56, besides offering support to crossbars 40 and 42, connects the bottom wall of sealing member 10 to the top wall through the upper intersecting portions of crossbars 40 and 42. Consequently, when sidewalls 18 and 20 are pressed toward each other, intermediate wall 56 through its connection with the top wall will insure the downward folding of the middle portions of the top wall, so that none of the sealing member will extend above the upper surfaces of pavement slabs 14. Intermediate wall 56 also divides the internal truss structure of sealing member 10 into two groups thereby providing substantially uniform action of both groups and distributes the expansion of sealing member 10 so that outward pressures exerted by the diagonal crossbars will be substantially equally applied to both sidewalls 18 and 20.

The orientation of bars 48 and 50 and their intersection with long intersecting crossbars 42 and 40 is a particularly significant feature of this invention because such bars 48 and 50 in conjunction with bars 40 and 42 are effective to urge bottom wall portions 32 and 34 laterally outwardly against the opposed faces 12 of adjacent pavement slabs 14 during compression of sidewalls 18 and 20. When sidewalls 18 and 20 are pressed toward each other during compression as shown in FIG. 2, portions 32 and 34 are forced laterally outwardly and tend to roll progressively along faces 12 from the upper edges of portions 32 and 34 adjacent intersections 30 downwardly toward the lower edges thereof causing the effective seal-contacting surface or interfacial surface contact area of sealing member 10 to increase by migrating downwardly along faces 12 of pavement slabs 14. As shown in FIG. 2, the contact area between sealing member 10 and faces 12 of slabs 14 has increased downwardly below the adhesive line 16. Such interfacial surface contact area continues to increase with increased compression of sealing member 10 as shown in FIG. 3 Moreover, the outward lateral pressure exerted by portions 32 and 34 tends to fill any voids or cavities present in surface faces 12 of slabs 14 caused by peeling, interfacial spalling, interfacial cavitation, or any other damaging action.

FIG. 4 illustrates another form of sealing member, generally designated 60, of this invention and comprises sidewalls 62 and 64 which are slightly inclined downwardly in a converging relation. The upper edges of sidewalls 62 and 64 are connected to a top wall having downwardly sloping portions 66 and 68 leading to increased sloping portions 70 and 72 terminating in a V-shaped recess. Portions 66, 68, 70 and 72 can be slightly curved to form continuous arcuate surfaces meeting at the V-shaped recess, if desired, within the purview of this invention. The lower edges of sidewalls 62 and 64 are connected as at rounded corners 74 to a bottom wall having downwardly sloping portions 76 and 78 which converge and meet at a common juncture 80. If desired, corners 74 can be angular rather than curved and the upper corners of sealing member 60 can be curved, as desired.

The interior of sealing member 60 differs from that of the first form described and comprises a pair of long intersecting crossbars 82 and 84 extending downwardly at an angle from sloping portions 66 and 68 of the top wall adjacent portions 70 and 72 thereof to bottom wall portions 78 and 76 at points spaced below corners 74. Crossbars 82 and 84 intersect intermediate their opposite ends. A pair of short bars 86 and 88 extend downwardly at an angle in diverging relation from the top wall adjacent bars 82 and 84 to sidewalls 62 and 64 intermediate the upper and lower ends thereof. A pair of short bars 90 and 92 extend downwardly at an angle in converging relation from sidewalls 62 and 64 adjacent the lower ends of bars 86 and 88 to intersecting crossbars 84 and 82. Bars 90 and 92 intersect bars 84 and 82 intermediate the points of intersection thereof with each other and with wall portions 76 and 78. An intermediate upright wall 94 is arranged approximately midway of sidewalls 62 and 64 in substantially bisecting relation to the angle defined thereby and extends from juncture 80 of bottom wall portions 76 and 78 upwardly to the intersection of crossbars 82 and 84 to which intermediate wall 94 adds support.

As in the form of the invention first described, when sidewalls 62 and 64 are pressed toward each other during compression of sealing member 60, portions 76 and 78 are urged laterally outwardly against pavement sidewall faces 12 from corners 74 downwardly, thereby increasing the interfacial surface contact area of sealing member 60 with pavement sidewall faces 12. It will be appreciated that, as in the form of FIG. 1, the various wall portions and internal truss bars extend the full length of the seal.

The extension of crossbars 82 and 84 from the top wall to bottom wall portions 78 and 76 below corners 74 facilitates and more positively insures engagement of portions of bottom wall portions 76 and 78 with the side faces 12 of pavement slabs 14 during compression of sealing member 60. Also, the downwardly sloping orientation of sidewalls 62 and 64 which merge smoothly into bottom wall portions 76 and 78 at 74 form substantially continuous sidewall surfaces and further facilitates contact between bottom wall portions 76 and 78 with the pavement sidewall faces 12.

From the foregoing, it is apparent that the objects of the present invention have been fully accomplished. As a result of this invention, an improved sealing member is provided having a novel internal truss structure for translating compressive forces into laterally acting forces to increase the interfacial surface contact area between the sealing member and the adjoining slab surfaces. This occurs upon expansion of the pavement slabs, and increases the effective seal against the upward ingress of foreign matter between the seal and the adjacent slab surfaces. Moreover, such increase of the interfacial surface contact area is not accompanied by a corresponding increase in structure or material forming the sealing member.

Preferred forms 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 sealing member comprising: an elastic body of resiliently yieldable material having a generally V-shaped top wall, a V-shaped bottom wall and a pair of opposite sidewalls formed integral with said top and bottom walls forming a tubular structure; an internal truss structure formed integral with said body and disposed within said tubular structure; said internal truss structure being effective to exert laterally outwardly directed forces against portions of said bottom wall to urge said bottom wall portions laterally outwardly for increasing the interfacial surface contact area of said sealing member at opposite sides thereof during compression; said top wall comprising at least a pair of sloping portions extending from said sidewalls downwardly in a converging relation and meeting at an apex juncture; said bottom wall comprising a pair of sloping portions extending from said sidewalls downwardly in a converging relation and meeting at a common juncture to form an apex; said internal truss structure including a pair of

intersecting crossbars, each extending from the region of the juncture between a sidewall and said bottom wall upwardly at an angle to the opposite top wall sloping portion; said crossbars intersecting intermediate the opposite ends thereof; and an intermediate wall extending vertically from the intersection of said intersecting crossbars to said bottom wall apex whereby said bottom wall apex is restrained against excessive downward movement during compression to facilitate lateral outward movement of said bottom wall portions.

2. A sealing member according to claim 1 wherein said sidewalls join said bottom wall at curved junctures.

3. A sealing member according to claim 1 wherein said intersecting crossbars join the lower portions of said sealing member at the junctures of said bottom wall with said sidewalls.

4. A sealing member according to claim 1 wherein said intersecting crossbars join the lower portions of said sealing member at said bottom wall below the junctures of said bottom wall with said sidewalls.

5. A sealing member according to claim 1 wherein said sidewalls are inclined downwardly in a converging relation.

6. A sealing member according to claim 1 including a pair of short bars extending downwardly from said sidewalls at an angle in converging relation to the lower portions of said intersecting crossbars.

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