United States Patent

[11] 3,595,141

[72] Inventors **Donald R. Boney**
North Baltimore;
Frank Kenneth Hall, Findlay, both of, Ohio

[21] Appl. No. **786,889**
[22] Filed **Dec. 26, 1968**
[45] Patented **July 27, 1971**

[73] Assignee **The D. S. Brown Company**
North Baltimore, Ohio

[54] **PAVEMENT AND BRIDGE JOINT SEALS**
9 Claims, 6 Drawing Figs.

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

[56] **References Cited**

UNITED STATES PATENTS

2,230,303	2/1941	Leguillon	94/18
3,178,778	4/1965	Reahard	94/18 UX
3,179,026	4/1965	Crone	94/18
3,323,426	6/1967	Hahn	94/18
3,395,627	8/1968	Barton	94/18 X
3,396,640	8/1968	Fujihara	94/18

Primary Examiner—Jacob L. Nackenoff
Attorney—Marzall, Johnston, Cook & Root

ABSTRACT: Elongated, hollow elastomer seals particularly useful for the sealing of concrete pavement joints, bridge deck joints, etc. against intrusion by liquids and incompressible solids and embodying bottom wall; substantially flat, elongated sidewalls; and an internal, thrust structure or network having elongated, downwardly diverging webs in the transversely median portion of the network and diverging from an apex at or below the longitudinal midportion of the top wall and one or more pairs of elongated, transversely laterally extending webs extending between the diverging webs and respective sidewalls.

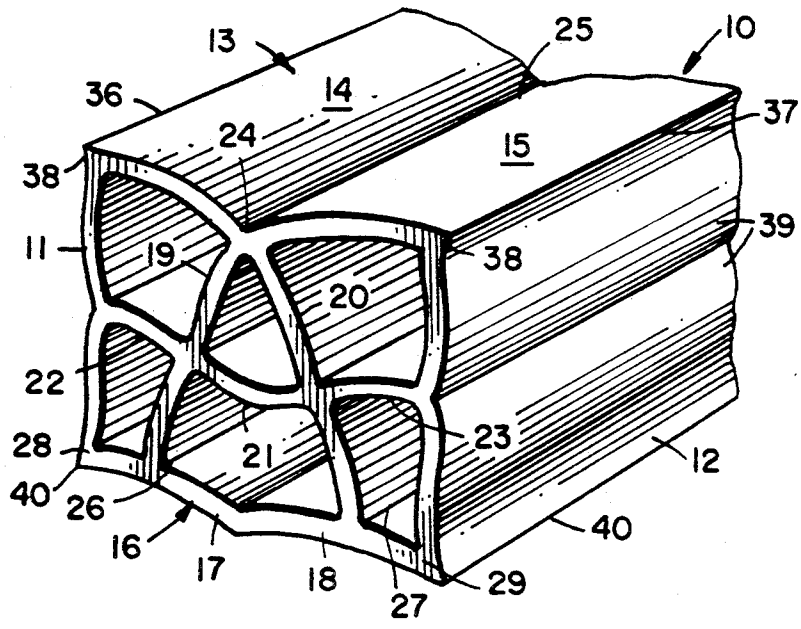


FIG. 1

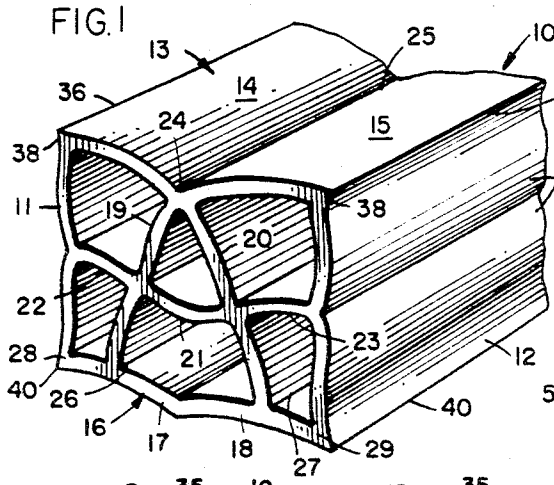


FIG. 3

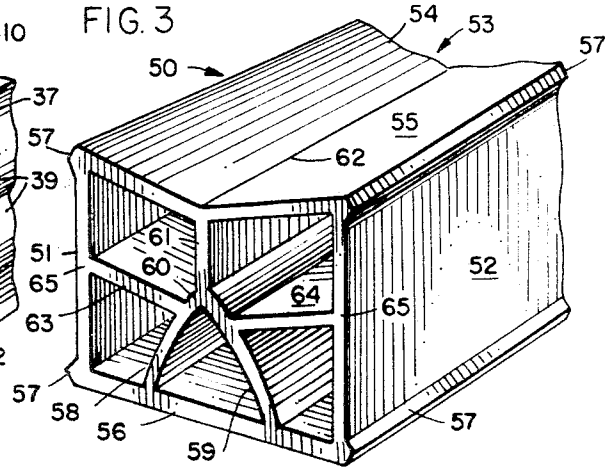


FIG. 2

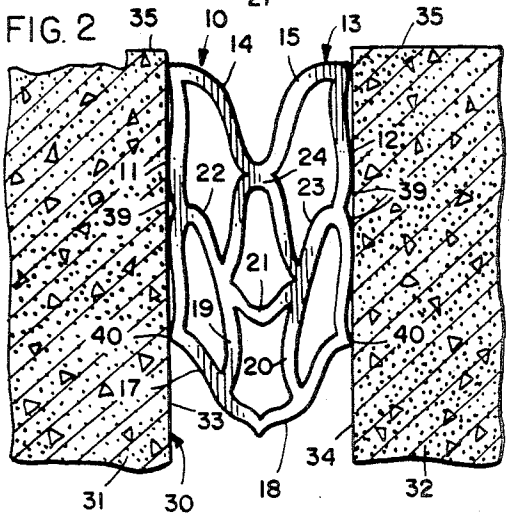


FIG. 4

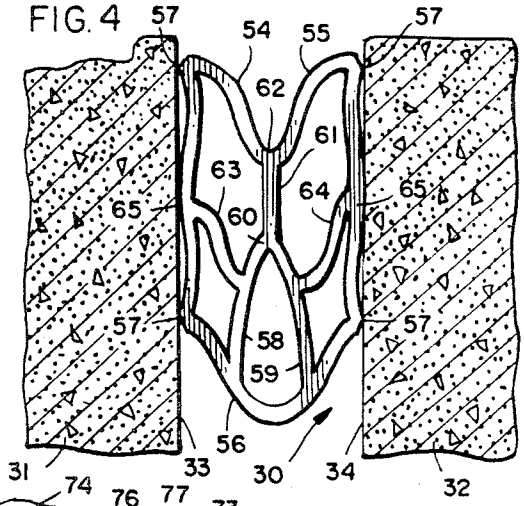


FIG. 5

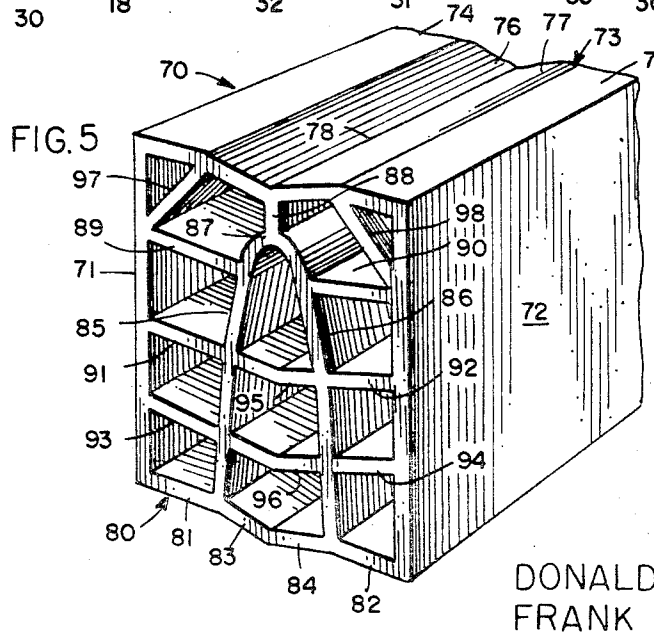
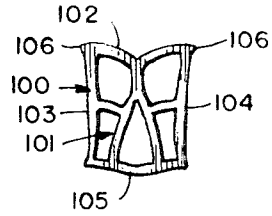


FIG. 6



INVENTORS:
DONALD R. BONEY
FRANK KENNETH HALL
BY: Marzall, Johnston, Cook & Root
ATT'YS

PAVEMENT AND BRIDGE JOINT SEALS

BACKGROUND OF INVENTION

This invention concerns improvements in elastomer seals for joints in concrete pavements such as highways, airport strips, bridge decks or floors and the like. They are particularly suitable for use in joints having a relatively large amount of movement during expansion and contraction inasmuch as their internal thrust structure and overall arrangement of the outer walls therewith provide a seal having good lateral thrust against the sidewalls of the joint over a wide range of movement of said joint. The seals herein are suitable for use as joint seals in contraction joints, expansion joints and bridge joints and may, if desired, also be used as seals for longitudinal joints, the latter having considerably less amount of temperature change-induced movement than the aforesaid joints.

In recent years, hollow, elongated, elastomer strips have been developed for use as seals in concrete joints such as expansion and contraction joints in concrete roadways, air strips, ridge joints, and the like. These joint seals are inserted in a laterally compressed state into the joints to seal them against intrusion by water, solids and the like. The sides of the joint seal strips are in tight, sealing contact with the sidewalls of the slots or grooves forming the joint.

Joints of the aforesaid character are used in concrete pavement or similar concrete structures to permit expansion and contraction of a given length of the concrete under varying temperature conditions. Expansion joints, which extend transversely across roadways at predetermined intervals through the full depth of the pavement, are wide enough to accommodate the lineal expansion or movement of pavement sections over the seasonal changes. Transverse contraction joints are formed less than the full depth of the pavement and control random cracking by creating transverse lines of weakness. They usually are formed by strip laid edgewise in wet concrete before or after the concrete is poured, or by sawing a groove across continuous strip of pavement, usually after the concrete has initially set. Contraction joints usually crack the full depth along said lines of weakness as the concrete shrinks during curing or hardening or sometimes later when the pavement contracts in cooler weather.

Bridge joints are generally wider and have more movement than do contraction joints and the usual expansion joints. Bridge joints in the floor or deck of a bridge are designed to accommodate expansion and contraction of the floor or deck.

In some highway designs, expansion joints are used in combination with contraction joints, e.g., in an arrangement of relatively widely spaced expansion joints and a plurality of contraction joints therebetween. Contraction joints allow pavement slabs to expand only to their original length. They do not accommodate relatively high orders of expansion of the concrete sections between the contraction joints with the result that some highways are designed to include expansion joints periodically in addition to the contraction joints to take up expansion of pavement which cannot be accommodated by the contraction joints between two expansion joints.

Longitudinal joints are formed between longitudinal strips of pavement, for example, of a two or more lane highway. The major function of longitudinal seals is to prevent foreign material from entering the longitudinal joints between the side-by-side strips or lanes of pavement.

It is desirable that all such joints be sealed in order to prevent accumulation of unwanted particles such as sand, gravel, or other incompressibles from entering the open joint, filling the joint, and thereby preventing the joint from closing upon expansion of the concrete in warm weather. Joints are also sealed to prevent infiltration of water, the freezing of which in cold weather can be responsible for heaving and cracking of the pavement or damage to the joint. In highways, water in some situations may erode away the subsoil adjacent the joint. In the case of bridges, water carrying dissolved chemicals, particularly salts used to deice or prevent ice on bridge decks, can be detrimental to metal and/or concrete understructures of the bridge.

It has been standard practice for many years to fill such joints with a rubber asphalt composition or similar type of caulking filler which would yield during warm weather when the width of the joint becomes smaller due to expansion of the adjacent pavement lengths. Joints having such filling materials must be repaired and replaced periodically and may require inspection and repairs at six month intervals. Caulking type fillers have several other disadvantages, a major one of which is that appreciable amounts thereon are squeezed out of the joints in warm weather when the joints are most closed and the sealing of the joints is lost when they open in colder weather.

Briefly, the subject invention concerns joint seals which are improvements over heretofore known caulking-type and elastomer joint seals. The subject joint seals are characterized by a relatively simple internal structure having a minimum of internal webs while retaining excellent, relatively constant, lateral thrust of the sidewalls of the seal against the sidewalls of the joint over a wide range of movement of the joint with the seal in various degrees of lateral collapse. It is important that such lateral thrust be maintained throughout the entire range of movement of the joint to maintain the sealing of the joint against intrusion of water, ice or snow and dirt or other incompressible solids, the latter two of which may preclude joint movement as the joint begins to close during the period of late spring through early fall. If the joint is unable to move, the pavement sections may become sufficiently stressed so as to cause heaving or random cracking of the pavement slabs.

Seals of the subject invention are capable of exerting a relatively constant lateral thrust against the sidewalls of the joint from the 50 percent collapsed state to about one-fifth (20 percent) collapse, said percentages being based on the uncollapsed width of the seal. The seals as initially installed preferably should exert at about 20 percent collapse approximately four pounds of thrust per lineal inch of joint. All such seals have a normal width dimension greater than the widest opening expected from the joint over its anticipated movement in the field. When the seal is in its fully collapsed state, it is laterally compressed to the degree that the walls and internal webs lie against each other and preclude further lateral collapse. When the joint has opened to its widest dimension, it is preferred that the seal be at least 15—20 percent laterally collapsed, i.e., a collapsed width of about 80—85 percent of the uncollapsed or normal width of the seal.

BRIEF DESCRIPTION OF INVENTION

The subject elongated, hollow elastomer seals have longitudinally elongated top, bottom and sidewalls defining a hollow, tubularlike elastomer member adapted to be laterally compressed and inserted in the laterally compressed state into joints of the character above described. The lateral or outward thrust of the sidewalls of the seal against the sidewalls of the joint is increased by an elastomer internal thrust structure functioning in coaction with the top, bottom and sidewalls to provide lines of increased localized thrust along at least the upper and lower edges of the sidewalls against the sidewalls of the joint.

The internal thrust structure of the subject seals comprises a pair of elongated, downwardly diverging webs in the transversely median portion of the seal as viewed in end elevation or transverse cross section. These diverging webs may be joined directly at their apex with the longitudinal midportion of the top wall. More preferably, however, they are connected at their apex with said longitudinal midportion of the top wall by a vertical, narrow web substantially midway between the sidewalls. The lower longitudinal edges of the diverging webs are joined with the bottom wall. Additional webs of the internal thrust structure include webs extending substantially transversely laterally between the aforesaid median portion of the internal structure and respective sidewalls of the seal. Such

webs preferably have an outward and upward slope in the transverse direction and are joined at their inner longitudinal edges with the aforesaid downwardly diverging webs. In some embodiments of the invention, the internal structure also includes one or more additional webs extending laterally between the diverging webs which additional webs may be substantially planar, horizontal webs or may have a shallow V configuration as viewed in end elevation or transverse cross section.

The top wall of the seals herein may be substantially flat but more preferably has a shallow V configuration at least along the longitudinal midportion thereof. If desired, the entire top wall may have a shallow V configuration. Furthermore for purposes of effecting a better seal of the upper, longitudinal edges of the sidewalls with the sidewalls of the joint, these upper longitudinal edges may have a small, laterally projecting, preferably substantially sharp-edged lip, each of which provides a relatively sharp longitudinal line of localized lateral thrust against the sidewalls of the joint along the respective upper corners of the seal.

The bottom wall may be substantially flat or planar or it may have a V shape, preferably a shallow V shape, at least in the longitudinal midportion, as viewed in end elevation or transverse cross section. The joinder of the top and bottom walls via the aforedescribed internal thrust structure, i.e., the downwardly diverging webs per se or such webs in connection with the vertical web extending between the longitudinal median portion of the top wall and the apex of the diverging legs, is a desirable arrangement of the internal structure. Upon lateral collapse of the seal, the bottom wall progressively assumes a deeper V configuration. By virtue of the connection of the bottom wall with a longitudinal midportion of the top wall via the aforesaid internal structure, he elastic recovery forces developed upon bending the substantially planar bottom wall creates an upward thrust therein. This upward thrust is transmitted through the internal structure of the seal with the result that elastic recovery forces in the bottom wall push the center portion of the top wall upwardly and thus augment the sealing thrust of the top wall at the primary lines of sealing of the joint, i.e., along respective upper corners of the sealing strip.

As will be described more particularly hereafter, one of the distinct advantages of the internal structure of the subject seals is that all or most of the webs thereof in the state of substantially full collapse of the seal are not bent transversely into bends exceeding substantially 90°. In fact, it is desirable to keep the diverging webs and apex-connecting web as straight as possible. One of the disadvantage of many of the known elastomer pavement or bridge joint seals is that such seals in the full state of lateral collapse have transverse bends in many of their webs of the internal structure well above 90° and often approaching 180°. The latter bends or folds cause considerable stress within the webs at the bends, particularly as they approach about 180° because such bends or folds place high amounts of stress in the web structures. Also, at high temperatures such as are common in pavements during the hot summer months, e.g., 100—140° F., the joints are in their most closed state and the seal is in its most laterally collapsed state. Field experience with the aforesaid prior art seals has shown a high incidence of internal web adhesion, which is permanent to the extent that in the following winter the seal does not expand laterally as the joint opens.

DESCRIPTION OF THE DRAWING

Preferred embodiments of the invention are illustrated in the drawing wherein:

FIG. 1 is perspective view of a fragmentary end section of a first embodiment;

FIG. 2 is n end elevation of an expansion joint in concrete pavement (shown in fragment) with the joint seal of FIG. 1 mounted therein in a laterally collapsed state;

FIG. 3 is a perspective view of fragmentary end section of a second embodiment of the subject joint seals;

FIG. 4 is a vertical section through a contraction joint in concrete pavement (shown in fragment) with the joint seal of FIG. 3 mounted therein in a laterally collapsed state;

FIG. 5 is perspective view of a fragmentary end segment of a third embodiment which is particularly useful for sealing wide joints such as bridge joints; and

FIG. 6 is an end elevation of a fourth embodiment of the subject sealing strips for sealing pavement joints having a relatively narrow width dimension, e.g., narrow contraction joints or longitudinal joints.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawing, the hollow, elongated elastomer seal **10** of FIGS. **1** and **2** embodies elongated, elastomer sidewalls **11** and **12** joined at their upper longitudinal edges with an elongated, elastomer top wall **13**. The top wall **13** preferably is symmetrically concave and comprises elongated, elastomer sections or strips **14** and **15** having a configuration in end elevation or transverse cross section of a shallow, substantially V shape. The lower longitudinal edges of the sidewalls **11** and **12** are joined with respective longitudinal edges of an elongated, elastomer bottom wall **16** which may be substantially flat or planar or may have a shallow, substantially symmetrical V shape as viewed in end elevation or transverse cross section and formed by the longitudinally elongated strips or segments **17** and **18**.

The internal structure of the seal embodiment of FIGS. **1** and **2** comprises a pair of transversely downwardly diverging, elongated elastomer webs **19** and **20**. The upper apex **24** of said webs is joined directly with the longitudinal midportion or nadir **25** of the top wall **13**, i.e., with the longitudinal line of juncture of segments or strips **14** and **15**. The lower longitudinal edges **26** and **27** of the diagonal webs **19** and **20** are joined with the bottom wall laterally inwardly of the respective longitudinal junctures **28** and **29** of the sidewalls and bottom wall.

The internal structure of the seal **10** also includes a substantially horizontal, elongated elastomer web **21** extending between the diverging webs **19** nd **20** at substantially the midpoint thereof. The web **21** may be substantially flat or may have a slight concavity, e.g., a shallow V shape, as viewed in end elevation or transverse cross section. The internal structure further includes an additional pair of transversely laterally extending, elongated elastomer webs **22** and **23** joined at their longitudinal edges respectively with one of the diverging webs **19** or **20** and one of the sidewalls **11** or **12**. The additional webs **22** and **23** may be substantially horizontal but preferably have a slight outwardly upward orientation for purposes later described. The internal structure of the seal **10** may be characterized as having an A-shape web configuration connected to the top and bottom walls as aforedescribed and also connected with the longitudinal midportions of the sidewalls **11** and **12** by the aforesaid substantially horizontal, elongated webs **22** and **23**.

The seal **10** as illustrated in FIG. **1** has a width dimension greater than its depth. Such seal is particularly suitable for sealing of expansion joints and narrow bridge joints. When the seal **10** is to be used in narrower joints such as contraction joints or longitudinal joints, the same general configuration of the top, bottom and sidewalls and the internal structure may be employed, the major difference being a change of the outside dimensions of the seal whereby the width is less than the depth of the seal.

When the seal **10** is mounted in a joint **30**, e.g., an expansion joint or small bridge joint, the seal is always in a state of lateral compression so that it is in sealing contact with the opposing faces **33** and **34** which form the space or joint between contiguous slabs of concrete **31** and **32**. The upper wall **13** of the seal is slightly below the upper faces **35** of the slabs **31** and **32**. In the laterally compressed state, the top and bottom walls collapse downwardly into a concave configuration of general V or U shape. It is particularly desirable that the top wall collapse concavely so that no portion thereof will protrude above

the surface 35 where such portion could be struck by automotive tires.

In the collapsed state, each side of the seal 10 is thrust into sealing contact with the faces 33 and 34 of the joint 30 in three longitudinal, general lines or zones of outward sealing thrust. The uppermost and primary seal occurs at the upper corners 36 and 37, which preferably are sharp corners formed by small, longitudinal, sharp-edged lip segments 38. Such sharp longitudinal lips exert localized or concentrated lines of thrust at the upper corners of the seal. The lateral outward thrust of the lips 38 against the faces 33 and 34 comes primarily from the elastic recovery forces in the top and bottom walls. The elastic recovery thrust of the downwardly bent top wall is augmented by the elastic recovery forces in the downwardly bent bottom wall 16, the latter forces being transmitted to the apex 24 via the diagonal webs 19 and 20. This coaction elastically urges the top wall 13 toward its unstressed shape as shown in FIG. 1 with the result that lateral pressure is transmitted via top wall strips or segments 14 and 15 into lateral thrust of the upper corners 36 and 37 against the joint faces 33 and 34.

The second zone of lateral thrust occurs in the vicinity of the respective junctures of the webs 22 and 23 with the sidewalls. In lateral collapse of the seal 10, the webs 22 and 23 assume a slightly bent, diagonally downward orientation. As the top and bottom walls elastically seek their unstressed shape (FIG. 1), webs 22 and 23 are pushed upwardly and outwardly and urge the longitudinal midportion 39 of sidewalls 11 and 12 into sealing contact with the faces 33 and 34 of the joint 30. The lower corners of the seal 10 may have at the junctures 28 and 29 small sharp-edged lips 40 similar to lips 38. The longitudinal, lower corners of the seal form the third line of longitudinal localized lateral thrust against the faces 33 and 34, which thrust is derived primarily from the elastic recovery forces in the strips or segments 17 and 18 of the bottom wall 16.

The embodiment of FIGS. 3 and 4 is a hollow, elongated elastomer seal 50 comprising substantially flat or planar sidewalls 51 and 52, a top wall 53 and a bottom wall 56. The top wall 53 may be substantially flat or planar but preferably has a shallow concavity, e.g., a shallow, substantially symmetric, V shape as viewed in end elevation or transverse cross section and composed of elongated, elastomer top wall strips or segments 54 and 55. The bottom wall 56 may be substantially flat or planar as illustrated or it may have a concave shape, e.g., a shallow V similar to the top wall 53.

At the respective junctures of the sidewall 51 and 52 and the top and bottom walls 53 and 56, the sidewalls 51 and 52 preferably have longitudinal, relatively sharp-edged lips or ribs 57. These lips or ribs provide localized lines of lateral thrust force at the corners of the seal against the faces 33 and 34 of the joint 30.

The internal structure of the seal 50 comprises transversely downwardly diverging, elongated elastomer webs 58 and 59 having their apex 60 substantially directly below the longitudinal midportion 62 of the top wall 53 and vertically aligned therewith. A narrow, vertical, elongated, elastomer web 61 is joined at its respective longitudinal edges with the apex 60 and the midportion or nadir 62, thereby tying top wall 53 and apex 60 together. Said internal structure further includes an additional pair of elongated elastomer webs 63 and 64 respectively joined at their longitudinal edges with the upper portion of diverging webs 58 and 59 and the longitudinal midportions 65 of said walls 51 and 52.

When the seal is mounted in the joint 30 in the laterally compressed state as shown in FIG. 4, the top wall 53 collapses downwardly and inwardly into a deeper V or U configuration. The bottom wall 56 also collapses downwardly and inwardly into a U or V configuration. The additional webs 63 and 64 may be substantially horizontal or more preferably have a slightly upward and outward inclination in the unstressed state of the seal (FIG. 3). Upon lateral collapse, these webs assume a slightly bent downward orientation and exert a lateral thrust on the longitudinal midportions 65 of the sidewalls 51 and 52.

As in the previous embodiment, the laterally collapsed seals exert a lateral thrust against the faces 33 and 34 in three primarily longitudinal lines or areas of localized lateral thrust. The uppermost lines of lateral thrust are at the upper corners of the seal wherein the upper lips 57 are thrust laterally against the faces 33 and 34 by the lateral recovery forces in the downwardly collapsed top wall 53. The latter forces are augmented by an upward thrust exerted against lateral midportions 62 of the top wall 53 by virtue of the elastic recovery forces in the downwardly collapsed bottom wall 56 and the transmission thereof through diagonal webs 58 and 59 and vertical web 61.

The second longitudinal line or area of lateral thrust occurs in the longitudinal midportion 65 of the sidewalls 51 and 52. These lines or areas of thrust are created primarily by the elastic recovery forces in the additional webs 63 and 64 and the wedginglike action thereagainst in the elastic forces tending to push the diagonal webs 58 and 59 upwardly. The third line of primary thrust or force is at the lower lips 57. The lateral thrust of these lips against the faces 33 and 34 is derived primarily from the elastic recovery forces in the downwardly collapsed bottom wall 56 in coaction with diverging webs 58 and 59.

It will be noted particularly from FIG. 4 that the webs of the internal thrust structure have no severe bends. The disadvantages of sharp bends in web structures of elastomer seals of the character described herein have been outlined above. Accordingly the subject seals avoid disadvantages found in heretofore known seals by avoiding overstress of the webs of the internal structure through sharp bends therein when the seal is in the fully collapsed state.

The embodiment of FIG. 5 is similar in many respects to the embodiment of FIG. 3. It is a seal of relatively large dimension primarily useful in sealing of large bridge joints in the order of two or more inches in width. The seal 70 comprises sidewalls 71 and 72 connected at their upper longitudinal edges by a top wall 73. The top wall 73 preferably has a concave shape as viewed in end elevation of the transverse cross section. Such concave shape may be provided, for example, by a pair of substantially horizontal, elongated longitudinal elastomer strips or segments 74 and 75 connected by a concave longitudinal midportion at the top wall 73 formed by downwardly sloping, elongated longitudinal elastomer strips or segments 76 and 77 joined at the longitudinal midportion or nadir 78 of the top wall 73.

The bottom wall 80 of the seal may have a similar shape provided by the substantially horizontal strips or segments 81 and 82 and the transversely downwardly sloping strips or segments 83 and 84 corresponding respectively to the strips or segments 74—77. Alternatively, the bottom wall may be substantially planar.

The internal thrust structure of the seal 70 comprises a pair of transversely downwardly diverging, elongated, elastomer webs 85 and 86 having an apex 87 substantially vertically aligned with the longitudinal midportion 78 of the top wall 73. The lower longitudinal edges of the downwardly diverging webs 85 and 86 are joined with the bottom wall 80 laterally inwardly of the respective junctures of the sidewalls and bottom wall, e.g., along the longitudinal lines of junctures of respective strips or segments 81, 83 and 82, 84. The apex 87 of the downwardly diverging webs 85 and 86 is connected to the longitudinal midportion 78 of top wall 73 by an elongated, narrow elastomer, vertical web 88 connected at its respective longitudinal edges to apex 87 and longitudinal midportion 78. Alternatively, apex 87 may be directly joined to the longitudinal midportion 78 as shown in the embodiment of FIGS. 1 and 2.

Elastomer seals of the type shown in FIG. 5 are heavy-duty seals and ordinarily have a considerable depth, e.g., two or more inches. Accordingly it is preferred to employ more than one set of additional pairs of laterally extending webs which are joined at their respective longitudinal edges to the sidewalls 71 and 72 and the downwardly diverging webs 85 and 86. In the illustrated embodiment, these webs comprise

three sets of elongated, elastomer web pairs **89** and **90**, **91** and **92**, and **93** and **94** in a substantially horizontally or more preferably slightly upwardly and outwardly inclined orientation. Each of such webs forms a longitudinal line or area of lateral thrust substantially at its juncture with its respective sidewall **71** or **72**.

Additionally, primarily because of the relatively large size of the seal **70** and the corresponding relatively large length of the downwardly diverging webs **85** and **86**, it is preferred to provide in the internal structure at least one additional web extending substantially horizontally between diverging legs **85** and **86**. In the illustrated embodiment, the upper half of the seal **70** corresponds substantially with the seal **50** of FIG. **3**. Webs **89** and **90** are joined to diverging legs **85** and **86** near the apex **87** and no further internal reinforcing is required between these legs at this point, as is the case with the seal **50** of FIG. **3**. However in the lower half of the seal **70**, the downwardly diverging legs **85** and **86** are preferably reinforced against substantial bending upon lateral collapse of the seal **70** by substantially horizontal webs **95** and **96**. These webs may be substantially flat or planar or may have shallow V configuration as viewed in end elevation or transverse cross section. They are preferably joined at their respective longitudinal edges to the downwardly diverging webs **85** and **86** at junctures substantially directly opposite the junctures of webs **91—94** with said downwardly diverging legs. If desired, the internal structure of the seals at the upper corner may be reinforced by elongated elastomer diagonal webs **97** and **98** extending downwardly and outwardly between the top wall **73** and respective sidewalls **71** and **72**.

In lateral collapse, the webs **89—94** assume configuration like webs **63** and **64** (FIG. **4**). Webs **95** and **96** collapse downwardly in a U or V configuration similar to that of web **21** (FIG. **2**). Diagonal webs **97** and **98** assume a shallow transverse bend or fold. The top and bottom walls collapse downwardly inwardly substantially as illustrated in FIGS. **2** and **4**. The top and bottom walls, the diagonal webs **85** and **86**, and the webs **89—96** coact substantially as above described in providing lines or areas of lateral thrust of the sidewalls **71** and **72** against the faces of the joint when the seal **70** is mounted therein in the laterally collapsed state.

The embodiment of FIG. **6** illustrates an elongated, elastomer seal **100** having a depth greater than its width. The general configuration of its top, side and bottom walls is similar to the embodiment of FIG. **3**, as is the internal structure **101** therein. The top wall **102** has a concave configuration as viewed in end elevation or transverse cross section, e.g., a shallow substantially V shape. The sidewalls **103** and **104** may be substantially parallel or may have a slightly downward taper. The bottom wall **105** may be substantially planar or have a shallow V configuration as viewed in end elevation or transverse cross section. Relatively sharp-edged lips **106** project laterally outwardly from only the upper longitudinal edges of the sidewalls **103** and **104**, their function being the same as that of lips **57** in the embodiment of FIG. **3**. Upon lateral collapse of the seal **100**, its top and bottom walls **102** and **105** and its internal structure **101** assume substantially the same shape and coact in substantially the same manner in providing lateral thrust of the sidewalls **103** and **104** against the faces of the joint as shown and described in reference to FIG. **4**. The seals of the type illustrated in FIG. **6** are relatively small seals, e.g., in the order of less than one inch width and are used primarily for the sealing of narrow contraction joints and longitudinal joints.

It is thought that the invention and its numerous attendant advantages will be fully understood from the foregoing description and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of the invention, or sacrificing any of its attendant advantages, the forms herein disclosed being preferred embodiments for the purpose of illustrating the invention.

In any of the forms of the invention herein, the seals should be made of good quality elastomer formulations in order that these seals retain their elastic properties with aging under environmental conditions. To this end, the elastomer composition should be an elastomer formulation which is extrudable, and which upon vulcanization, will be resistant to deterioration and/or loss of resilience after exposure to hot and cold weather conditions, sunlight, and like elements of nature in the use hereof in joints of pavement, air strips, and the like. Care should be exercised in selecting an elastomer formulation whereby the seal will retain its flexibility and elastic recovery force generation at the coldest temperatures to be encountered in the field. The presently best known elastomer is neoprene, particularly the crystallization-resistant types thereof.

The invention is hereby claimed as follows:

1. A hollow, elongated elastomer seal useful for sealing pavement joints and bridge joints comprising an elongated, hollow elastomer body having a substantially V-shaped top wall, substantially parallel sidewalls and a bottom wall joined to said sidewalls and configured to assume a progressively deeper concave shape upon lateral compression of said seal, and an internal web structure including a pair of laterally diverging webs having an apex portion joined to the nadir of said substantially V-shaped top wall, the lower ends of said diverging webs being joined to said bottom wall inwardly from the junctures of said bottom wall and said sidewalls in position to pull said diverging legs downwardly as said seal is laterally collapsed, and a pair of additional, lateral web members connecting said laterally diverging webs to a contiguous sidewall.

2. An elastomer seal as claimed in claim **1** wherein said apex portion of said diverging webs is joined directly with said nadir of said top wall.

3. An elastomer seal as claimed in claim **1** wherein said apex portion of said diverging webs is joined with said nadir of said top wall by a vertical web substantially midway between said sidewalls and having its longitudinal edges respectively joined with said apex portion and said nadir.

4. An elastomer seal as claimed in claim **1** wherein said additional web members are joined at their respective longitudinal edges with respective diverging webs at points near but below the apex of said diverging webs.

5. An elastomer seal as claimed in claim **1** wherein said seal has a plurality of pairs of said additional web members in vertically spaced relationship.

6. An elastomer seal as claimed in claim **5** herein said seal has at least one further web extending substantially horizontally between said diverging webs.

7. An elastomer seal as claimed in claim **1** wherein said seal has at least one further web extending substantially horizontally between said diverging webs.

8. An elastomer seal as claimed in claim **1** wherein said bottom wall is a substantially V-shaped wall.

9. An elastomer seal as claimed in claim **1** wherein said bottom wall is a substantially planar wall.

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,595,141 Dated July 27, 1971

Inventor(s) Donald R. Boney and Frank Kenneth Hall

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

First page, right-hand column, fourth line of the Abstract, "embodying bottom" should read -- embodying an elongated, preferably transverse concave top wall; an elongated bottom --.

Column 3, line 33, "he" should read -- the --; line 71, "n" should read -- an --.

Column 4, line 40, "nd" should read -- and --.

Column 8, line 54, Claim 6, "herein" should read -- wherein --.

Signed and sealed this 21st day of March 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents