Dec. 23, 1969 D. R. BONEY 3,485,149

ELASTOMER SEALING STRIPS

Filed Dec. 8, 1967

FIG. 1

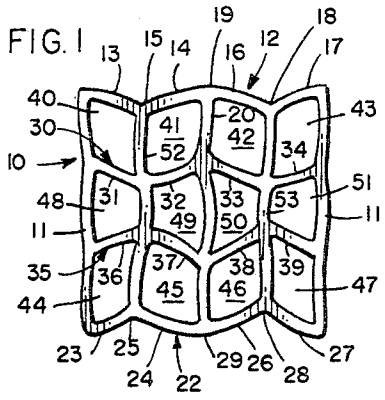

FIG. 2

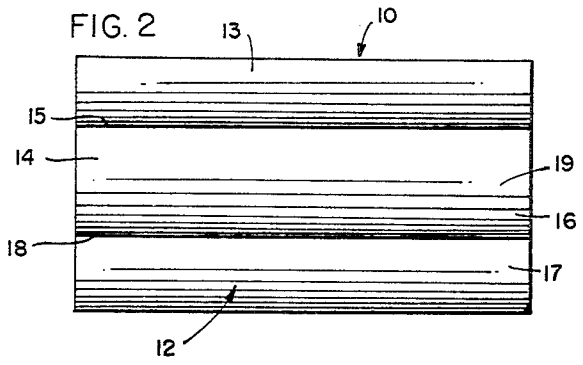

FIG. 3

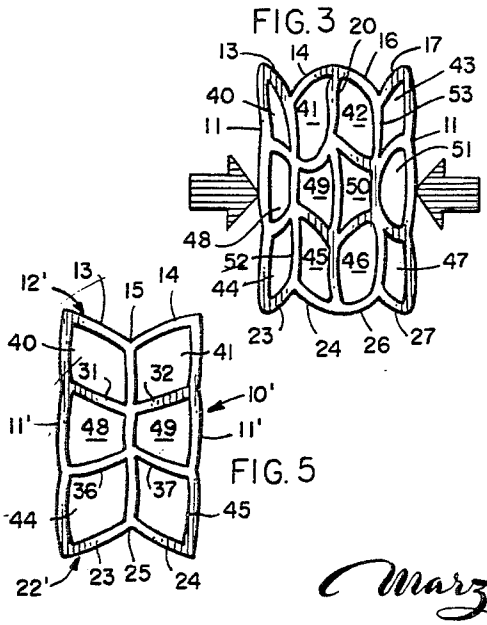

FIG. 4

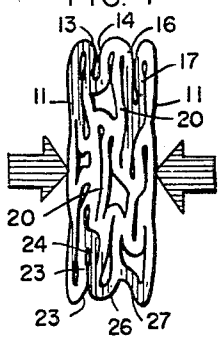

FIG. 5

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ELASTOMER SEALING STRIPS

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U.S. Cl. 94—18 4 Claims

ABSTRACT OF THE DISCLOSURE

Elongated, laterally compressible, elastomer sealing strips reversibly mountable in joints to seal same and having reinforcing web network of at least one vertical strip, and transverse webs intersecting same to provide elongated hollow spaces of essentially parallelogram and regular trapezoid transverse cross-section.

Background of the invention

The sealing strips of the invention may be used to seal joints in concrete members such as highways, airstrips, walkways, and the like. The joint seals prevent water accumulation in the joint and also prevent filling of the joint with incompressible solids such as dirt, sand and other foreign solids. These joints may be contraction joints, expansion joints, longitudinal joints or bridge joints.

Contraction joints are usually formed of sawed grooves extending transversely across the concrete strip to a depth less than the full depth of the concrete slab and serve as lines of weaknesses across the slab. When the concrete is stressed sufficiently by temperature changes it breaks along the lines of weaknesses.

Expansion joints also extend transversely across the concrete slab and, as a general rule, are wider than contraction joints. They usually are the full depth of the concrete slab and are provided to divide the slab into sections of predetermined length, each section expanding and contracting independently of other sections. The gap across the expansion joint narrows with expansion of the respective sections and widens with contraction of adjacent sections.

Longitudinal joints are narrow grooves running the length of a highway, usually between lanes thereof. Bridge joints, on the other hand, are grooves like expansion joints but may be much wider. They may be used between concrete sections adjacent each end of a bridge, as the joint between the concrete highway and each end of the bridge floor, and/or in the bridge floor itself.

The laterally compressed, elastomer seals keep their side walls in sealing contact with the side walls of the joint in all gap dimensions by virtue of the elastic lateral pressure which the reinforcing network exerts when the seals are under lateral compression. In many states, joints of highways and bridges have been sealed with elastomer strips embodying reinforcing networks comprising intersecting, diagonally extending webs forming with each other and with the side, bottom and top walls of the strip, elongated spaces of diamond and triangular shapes in transverse cross-section. Typical thereof are the networks shown in U.S. Patents No. 3,179,026 and 3,276,336. Such networks function reasonably well as reinforcing networks but have the disadvantage of formations of 180° bends in the diagonal web sections wherein the strip is under substantially maximum lateral compression. The overall elastic recovery of such strips is adversely affected through deterioration of the elastic properties of said diagonal web sections when they are held for long periods with substantially 180° bends there-

ing, e.g., during periods when the strips are under maximum lateral compression in the hot summer months, during which the highway or bridge sections are expanded by the warm climate conditions and direct sunlight thereon.

BRIEF SUMMARY OF THE INVENTION

The elongated, elastomer sealing strips of this invention have top, bottom and side walls and a reinforcing web network in a substantially symmetrical arrangement. The top and bottom walls have one or two pairs of transversely, inwardly sloping elastomer strip segments converging together to form one or two concave top wall or bottom wall sections. A vertical, elongated, elastomer wall extends between opposing points of convergence of said segments, and where the strip is one with two, side-by-side, concave sections in the top and bottom walls, another elongated, elastomer, vertical wall extends between the points of joinder of said sections.

The elongated, elastomer cross webs of the reinforcing network comprise an upper set in which the cross web sections are substantially parallel and substantially equal in width with the top wall segments respectively thereabove, and a lower set in which the cross web sections are substantially parallel and substantially equal in width with the lower wall segments respectively therebelow. This arrangement provides elongated hollow spaces in the elongated sealing strip comprising an upper and a lower series of hollow spaces of essentially non-rectangular parallelogram cross section and an intermediate series of hollow spaces of generally regular trapezoidal cross section.

In the fully collapsed state, the cross webs do not collapse into tight 180° bends. The sharpest angles in the reinforcing network at full lateral compression of the sealing strip occur at the junctures of the cross webs and the vertical walls.

The sealing strips herein are also reversible because the top wall and bottom wall are substantially mirror images of each other in transverse cross section. This structure has the advantage of permitting the strip to be inverted in the event the top wall should become punctured during installation or field use of the sealing strip. In sealing strips of the design in the aforesaid patents, the strip had to be discarded if its top wall were punctured because they were not invertible.

BRIEF DESCRIPTION OF DRAWINGS

The drawings illustrate preferred embodiments of elongated, elastomer sealing strips of the invention, wherein:

FIG. 1 is an end elevation of a sealing strip particularly suited for sealing wider joints such as expansion joints and bridge joints;

FIG. 2 is a top plan view of a fragment of the elongated strip of FIG. 1;

FIGS. 3 and 4 are end elevations of the strip of FIG. 1 under partial and full lateral compression; and

FIG. 5 is an end elevation of the basic unit of the seal strips of the invention and provides a narrower sealing strip useful in narrow joints such as contraction joints or even narrow expansion joints.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The embodiment of FIGS. 1–4 illustrate an elongated, extruded, elastomer sealing strip **10**. It has substantially parallel, vertical, essentially flat, elongated side walls **11** connected at their upper edges by top wall **12**. The top wall is composed of a first pair of elongated, transversely inwardly sloping, elastomer strip segments **13** and **14** converging together at juncture **15** and a side-by-side, second pair of elongated transversely inwardly sloping, elas-

tomer strip segments **16** and **17** converging together at juncture **18**. The respective pairs are joined at apex juncture **19**.

The bottom wall **22** is substantially the mirror image of the top wall. If strip **10** were rotated 180°, the bottom wall **22** would appear the same as top wall **12**. Bottom wall **22** comprises a first pair of elongated, transversely inwardly sloping, elastomer strip segments **23** and **24** converging together at juncture **25** and a side-by-side, second pair of elongated, transversely inwardly sloping, elastomer strip segments **26** and **27** converging together at juncture **28**. The respective pairs are joined together at apex juncture **29**.

The apex junctures **19** and **29** are connected by an elongated, substantially planar, elastomer, vertical wall **20** and junctures **15** and **25**, and **18** and **28** are connected by similar vertical walls **52** and **53**.

The upper set **30** of elongated, elastomer cross webs and a lower set **35** of elongated, elastomer cross webs extend between side walls **11** and intersect the mid-wall and vertical walls. The upper set **30** has substantially the same configuration as said top wall and comprises a first pair of elongated, transversely inwardly sloping, elastomer web segments **31** and **32**, which are respectively substantially parallel to top wall segments **13** and **14**, and a second pair of elongated, transversely inwardly sloping, elastomer web segments **33** and **34**, which are substantially parallel with top wall segments **16** and **17**. The lower set **35** has substantially the same configuration as said bottom wall and comprises a first pair of elongated, transversely inwardly sloping, elastomer web segments **36** and **37**, which are substantially parallel with bottom wall segments **23** and **24**, and a second pair of elongated, transversely inwardly sloping, elastomer web segments **38** and **39**, which are substantially parallel with bottom wall segments **26** and **27**. The respective pairs of web segments converge at the vertical wall **52** or **53**.

The side, bottom and top walls, together with the reinforcing network of vertical walls and cross webs, divide the hollow sealing strip into a plurality of elongated hollow spaces. The upper row of spaces comprises side-by-side, hollow spaces **40**, **41**, **42** and **43**, each of transverse cross section which is an approximate non-rectangular parallelogram. The lower row of spaces **44**, **45**, **46** and **47** is similar. The middle row of spaces is comprised of four substantially regular trapezoidal spaces **48**, **49**, **50** and **51** in back-to-back arrangement.

The basic unit for the elastomer reinforcing network of the invention is illustrated in FIG. 5. This embodiment may be used as a sealing strip for narrower concrete joints. The elongated, elastomer seating strip **10'** has side walls **11'** connected by concave top wall **12'** and concave bottom wall **22'**. It is the equivalent of the left half of the strip of FIG. 1 where vertical wall **20** (FIG. 1) becomes the right hand side wall **11'** (FIG. 5). Therefore, in FIG. 5 the remaining reference numerals designate the previously described components.

It will be seen in FIG. 1 that top wall **12** and the upper set **30** of cross webs **31–34** have the shape of a shallow W, while bottom wall **22** and the lower set **35** of cross webs **36–39** (being the mirror image of the former) have the shape of a shallow M. In the basic unit (FIG. 5), the top wall **12'** and upper web pair **31**, **32** have the shape of a shallow V while bottom wall **22'** and lower web pair **36**, **37** have the shape of an inverted, shallow V. The pairs of strip segments **13**, **14** and **16**, **17** in the top wall and pairs of strip segments **23**, **24** and **26**, **27** in the bottom wall form two, side-by-side, elongated, transversely concave segments in the respective top and bottom walls (FIGS. 1–4) or one transversely concave segment in each wall (FIG. 5). The concave segments in the top and bottom walls, under lateral compression of strip **10** or **10'**, each collapse into two inward folds (FIGS. 3 and 4) or into one inward fold in the case of FIG. 5.

The elastomer from which the sealing strips of the instant invention is made may be any suitable 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 thereof in joints of pavement, air strips, and the like. The preferred elastomer composition comprises neoprene formulations containing substantial proportions of neoprene characterized by low crystallization values at low temperatures, e.g., +14° F. to −20° F.

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.

The invention is hereby claimed as follows:

1. An elongated, elastomer sealing strip useful for sealing expansion joints, and bridge joints, and like joints in concrete comprising elongated, elastomer sidewalls substantially parallel to each other, an elongated, elastomer, vertical mid-wall substantially parallel to said side walls and about midway therebetween, an elongated, elastomer, vertical intermediate wall substantially midway between said mid-wall and respective sidewalls and substantially parallel therewith, an elongated, elastomer top wall extending across and connecting the upper edges of said side walls, mid-wall and intermediate walls, said top wall having segments sloping transversely upwardly from the upper edge of each intermediate wall to the upper edges of respective side walls and from the upper edge of each intermediate wall to the upper edge of said mid-wall, an elongated, elastomer bottom wall extending across and connecting the lower edges of said side walls, mid-wall and intermediate walls, said bottom wall having segments sloping transversely downwardly from the lower edge of each intermediate wall to the lower edges of respective side walls and from the lower edge of each intermediate wall to the lower edge of said mid-wall, and a pair of vertically spaced, elongated, elastomer, intermediate web members extending transversely between said side walls and intersecting said mid-wall and intermediate walls, each web member having segments extending between respective walls with respective segments substantially parallel to the contiguous segments of respective top and bottom walls.

2. A sealing strip as claimed in claim **1** wherein said walls and intermediate webs define an upper row and a lower row of side-by-side, hollow spaces, each of which in transverse cross-section is an approximate, non-rectangular parallelogram, and a middle row of hollow spaces, each of which in transverse cross-section is substantially regular trapezoidal in back-to-back arrangement.

3. An elasomer sealing strip comprising an elongated, hollow, elastomer member having elongated, elastomer, substantially parallel side walls, an elongated vertical mid-wall about midway between said side walls, a top wall extending across and connecting the upper edges of said sidewalls and mid-wall, said top wall having segments sloping transversely upwardly from the upper edge of said mid-wall to the respective upper edges of said side walls, a bottom wall extending across and connecting the lower edges of said side walls and mid-wall, said bottom wall having segments sloping transversely downwardly from the lower edge of said mid-wall to the respective lower edges of said side walls, and a pair of vertically spaced, elongated, elastomer, intermediate web members extending transversely between said side walls and intersecting said mid-wall, each web member having segments extending between respective walls with respective segments substantially parallel to the contiguous segments of respective top and bottom walls.

4. A sealing strip as claimed in claim 3 wherein said walls and intermediate webs define an upper row and a lower row of side-by-side, hollow spaces, each of which in transverse cross-section is an approximate, non-rectangular parallelogram, and a middle row of hollow spaces, each of which in transverse cross-section is substantially regular trapezoidal in back-to-back arrangement.

References Cited

UNITED STATES PATENTS

3,343,470	9/1967	Atkinson	94—51
3,358,568	12/1967	Brown	94—18
3,395,627	8/1968	Barton	94—18 XR
3,218,941	11/1965	Daum	94—18

OTHER REFERENCES

Acme Highway Products Corp. (Trade circular) p. 3, received July 17, 1963.

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