Dec. 11, 1951 J. E. CARTER 2,577,998

VERTICAL JOINT SEALING STRIP FOR CONCRETE SLAB ROAD PAVEMENTS

Filed Oct. 1, 1946

Fig. 1

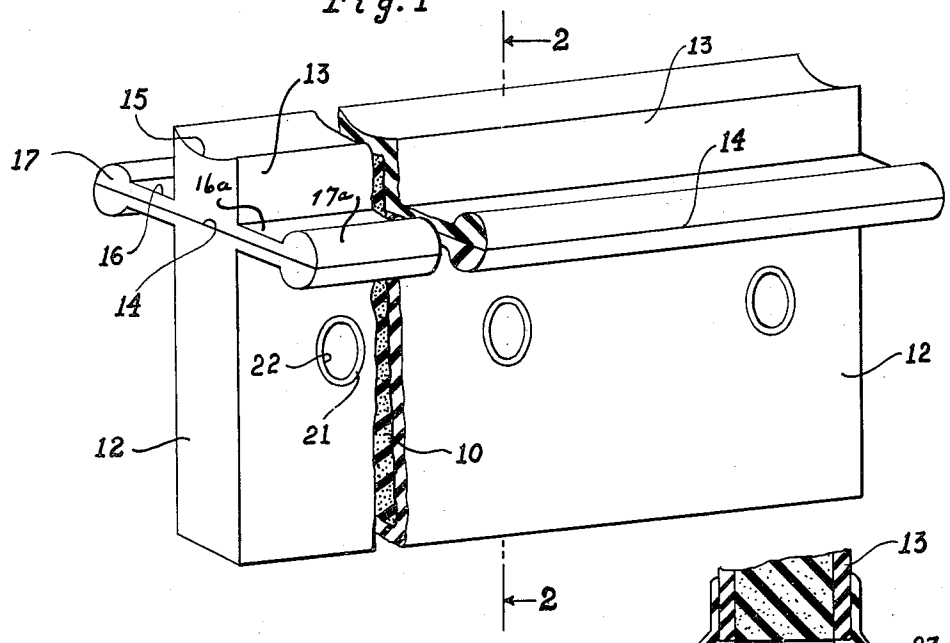
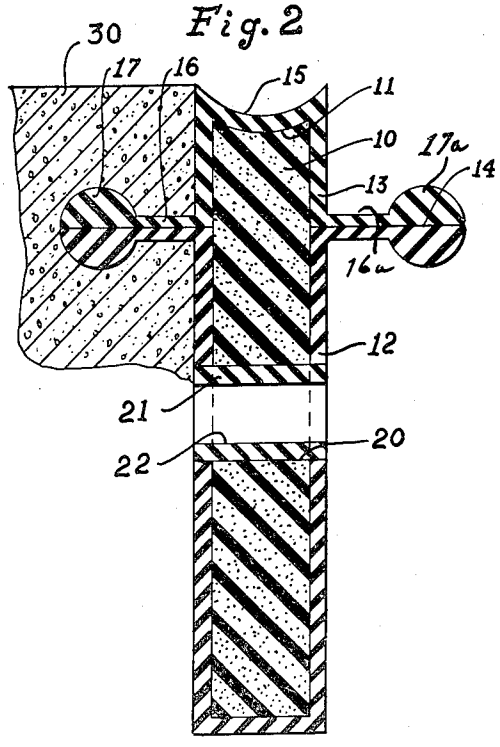


Fig. 2



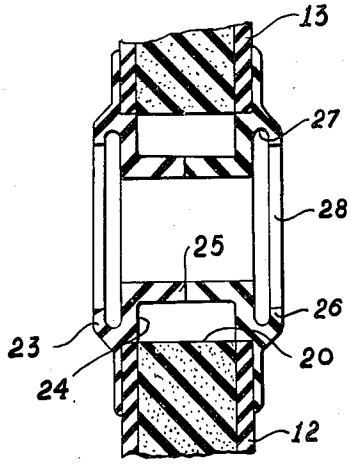


Fig. 3

INVENTOR.
JOHN E. CARTER
BY
DesJardins & Compton
HIS ATTORNEYS

Patented Dec. 11, 1951

2,577,998

UNITED STATES PATENT OFFICE

2,577,998

VERTICAL JOINT SEALING STRIP FOR CONCRETE SLAB ROAD PAVEMENTS

John E. Carter, Columbus, Ohio

Application October 1, 1946, Serial No. 700,532

6 Claims. (Cl. 94—18)

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This invention relates to a novel vertical joint sealing strip for concrete slab road pavements, and particularly pertains to a resilient strip made of a core of cellular elastomeric material encased in a sheath of solid elastomeric material provided with extension fins having beads which may be imbedded in the concrete to maintain the position of said strip, the said strip having holes therein for accommodating the passage of dowel bars connecting adjacent pavement blocks.

This invention is an improvement over the elastomeric strip described in my copending application for United States Letters Patent, Serial No. 670,793, filed May 18, 1946, and this application is a companion application to my application for United States Letters Patent Serial No. 700,531, filed October 1, 1946, and patented May 29, 1951 as Patent No. 2,554,522, claiming the process for making this novel joint sealing strip.

Vertical joint sealing means are provided for vertical joints between concrete slabs, to prevent the entry of water and dirt into such joints. Commonly, in the past, such joints have been made of bituminous material. More recently such joints have been plugged with strips of elastomeric material which have the advantage over the bituminous material of quickly regaining normal shape after being distorted by forces due to the expansion and contraction of the slabs.

Dowel bars are normally used to connect adjacent road slabs by being buried across the joint intervals therein at the time the concrete is poured upon the roadbed. It is, therefore, necessary when an integral joint sealing strip made of elastomeric material is to be placed at the intended joint interval, that it be placed on the roadbed prior to the pouring of the concrete and that it be supplied with apertures through which the dowel bars may be passed. It is also desirable that such joint sealing strips include formations thereon which extend laterally from the joint vicinity into the space to be covered by the concrete so as to be grasped by the concrete, as it hardens, to prevent escape of the strip from the joint and also to provide a water-tight seal against the downward penetration of water into the joint even though the concrete be so contracted as to open the joint farther than the main body parts of the strip will fill.

The novel elastomeric vertical joint sealing strip, which is the subject of this application, has the external contour of that described in my copending application for United States Letters Patent, Serial No. 670,793, but is an improvement thereover. Whereas, the former strip was an integral piece of rubber with internal parallel gas retaining channels piercing it, the strip of this invention provides an inner core made of cellular elastomeric material surrounded by a sheath of solid elastomeric material, but not attached thereto. The cells of the cellular material, being not inter-communicating, resist the passage or absorption of water and yet provide a spongy cushion against which the forces of the expanding concrete may push. The included air in the cells adds to the resilient nature of the elastomeric material to bring about a quick recovery of the strip after the compression forces have been removed. In order to more surely seal a joint against the entry of water, I provide a loose, close fitting outer casing of non-cellular elastomeric material for the core, which casing has laterally extending fins ending in longitudinal beads which are adapted to be mechanically bonded in concrete cast thereabout, I provide dowel bar apertures through the narrow dimension of said strip and I further provide seal means for said apertures which prevent water from entering in between the core and the case.

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Therefore, it is the principal object of my invention to provide a novel elastomeric vertical joint sealing strip, for concrete road pavement construction, including a cellular elastomeric core provided with an external elastomeric sheath.

Another object of my invention is to provide such a novel joint sealing strip made of cellular rubber and having a solid rubber sheath covering it.

Another object of my invention is to provide a vertical joint sealing strip for concrete slab road pavements which includes an elastomeric cellular core covered by a non-cellular sheath equipped with longitudinally extending fins adapted by their formations to be embedded and held mechanically by concrete cast thereabout.

Further objects, and objects relating to details and economies of construction, will definitely appear from the detailed description to follow. In one instance, I have accomplished the objects of my invention by the devices and means set forth in the following specifications, My invention is clearly defined and pointed out in the appended claims. Structures constituting the preferred embodiment of my invention, and a modified form thereof, are illustrated in the accompanying drawings forming a part of the specification, in which:

Fig. 1 is a perspective view of my novel joint sealing strip broken at a mid-portion thereof to show the internal construction.

Fig. 2 is a section of the substance of Fig. 1 on the line 2—2, looking in the direction of the arrows.

Fig. 3 is a modified section through a dowel bar aperture, the modification consisting in the use of another kind of dowel bar seal.

In the specification the same reference numerals refer to the same parts through the several views.

Of the elastomeric materials which I intend to be used in the making of my novel strip, I prefer the oil resistant types of synthetic rubber such as a butadiene-acrylonitrile copolymer, although other oil resistant natural rubbers or synthetic rubbers may be used. I contemplate the use of natural rubber or synthetic rubber compounded with toughening and vulcanizing ingredients and vulcanized to a tough resilience such as that associated with modern automobile tires. I am not in any way limiting the invention to the use of rubber, natural or synthetic, as I also contemplate the use of other materials having the same or similar characteristics of resilience, toughness, water resistance and atmospheric aging resistance.

By the use of the term "cellular" I mean elastomeric materials in which are included air or other gas enclosing cells which are not interconnected but are discrete within the material. Such cellular structure prevents the passage of water therethrough. I do not intend to restrict the invention to cores having an absolute cellular condition, as an approximation of that condition is all that is necessary to render the material suitable for the use it is to be put here. A strip having a core of cellular elastomeric material, in addition to more readily conforming and responding to the action of the concrete thereabout, has the added advantages of lightness in weight and cheapness of material cost, inasmuch as less elastomeric material is used for a given length of the strip.

Referring to Figs. 1 and 2, the cellular core **10** is made pre-molded to a width equal, or nearly so, to the intended joint width of the pavement, of the length equal to, or approximately so, of the intended joint length, and of a height equal to, or approximately so, of the intended vertical joint height. The core is generally rectangular but the top edge is made concave as at **11** so that upon lateral compression of the strip the concavity will absorb most of the excess of the upward extrusion of the core as it is compressed. Closely surrounding the core, but loose therefrom, is a sheath formed of elements **12** and **13** which are vulcanized together on a seam **14**. Elements **12** and **13** are boots made of solid sheet elastomeric material, and preferably are of the same material as is the core **10**, and vulcanized to a tough resilience. The top edge of member **13** is concave as at **15**, to fit the contours of the upper surface **11** of the core. The laterally extending fin portions, like fins **16** and **16***a* and the beads **17** and **17***a*, provided on either long side of the sheath elements are spaced below the top edge about one quarter of the distance of the depth of the strip, and form bead contours which, when concrete **30** is poured thereabout, locks the outer casing, formed of members **12** and **13**, into the concrete so that if the concrete contracts to where the main thickness of the strip will not completely fill the joint the fin or neck portions, like neck **16** will prevent the entry of water down into the gap.

After the core and casings are assembled, dowel

bar apertures like aperture **20** (Fig. 2), are cut through the thickness of the strip and are sealed with elastomeric cylindrical seals such as seal **21** and the aperture, such as aperture **22**, and said seals permit the passage of dowel bars through the strip without interfering with the water sealing effectiveness thereof. The function of such seals and dowel bars are more fully described in my copending application Serial No. 670,793, which has been referred to.

Referring to Fig. 3, I show a modified form of seal consisting of two seal pieces such as piece **23** having an aperture sealing portion **24** and a neck portion **25** which meets a similar neck portion of a seal **26** extending from the opposite side of the same aperture. These seals have grooves like groove **27** for use where the dowel bars are provided with casings in which they are floating, and the casings by flange ends are locked into the seals by said grooves like groove **27**, and lip **28**, such being more fully described in another copending application of mine for United States Letters Patent, Serial No. 691,689, filed August 20, 1946, and patented May 23, 1950, as Patent No. 2,508,443.

It is apparent that my novel joint sealing strip has the advantages of being light in weight, easy to make by common rubber molding methods, and forms an absolutely water tight and permanent joint for concrete slab road pavements. In action, deformations occasioned to the encasing envelopes are easily compensated for by reason of the thinness of the casing which allows a stretching thereof without interfering with the shape of the inner core.

I am aware that the device disclosed herein, and its modification, may be varied considerably without departing from the spirit of my invention and therefore, I claim my invention broadly as indicated by the appended claims.

Having thus described my invention, what I desire to claim as new and useful is:

1. A resilient and compressible joint sealing strip for insertion in the joint space between adjacent cast concrete slabs of a roadway comprising the combination of an elongated core strip, of substantially rectangular cross-section, formed of cellular elastomeric material, a solid elastomeric relatively thin sheath completely enveloping said core strip and closely surrounding it, but loose therefrom, and fins laterally extending from opposite sides of the sheath carrying means for interlocking with the adjacent ends of the concrete paving slabs.

2. The strip of claim 1 wherein the material used for the cellular strip is vulcanized rubber.

3. A resilient and compressible joint sealing strip for use in making a cast concrete slab road pavement upon a roadbed, including, in combination, a strip-like core of cellular elastomeric material; and a solid elastomeric sheath closely encasing said core, but loose with respect thereto, said sheath having extending laterally therefrom, on either of the long sides thereof, integral fins ending in beads which may be gripped by concrete cast about the strip as it is set on one long edge on a roadbed.

4. A resilient and compressible joint sealing strip for use in making a cast concrete slab road pavement upon a roadbed, including, in combination, a core of cellular elastomeric material; a sheet of solid elastomeric material covering said core closely but unconnected therewith, said core with covering being pierced at intervals, between the broad surfaces thereof, by dowel bar apertures; and a cylindrical elastomeric seal fitted into each

of said apertures, whereby to admit the passage of dowel bars therethrough.

5. A resilient and compressible joint sealing strip for use in making a cast concrete slab road pavement upon a roadbed, including in combination, a strip core made of waterproof cellular elastomeric material; and a solid elastomeric sheath closely encasing said core, said core and sheath being pierced at intervals from side to side by dowel bar apertures; waterproof elastomeric sleeves fitted in each aperture and sealing the interior of the case and the core against entry of water.

6. The strip of claim 5 in which the casing has extending laterally from the longitudinal surfaces thereof fins ending in beads which are adapted to be grasped by concrete cast about the strip as it stands on edge on a roadbed.

JOHN E. CARTER.

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