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METHOD OF SEALING EXPANSION JOINTS

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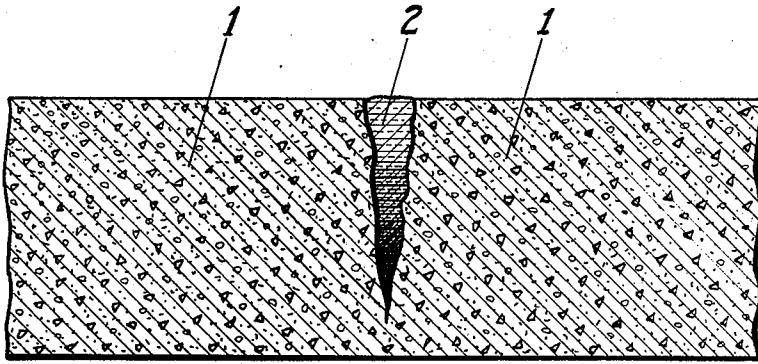


Fig. 1

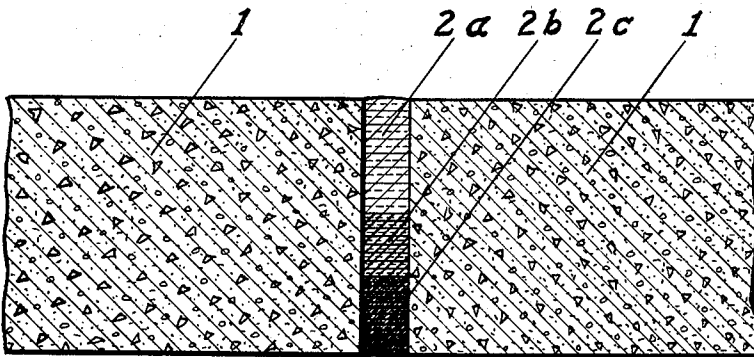


Fig. 2

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UNITED STATES PATENT OFFICE

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METHOD OF SEALING EXPANSION JOINTS

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5 Claims. (Cl. 94—18)

My invention relates to improvements in methods of sealing pavement and like expansion joints and more particularly relates to improved means and products for sealing open joints or cracks in pavements, sidewalks, roadways, walls and other similar structures. One of the objects of my invention is to provide highly efficient means for filling expansion joints in concrete, asphalt and composition highways at the time of their construction, and another of the objects of my invention is to provide efficient repair means for filling cracks and openings in highways, sidewalks, roadways, pavements and the like, as they appear from time to time due primarily to the effects of expansion and contraction or uneven settling of the foundation of the structure.

For a better understanding of the invention, reference will be made to the accompanying drawing, forming a part of this specification, in which Figure 1 is a sectional view through an expansion joint sealed in accordance with the present invention, and Figure 2 is a sectional view through a slightly different type of expansion joint also sealed in accordance with the present invention.

For the purpose of better illustrating the novel features of my invention, there are shown in the drawing two joints closed in accordance with the method involved in my invention. Figure 1 is a cross section through a crack or fissure in which 1, 1 is the original pavement material and 2 is the improved sealing material, the chemical nature and the physical characteristics of the sealing composition changing progressively from the upper surface of the seal to the lower extremity of the sealing composition. Similarly Figure 2 is a cross section of a portion of an expansion joint in which 1, 1 is the original paving material, 2a is the surface portion of the expansion joint seal, 2c is the lowermost portion of the seal, of different chemical nature and of different physical characteristics than the portion 2a, and 2b is an intermediate portion of the seal, differing in chemical nature and in physical characteristics from the portion 2a and 2c but grading into each of these materials at the line of junction.

My invention involves the use as an expansion joint sealing material of a chemical mixture which is initially either a liquid or a plastic solid at ordinary temperatures and which can be changed by either heat or chemical means to an elastic and relatively tough and strong solid, and my invention further involves the filling of a crack or expansion joint with such a product,

and then supplying either heat or a chemical reagent to the surface of the seal, to both chemically and physically modify the surface portion of the seal without correspondingly changing the lowermost portion of the sealing composition, so that my finished seal comprises an initially homogeneous filling which has been rendered chemically and physically heterogeneous in situ by the application of either heat or a chemical reagent to the surface of the seal, the thermal or chemical effects then penetrating through a portion of the seal but not through the whole of the seal, so that the upper portion of the seal possesses different physical and chemical characteristics than those possessed by the lowermost portion of the seal. With some materials the change is progressive, through the whole of the extent of the seal, as shown in Figure 1, while in the case of other materials, (and particularly where liquid or gaseous modifying reagents are applied at the surface and are allowed to penetrate downward into the liquid or plastic intermediary sealing composition) the material at the bottom of the crack or fissure is entirely unaltered and the material at the top of the fissure is completely or substantially completely altered to the final tough vulcanized or polymerized condition, while a portion of the material intermediate between the upper completely-converted product and the lowermost completely unaltered liquid or plastic product is partially converted (as shown in Figure 2) into a partially reacted or partially converted product which blends above into the completely reacted product and which blends at its lower extremity or boundary into the completely unaltered filling material.

Although caoutchouc is by far the most satisfactory product for use in accordance with my present invention, my invention is broader than the use of caoutchouc and vulcanization of the surface portion of the caoutchouc in situ, as I can obtain related and somewhat similar pavement seals by other means not involving the use of caoutchouc at all.

As an example of a pavement seal which does not involve the use of any caoutchouc whatever, I may fill an expansion joint with a phenolic condensation product of the usual intermediate phenol-formaldehyde type, preferably employing such intermediate or partially heat-converted phenolic condensation product in admixture with a filling agent such as infusorial earth, wood pulp, asbestos fiber, or an admixture of these materials, and I may then apply heat to the surface portion of this pavement seal, to modify the sur-

face portion of the sealing composition to a hard tough product, without similarly permitting heat to extend to the composition in the lower portion of the seal, thus leaving the lowermost portion of the phenolic condensation product still relatively tender and very soft and very plastic. Instead of a phenolic condensation product, I may employ a heat-hardening material such as tung oil or "China-wood oil", such oil being preferably admixed with a filler such as wood pulp, and the surface portion of the mass being then thermolyzed to form first a gummy and subsequently an elastic mass, the surface portion of the finished seal being thus tougher than the lower portions of the seal, and the surface portion of the seal being elastic and yielding, although non-plastic, while the lowermost portion beyond the distance to which the heat employed in the surface treating operation extends remains permanently soft, sticky and plastic.

Although in the preferred embodiment of my invention I prefer to employ heat as my polymerizing, vulcanizing or hardening agent, it will of course be evident that it is possible to make use of chemical reagents in an exactly similar way, and accordingly my invention is broader than the use of heat alone. Employing caoutchouc, for example, or vulcanizable oils in admixture with filling agents, I find that it is entirely possible after filling the expansion joint with a homogeneous vulcanizable mixture to paint the surface or the crack or fissure with a vulcanizing agent such as sulfur chloride in a solvent such as carbon bisulfide, and instead of painting the surface with a plurality of layers of such vulcanizing composition, as a means of obtaining surface vulcanization of the mass, I find it is possible to merely lay a fabric saturated with such a vulcanizing mixture on the surface of the roadway over the filled crack or fissure, the fabric being in turn covered by earth, a plate of metal, or any suitable material for retarding the evaporation of the vulcanizing agent into the air with the subsequent wastage of a portion of the material.

Applicant is aware of the use, prior to the present invention, of tar, asphalt, rubber, phenolic condensation products and the like, as constituents of pavement sealing compositions. In view of the possibility of such materials becoming somewhat hardened or indurated at their exposed surfaces through the long continued effects of natural climatic influences such as sunlight, or summer warmth, rain or oxidation from the atmosphere, applicant specifically disclaims as any part of his invention any surface hardening due solely to the slow influence of natural agencies for long periods of time.

Applicant is also aware that prior to the present invention heat has been applied in the upper portions of masses of asphalt, tar or the like, for the purpose of fusing or melting such surface portions of a pavement seal made of a fusible material. Applicant specifically disclaims such application of heat to such tarry or asphaltic mixtures in the absence of vulcanizing, indurating or hardening agents in such tarry or asphaltic mixtures, capable under the application of heat of bringing about the hardening or indurating of such mixtures. Applicant's invention relates specifically to the application of heat or reagents applied in situ to mixtures of chemically-reactive compositions capable of becoming indurated or hardened as a result of such treatment.

As tar, asphalt, etc. in the absence of specific indurating or vulcanizing agents become softened rather than hardened by the application of heat, applicant specifically disclaims the mere heating of bituminous or other compositions, in the absence of specific indurating or vulcanizing reagents, and for the mere purpose of smoothing, fusing or melting the surface thereof.

The term homogeneous as used in this specification, means substantially uniform in composition and in physical characteristics in major units of weight or of volume, but does not mean microscopically or chemically homogeneous, as applicant prefers to employ mixtures of reactive base material containing suitable "fillers", as herein specifically described.

It will be evident that many modifications may be made within the limits of the present disclosure, without departing from the principles as herein set forth, and accordingly no limitations should be placed upon my invention except such as are indicated in the appended claims.

I claim:

1. The process of sealing pavement joints which comprises filling a homogeneous material selected from the group of vulcanizable but substantially unvulcanized products and polymerizable but incompletely polymerized products into the open space defining such joint and thereafter heating the surface portion of such material to harden it and render it non-plastic without similarly heating the material filling the lower portion of such joint.

2. The process of sealing pavement expansion joints which comprises filling a homogeneous material selected from the group of vulcanizable but substantially unvulcanized products and polymerizable but incompletely polymerized products into the open space defining such joint and thereafter heating the surface portion of such material to harden it and render it non-plastic without similarly heating the material filling the lower portion of such joint.

3. The method of sealing openings between adjacent paving units which comprises filling the open space between such adjacent pavement units with a homogeneous unvulcanized rubber composition and thereafter vulcanizing the rubber composition at the pavement surface by the application of heat without similarly hardening the rubber composition at the bottom of the opening.

4. The method of sealing openings between adjacent pavement units which comprises filling the open space between such adjacent pavement units with a homogeneous plastic mass selected from the group of vulcanizable but substantially unvulcanized products and polymerizable but incompletely polymerized products and thereafter modifying the surface portion of the sealing agent by the application of heat to form a tough non-plastic product without correspondingly heating material occupying the lower portion of the expansion joint.

5. As a new composition of matter, a pavement comprising a plurality of blocks of paving material separated by expansion joints filled with an organic sealing composition of tough non-plastic nature at the exposed surface of the joint and of progressively softer nature beneath the surface and grading to a soft and plastic nature at the lowermost portion of the joint.

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