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2,479,434

METHOD OF CONSTRUCTING CENTER PARTING AND CONTRACTION JOINTS AND SEALING EXPANSION JOINTS IN PAVEMENTS

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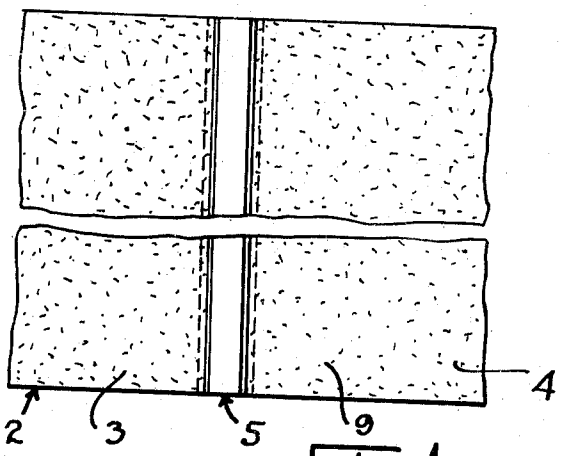


Fig. 1.

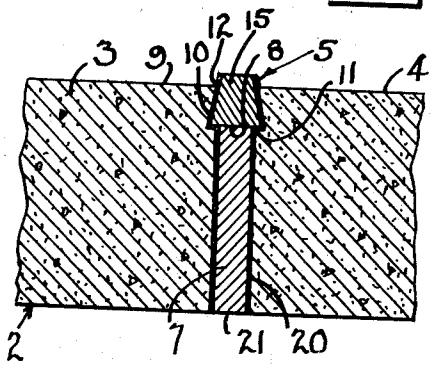


Fig. 2.

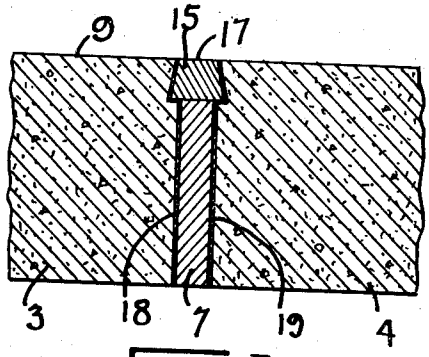


Fig. 3.

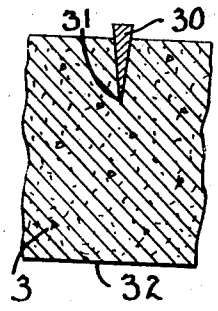


Fig. 4.

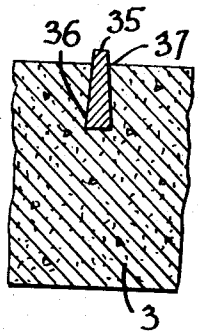


Fig. 5.

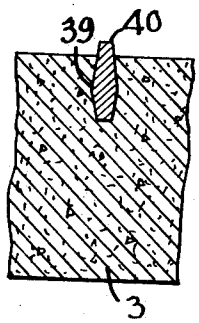


Fig. 6.

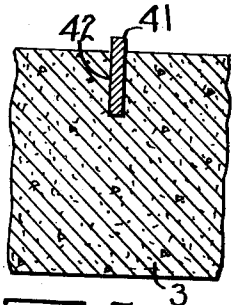


Fig. 7.

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METHOD OF CONSTRUCTING CENTER PARTING AND CONTRACTION JOINTS AND SEALING EXPANSION JOINTS IN PAVEMENTS

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6 Claims. (Cl. 94—22)

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The invention relates to center parting and contraction or dummy joint constructions for concrete pavements, slabs and the like, as well as a sealing strip for expansion joints.

In forming concrete pavement and similar slabs such as airport runways and the like, if the slab has any substantial width there must be a center parting joint provided due to the fact that when rain and moisture are absorbed by the earth at the edges, there is a certain amount of expansion tending to raise the edges of the slab and when evaporation occurs the edges of the slabs will settle and an irregular crack will form longitudinally along the slab. In order to insure that such crack will occur in a straight line along the center of the slab a plane of cleavage can be formed by providing a center parting joint longitudinally of the slab.

Contraction or dummy joints are formed at spaced intervals along the slabs so as to form a transverse plane of cleavage as the slab expands and contracts so as to insure a straight crack across the slab.

The present invention contemplates that the location of these cracks for both the center parting joint and the contraction joint can be determined by positioning a suitable strip of material in the green concrete as the pavement is formed or by routing out some of the concrete after it has taken a set and a suitable strip of material positioned in the groove or recess thus formed. This in substance reduces the thickness of the slab at this point and when stresses are applied to the concrete slab due to expansion and contraction longitudinally or to raising or lowering of the edges the crack will naturally occur along the strip thus formed.

It is therefore one of the objects of the invention to provide a strip of precompressed material which can be inserted in either green or existing concrete which will swell due to the absorption of moisture to fill the joint and maintain a seal therefor.

In providing expansion joints at spaced intervals for concrete pavements, slabs and the like, difficulty has been encountered in sealing such a joint to pevent the entrance of foreign matter and water and the present invention contemplates a sealing strip for any type of expansion joint wherein a strip of precompressed material is inserted in either green concrete or in existing expansion joints so that it will swell by the absorption of moisture and provide a seal for the joint.

Another object of the invention is to provide

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a sealing strip for expansion joints, contraction joints and center parting joints which will fill the joint at all times due to its inherent ability to expand upon the absorption of moisture.

Another object of the invention is to provide a wood or fiber board strip which has been precompressed to the desired percentage of its original thickness and to then insert it in a groove in the concrete so as to permit its expansion and locking in position due to swelling upon the absorption of moisture.

Another object of the invention is to provide a sealing strip for existing pavement joints of various types wherein a precompressed member is inserted in the joint at the surface so as to expand to fill and seal the surface of the joint by absorption of moisture.

Another object of the invention is to provide a sealing strip having various configurations adaptable to expansion joint and parting joint configurations so that the strip may expand upon the absorption of moisture and lock itself in position in the concrete.

Another object of the invention is the method of providing an expansion joint wherein a precompressed waterproofed strip of material is positioned in the forms prior to the depositing of the concrete and the concrete then laid to a depth of approximating one inch over the top of the strip so that the strip does not interfere with the finishing operations and then after the concrete has taken its initial set the material over the strip may be routed out to form a groove of a suitable configuration into which a retainer or locking strip of precompressed material may be thereafter inserted so that it will expand and form a seal against the entry of foreign matter.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings wherein:

Fig. 1 is a top plan view looking down on a concrete slab construction which has been provided with the expansion joint of the invention.

Fig. 2 is a transverse vertical section across the joint showing the expansion strip and the locking strip disposed in position.

Fig. 3 shows the same section as that of Fig. 2 with the retainer strip finished off to the level of the pavement.

Figs. 4, 5, 6 and 7 are all vertical sectional views showing a center parting or contraction joint strip which is adapted to effect a plane of cleavage as the concrete sets, but which strips

will expand to fill the joint adjacent the surface of the pavement.

The present invention relates to some extent to the general disclosure of my copending application Serial Number 506,995 for an expansion joint filler filed October 20, 1943, and since abandoned, wherein various details of procedure are outlined and which are hereby incorporated herein.

In Fig. 1 a pavement 2 has been illustrated as including the slabs 3 and 4 whose ends are arranged in spaced relation to form the expansion joint 5.

Fig. 2 shows a sectional view of the joint wherein the expansion strip 7 has been positioned on edge in the forms and the concrete material making up the slabs 3 and 4 deposited thereabout. It will be noted that the upper edge 8 of this expansion strip 7 is positioned a short distance below the surface 9 of the pavement slabs and that when the concrete is deposited it will be floated over the upper edge 8 so that the finishing operation may be a continuous one so that the stopping, lifting and carrying of the finishing equipment over the expansion joint is avoided. This results in a substantial saving in the cost of operation of the finishing machine and is the common practice in highway, street, and airport construction.

After the concrete has taken its initial set, any suitable tool may be used to rout out a portion of the material above the upper edge 8 of the strip so as to form a groove or recess 10. This recess may take any desired configuration, but in Figs. 2 and 3 it is shown as an inverted keystone wherein the base 11 thereof is considerably wider than the entrance 12 at the surface 9 of the concrete.

After the concrete has taken its final set, and the groove is a rigid construction, a locking or sealing strip 15 can be inserted therein in a pre-compressed condition so that it has a lesser width than the neck 12 of the groove 10. This strip is of a material which has the ability to absorb moisture and due to its pre-compression will be of lesser thickness than the neck of the groove and which will expand due to the absorption of moisture after it is inserted in the groove. It will then swell to the shape shown in Fig. 2 so as to completely fill the groove 10 and form a seal which will be compressed and expand with the expansion and contraction of the concrete slabs respectively.

After the strip 15 has had sufficient opportunity to swell to the size of the groove, the upper edge thereof may be finished off as at 17 in Fig. 3 so that it will be flush with the surface 9 of the pavement.

The foregoing procedure results in an expansion joint which completely fills the area between the slab ends 18 and 19 but which is capable of compressing when the slabs expand. The expanding operation of the slabs, however, merely tends to compress the material of the strips 7 and 15 and possibly squeeze some of the moisture therefrom. When the slabs contract the inherent expansibility of the strips 7 and 15 causes them to expand and follow the slab ends 18 and 19 so as to maintain a tight and sealed joint at all times.

The material of the strips 7 and 15 may be any suitable material which can be pre-dried if necessary, pre-compressed the desired percentage of its normal thickness and which is capable of swelling upon the absorption of moisture. In actual practice, however, I have found that wood or fiber board is a suitable material and that preferably pine, creosote treated or untreated, California redwood, red cedar, cypress and similar woods are capable of coming within the specifications of the material to be used.

The foregoing description as to the sealing strip 15 has been given in combination with the particular type of expansion joint of my prior application above referred to, but it is to be understood that the sealing strip 15 may be applied by itself to either existing or newly formed expansion joints of any other type, form or construction where the concrete of the slab end can be shaped to the desired configuration to receive an expansible sealing strip.

For purposes of description of an expansion joint formed by the combination of the strips 7 and 15 as seen in Figs. 1 to 3 the strip 7 may be a board of a suitable wood which has been compressed to say 65% of its normal thickness and room dried if desired. Such board may then be waterproofed with a layer 20 of waterproofing material on the sides thereof as seen in Fig. 2. The bottom edge 21 and the top edge 8 may or may not be waterproofed as desired. If the strip is to be applied immediately it can be deposited on edge in the forms and the concrete positioned about it. If the upper edge 8 is waterproofed it will prevent the entrance of moisture to a substantial extent while the concrete is taking its initial set. After the recess 10 is routed out this waterproofing material may be removed from the upper edge 8 just prior to inserting the sealing strip 15.

The thickness of the strip 7 will be such that when it is set it will be approximately 70% of its original thickness so as to allow for both expansion and contraction of the slabs and a working range for the strip of approximately 30% for either expansion or contraction. This thickness may be computed or determined due to various circumstances such as the atmospheric conditions in the location where the joint is being formed, the temperature at the time the pavement is being laid, the nature of the sub-soil and various other factors may come into consideration, but generally it is intended that the strip will be of such a thickness that when the slabs are contracted the maximum contemplated amount that the strip will have swelled due to the absorption of moisture so as to completely fill and maintain a tight joint. In other words, the strip must be of such thickness that it will swell sufficiently when it absorbs moisture so as to fill the joint even under the maximum dryness or low temperature to be encountered in the particular locality of the joint.

If the strips are to be compressed and then transported to the location it may be desirable to enclose them in suitable moisture proof containers or it may be desirable to place the waterproofing material on all sides and ends of the strip after it has been dried and compressed so as to maintain it at the desired dimensions prior to use.

The strip 15 will be formed similar to the above description for the strip 7 and as detailed in my copending application Serial No. 506,995. It seems obvious that this strip 15 may take various configurations, but the inverted keystone shape which has been shown seems to be adaptable for the purpose because the swelling of the strip will cause it to lock itself in position and to also maintain the joint filler in the intended position. The sides of this strip 15 may be

waterproofed as seen in Figs. 2 and 3 if desired. This strip may take a rectangular form so that the greatest compression of the material due to swelling will be at the neck 12 of the groove so that the material will prevent the entrance of foreign matter into the joint under all circumstances and also present a compressed surface 17 to the traffic. While the strip 15 may be waterproofed on its sides to the elevation of the surface, such waterproofing preferably extends to the top and may be omitted from the bottom and top of the strip as shown in Fig. 2. The manner of forming these pieces 15 may vary, and they may be either cut to the shape and pressed, pressed first and then cut, or they may be moulded of fiber.

In using the sealing strip 15 here disclosed in new expansion joints constructed of semi-plastic or other material of the usual types the groove or suitably shaped recess can be formed as desired and the pre-compressed strip, either waterproofed or not as desired, inserted and allowed to swell by the absorption of moisture to form a seal.

In laying most pavements a center parting strip or joint is provided so that as the concrete slab settles at the edges in dry weather and rises due to expansion of the sub soil in wet weather that the center of the slab will act as a hinge to permit this working of the edges of the slab. If no definite plane of cleavage adjacent the center is provided an irregular crack develops which is unsightly and undesirable. In order to provide a plane of weakness at the center it is contemplated that the positioning of a strip 30 of material such as seen in Figs. 4 to 7 may be employed. In such a situation the fact that a groove 31 extends partly into the slab 3 causes a plane of weakness at this position so that a crack will develop from the base 31 of the groove on down to the base 32 of the slab.

Figs. 4 to 7 inclusive show different configurations of the strips 30 which can be positioned by routing out a groove in the concrete before it has taken its initial set and the insertion therein of the strip 30 which may be made in accordance with the previous description for the preparation of the strips 15, and such strips may or may not be waterproofed, as desired.

Fig. 4 shows a triangular strip, Fig. 5 shows a wedge shaped strip 35 whose base 36 is wider than the neck 37 of the opening in which it is positioned. Fig. 6 shows the groove 39 as having been formed with a double taper or double wedge shape to receive the double tapered strip 40.

Fig. 7 shows a rectangular strip 41 which is deposited in a similarly shaped groove or recess 42. All of these strips are of pre-compressed material and of sufficient depth to extend into the concrete to give a self sealing joint. It is important that this parting strip joint be sealed at the surface to prevent any flow of water therethrough into the sub-surface at the center of the pavement causing any such infiltration of water to cause expansion of the sub-soil and additional cracking of the concrete.

Contraction or dummy joints are formed transversely of the pavement intermediate the spaced expansion joints so as to control location of transverse cracks. Such a joint should be initially formed by a material which will remain in firm contact with the upper portion of the concrete as the crack opens and should compress without extrusion when the concrete expands while still having the capability of reexpanding if necessary. The filler for such a contraction joint must exclude sand, soil, pebbles, and water; it must remain flush with the pavement surface; be practically permanent, and preferably blend in color with the pavement. The constructions shown in Figs. 4 to 7 and described as center parting strips may be used in providing contraction or dummy joints transversely of the pavement.

As an illustration of positioning a center parting strip or a contraction or dummy joint strip a piece of suitable wood such as Redwood, cypress, cedar or the like will be cut to the desired length, and formed to say two and one-half inches wide with a thickness of one-quarter inch at one edge and one-half inch at the other edge. This strip is then compressed to half or two-thirds of its original thickness and waterproofed. The strip is then inserted in the surface of the concrete to a depth of about two inches in the green finished concrete. The concrete is then refinished along the edges of the strip and the corner of the concrete should not be rounded. After the concrete hardens if the strip extends above the surface of the concrete it will be trimmed flush with the concrete surface and a suitable liquid which may include a non-evaporating or non-freezing liquid applied so as to cause swelling. This swelling action creates a compressive force against the concrete which not only fills the space to exclude foreign matter, but also sets up a pressure tending to prevent the undue flexing of the concrete and tends also to support the concrete at the joint. Where the strip is to be inserted in replacement of a prior strip or where the concrete has set and a groove routed out to receive it the strip need not of necessity be waterproofed.

Under some conditions water may not be available due to arid conditions or in other situations the freezing of the water might be objectionable so that it may be desirable to use a non-evaporating and anti-freezing fluid such as commonly used for automobile radiators. It has been found that such a non-evaporating, non-freezing fluid will expand precompressed wood in much the same manner as will water.

If sufficient water may not be available in some cases due either to high evaporation or arid climate it may be desirable to use a non-evaporating fluid to expand the compressed members. Since such a fluid does not evaporate it will be present in the filler to effect expansion at all times regardless of climatic conditions. Should the non-evaporating fluid become insufficient for expansion of the members due to being squeezed out by repeated compressions of the members it may be replaced by pouring additional fluid into the opening left between the filler member and the end of the slab when the pavement contracts.

In locations where extremely low temperatures occur and water is used for expanding the compressed member, the water may freeze and the resultant expansion may result in damage to either the compressed member or the pavement and it may be advisable in some such cases to use an antifreezing fluid as an expanding medium for the compressed member.

Broadly the invention contemplates a self sealing parting contraction or expansion strip capable of maintaining a seal during expansion and contraction of the concrete by the absorption of moisture and consequent swelling due to the fact that it has been precompressed prior to installation.

What is claimed is:

1. A method of creating a concrete pavement or slab construction including positioning a pre-dried, pre-compressed waterproof strip of water

swellable material at the location of the joint, such strip having its upper edge below the level of the surface of the slabs, depositing the concrete about and over said strip, allowing the concrete to take its initial set, forming a groove in the surface of the concrete to the top edge of the strip, said groove having a wider base than top, inserting a pre-dried, pre-compressed strip of water swellable material in said groove, allowing such strip to swell so as to fill the groove when the concrete expands and contracts.

2. A method of creating a concrete pavement or slab construction including positioning a pre-dried, pre-compressed waterproof strip of water swellable material at the location of the joint, such strip having its upper edge below the level of the surface of the slabs, depositing the concrete about and over said strip, allowing the concrete to take its initial set, removing a groove in the surface of the concrete to the top edge of the strip, said groove having a wider base than top, forming the waterproofing from the upper edge of said strip, applying moisture to the exposed said strip, inserting a pre-dried, pre-compressed strip of water swellable material in said groove, allowing such strip to swell so as to fill the groove when the concrete expands and contracts.

3. A self sealing concrete pavement joint including a body of pre-dried, pre-compressed, waterproofed material capable of swelling upon the absorption of moisture after having the green concrete deposited thereabout, a groove formed in the concrete to uncover the upper edge of such body before the concrete takes its final set, a retainer strip of like material inserted in said groove whereby the inherent expansibility of the body and strip upon the absorption of moisture causes the strips to bear against the slab ends and exclude foreign matter.

4. A self sealing concrete pavement joint including a body of pre-dried, pre-compressed, waterproofed material capable of swelling upon the absorption of moisture before having the green concrete deposited thereabout, a groove

formed in the concrete to uncover the upper edge of such body before the concrete takes its final set, a retainer strip of like material inserted in said groove whereby the inherent expansibility of the body and strip upon the absorption of moisture causes the strips to bear against the slab ends and exclude foreign matter, the base of said groove and retainer strip being wider than said first strip so as to wedge said retainer strip against removal.

5. A method of sealing a joint in concrete pavements which comprises inserting a strip of swellable material therein, and thereafter applying a non-evaporating, non-freezing fluid to the strip to be absorbed and effect swelling of the strip to seal the joint.

6. A method of providing a line of cleavage for contraction, dummy or center parting joints in pavement comprising, shaping a strip of wood so that the bottom is wider than the top, compressing and drying the strip, forcing the wide bottom into a pavement of green concrete, refinishing the concrete to settle it about the strip, so that the strip will absorb moisture after the concrete has set to swell and anchor itself in the concrete.

WILLIAM J. VAN LONDON.

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