Oct. 25, 1932. R. B. GAGE 1,884,647

TRANSVERSE JOINT FOR CONCRETE PAVEMENTS

Filed July 24, 1931 2 Sheets-Sheet 1

Fig. 1

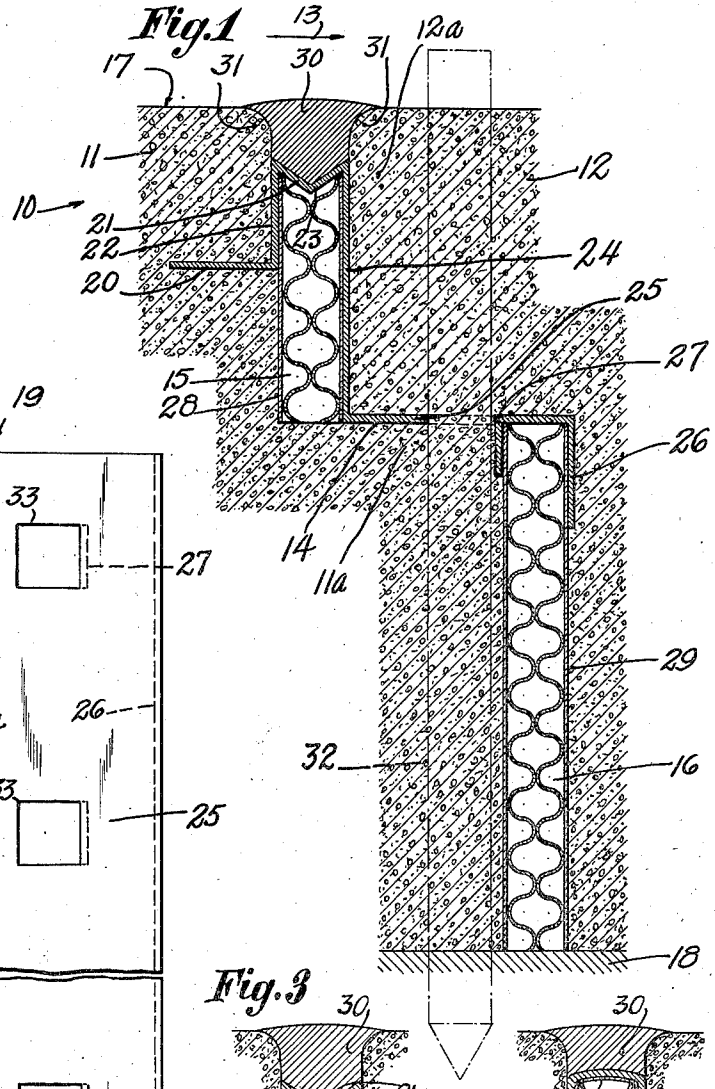


Fig. 2

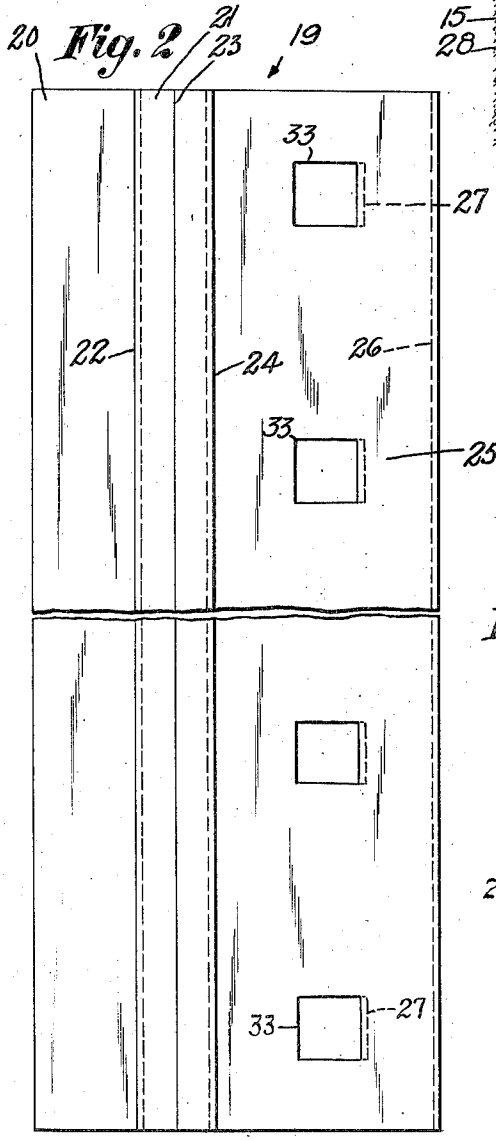
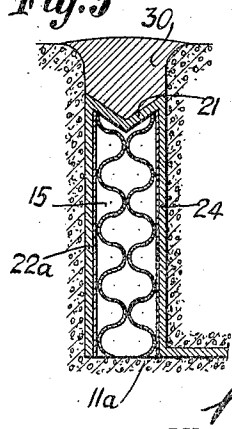


Fig. 3



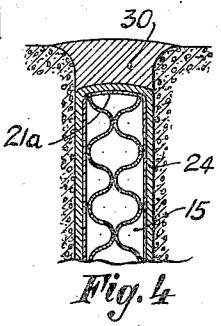


Fig. 4

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TRANSVERSE JOINT FOR CONCRETE PAVEMENTS

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Fig. 5

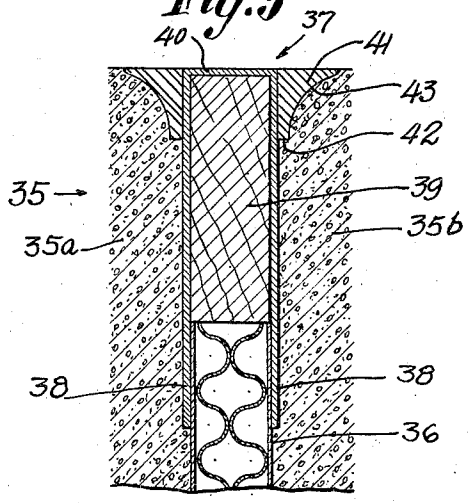
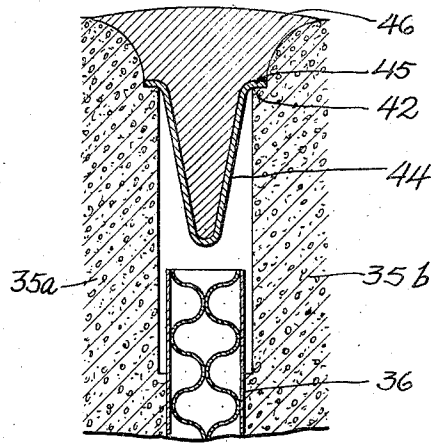


Fig. 6



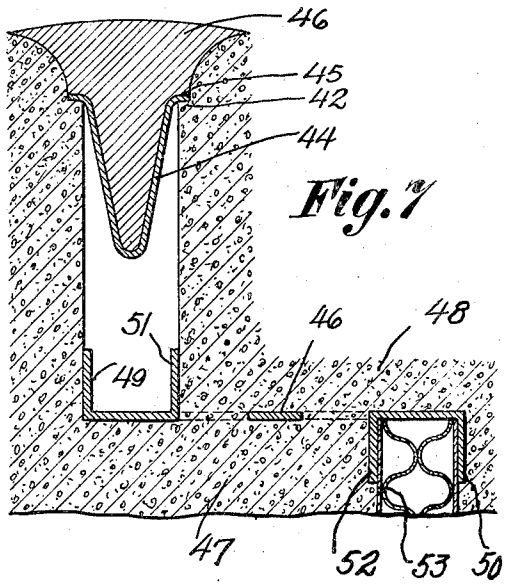


Fig. 7

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UNITED STATES PATENT OFFICE

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TRANSVERSE JOINT FOR CONCRETE PAVEMENTS

Application filed July 24, 1931. Serial No. 552,895.

This invention relates to transverse expansion joints for concrete pavements, and to methods of making the same.

One object of the invention is to provide an improved expansion joint for a concrete structure or pavement including a filler so arranged that the joint will be substantially liquid tight despite contraction of the concrete, and whereby the filler will not in any material degree be forced out of the joint upon expansion of the concrete.

Another object of the invention is to furnish improved means for constructing an expansion joint in a concrete pavement which shall permit the pouring and setting in an expeditious and convenient manner.

Another object of the invention is the provision of an expansion joint for concrete pavements, which joint includes offset portions arranged in an improved manner for affording a supporting relation between adjacent slabs of concrete while maintaining in a high degree the efficient action of the joint.

A further object of the invention is to provide an improved expansion joint and method of making the same to obtain ruggedness, reliability and the maintenance of a uniform pavement, in a simple, practical and inexpensive manner, with a long life of the pavement and little or no cost for upkeep and repair.

In expansion joints for concrete pavements heretofore used, it has been known to place in the joint as a filler a bitumen containing inert material applied in various ways. In certain types of expansion joints I have found that upon expansion of the concrete an excessive portion of the filler is forced out of the joint; in other types of joints, particularly if including a filler of premolded bitumen, the joint is partially open when the concrete contracts, so that surface waters flow into the subgrade destroying its stability and causing an excess heaving of the pavement by frost action.

Another defect that I have observed in connection with the pavement expansion joints of the prior art is that the edge portion of the concrete slab on the far side of the joint in the direction of traffic is frequently depressed or forced out of the plane of the pavement, although the slab on the near side of the joint is not thus affected. It has been attempted to remedy this defect by the provision of dowel bars extending across the expansion joint and connected to the adjacent concrete slabs which are cast therearound. But such bars either bend or otherwise fail to prevent the relative dislocation of the concrete slabs.

It is therefore an object of this invention to overcome the foregoing defects, and other objects will be apparent as the specification proceeds.

With the aforesaid objects in view, the invention consists in the novel combinations and arrangements of parts hereinafter described in their preferred embodiments, pointed out in the subjoined claims, and illustrated on the annexed drawings, wherein like parts are designated by the same reference characters throughout the several views.

In the drawings:

Figure 1 is a view in vertical section of a device embodying the invention, and showing in dotted lines an element utilized in course of construction of the joint.

Fig. 2 is a top plan view of a member that constitutes a part of the invention.

Figs. 3 and 4 are fragmentary vertical sectional views of modified forms of the expansion joints.

Fig. 5 is a fragmentary vertical sectional view of a modified method of making an expansion joint.

Fig. 6 is a similar view showing the completed modified joint.

Fig. 7 is a fragmentary vertical sectional view of a further modification of the expansion joint.

The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined in one and the same structure, but, useful devices may be produced embodying less than the whole.

It will be obvious to those skilled in the art to which this invention appertains, that the same may be incorporated in several different constructions. The accompanying drawings, therefore, is submitted merely as show-

ing the preferred exemplification of the invention.

Generally described, my invention provides an expansion joint for concrete pavements wherein only the top portion of the joint opening contains a plastic filler. Adjacent concrete slabs overlap at the expansion joints so that, preferably, the slab on the near side of the joint in the direction of traffic offers support to the slab on the far side of the joint. This may be regarded, broadly, as an interlocking sliding structure embodying an expansion joint, and with an intersupporting action between the adjacent slabs according to the direction or directions of traffic, permitting uniform and fluid tight joint operation with the maintenance of a smooth, even pavement surface at the joint.

Referring in detail to the drawings, 10 denotes a device embodying the invention. The same may include portions of a plurality of adjacent slabs 11, 12 made of a material such as concrete. Assuming that the direction of traffic is indicated by arrow 13, the slab 11 is seen to be on the near side of the joint and the slab 12 on the far side thereof. These slabs may, for convenience, be denominated as the near side slab and the far side slab respectively. The slabs may be provided with mating offset portions 11*a* and 12*a* at different elevations so that the near side slab affords support to the far side slab. These offset portions may have relative sliding coaction preferably along a horizontal plane at 14 which forms a part of the expansion joint. Extending upward and downward from this plane, there may be the spaced vertical joint compartments 15 and 16 respectively, the former extending to the pavement surface 17 and the latter to the road bed 18. The plane 14 may be at any suitable point intermediate of the pavement surface and the road bed consistent with the strength of the concrete and the maximum load that it is designed to carry. It is thus seen that the far side slab 12 has a snug and reliable overlapping bearing support on the near side slab 11 so that the load on the subgrade 18 is adequately distributed and a plane pavement surface maintained at the joint.

To facilitate the construction of the expansion joint, and according to the method hereinafter particularly set forth, a suitable mold means may be utilized which may consist of various materials and be of different shapes and constructions. One form of mold means 19 which may be advantageously employed may include a portion or lining 19 of sheet metal of a requisite degree of stiffness, and which may form a single means for molding the offset, overlapping portions of the joint and such associated parts as may be desired. The lining 19 may have a series of longitudinally extending flanges or parts and it may include a laterally extending anchor flange 20 that may be embedded in the near side of the slab 11. From the flange 20, a cap or filler support 21 may extend into and across the joint compartment 15 preferably in proximity to the pavement surface 17. The filler support may be connected to the anchor flange 20 as by a vertical plate portion 22, the flange 20 being at a substantial distance below the pavement surface. The filler support 21 may be concaved, preferably downward, as by means of a band at 23 so as to deform and allow for expansion of the concrete. Extending downward from the filler support 21 to the sliding surface 14 is a plate portion 24 spaced from its companion portion 22, these being close against the opposite main face of the slabs 11 and 12 in the joint compartment 15. The wall portion 24 may be provided with a lateral flange member or separating portion 25 extending in opposite direction to the anchor flange 20 and preferably disposed along the plane 14 between the offset slab portions 11*a* and 12*a*. At its extreme edge portion, the member 25 may have engagement means for a purpose hereinafter described, and which may include a downward extending lip or flange 26 disposed at the far side of the joint compartment 16, and a plurality of longitudinally spaced downwardly struck tongues 27 at the near side of said compartment.

Positioned in the joint compartments 15, 16 are compressible filler means, such as strips 28, 29 of corrugated paper. These strips substantially entirely fill their respective joint compartments, the strip 28 extending into and being engaged between the wall or holding elements 22 and 24, and the strip 29 being engaged at its upper edge between the holding elements 26, 27 and resting at its lower edge on the subgrade 18.

At the top of the expansion joint is a filler 30 of suitable plastic or semiplastic sealing material which may consist in whole or in part of bitumen. The filler 30 rests upon the support 21 and uniformly occupies the top of the joint. It may also extend over the rounded edges 31 of the slabs 11 and 12. It will be noted that the mass of the filler 30 is relatively small so that no material amount thereof will be squeezed out of the expansion joint when the concrete expands. The sealing is moreover such as to prevent entrance of any water into the expansion joint. It may also be remarked that when the concrete expands, the concave bitumen support at 23 moves slightly downward, thus partially compensating for the decreased volume of the joint. In contraction of the concrete, the stresses on the means 19 will balance, while in expansion of the concrete a sufficient balance of stresses is maintained together with such distribution of strains as to have no effect upon the operation of the expansion joint.

The method of constructing the expansion joint will now be described. After the subgrade has been properly prepared, the metal partition 19 may be mounted where the expansion joints are to be located, as by anchor pins 32 that may be passed through snug fitting holes 33 in the mold means and implanted in the subgrade. These anchor pins may be in relative proximity to the holding elements 26, 27. The filler strips 28, 29 may now, or may have been previously connected with the metal partition. The filler strip 29 resting on or secured at its lower edge to the subgrade, the entire mold means is in proper position. Any other supporting devices may also be used. There is thus provided a continuous wall or partition so that the concrete may be poured and the line of division between the slabs 11 and 12 maintained. Before the concrete has set, the anchor pins 32 are removed, the top of the joint opening above the filler support 21 being given the necessary shape by molding or hand finishing; and after the setting has occurred, the bitumen filler 32 may be poured into the joint. In this manner, a point of any required length may be constructed. It will be appreciated that the method may be practised in various ways, with omission or reversal of various steps, within the principal of the invention.

In operation, if expansion of the concrete occurs, the metal slab 12 will slide along or with the partition 25 over the supporting shelf 11*a*, and in fact movement of both slabs 11 and 12 may occur simultaneously. The corrugated paper strips 28, 29 will be compressed and will allow ample expansion to occur without producing strains. The reduction in volume of the joint opening for the bitumen will be relatively small compared to the total volume of the joint most of which is occupied by the corrugated paper. Consequently very little bitumen will be forced above the grade of the pavement surface. Since the joint below the cap 12 is sealed by the concrete at 22, 24, and 14, no bitumen can be drawn into the joint opening below the cap when the concrete contracts.

In Fig. 3 is shown a modification of the expansion joint which is similar to that hereinbefore described, except that the wall element 22*a* extends downward to the plane 14, and is free of any anchorage such as the flange 20 extending into the concrete slab 11. In this manner the wall element merely rests upon the shelf 11*a*, affording a high degree of flexibility.

In Fig. 4 is shown a further modification which is similar to that shown in Fig. 3, except that the filler support 21*a* is upwardly convexed to afford flexibility in the expansion of the concrete.

In Figs. 5 and 6 is shown a modified portion of an expansion joint and the method of making the same. The principles thereof may of course be used in connection with the joints hereinbefore described or in other types of joints. It will be noted that the concrete pavement 35 may include the slabs 35*a*, 35*b* which are molded in spaced relation by a novel molding device including a hollow compressible means such as the sheet of corrugated paper 36 and a coacting or superimposed molding means 37 which is removable and forms the space for the bitumen and its retaining cap. Thus the molding means 37 may include a pair of spaced longitudinally extending engaging flanges 38 adapted to engage the corrugated paper therebetween. In order that the molding means 37 may be supported on the paper 36 in the initial set up, and so that the paper may be spaced below the ground surface of the pavement, the device 37 may include any suitable body portion 39. The latter may consist of a strip of wood, around which a plate 40 extends, this plate having the flanges 38. If desired, lateral molding portions 41 may extend along opposite sides of the device for furnishing the shoulders or offsets 42 and/or producing the rounded edges 43 in the concrete slabs. After the concrete has set, the molding means 37 is removed but the corrugated paper 36 may be permitted to remain in the joint.

The expansion joint is completed by inserting into the space between the adjacent concrete slabs a filler support or cap 44 of any suitable type so arranged as to rest upon the shoulders 42 below the ground surface of the pavement. The said cap may, for example, consist of a resilient channel or V shaped metal member. the lower end of which may be in any desired proximity to the corrugated paper. The cap may span the space between the concrete slabs, and have longitudinal marginal lips or extensions 45 resting upon the shoulders 42, and preferably resiliently actuated into snug contact with the respective concrete slabs. In this manner, a suitable seal for the bitumen or other filler 46 is provided, for assuring retention thereof. It will be appreciated that the volume of the bitumen is comparatively small with respect to the total volume of the joint space, and that expansion and contraction of the concrete pavement may freely occur without affecting expansion joint and without entrance of water thereinto.

In Fig. 7 is shown a further modification which may be constructed in a manner similar to that hereinbefore described, except that the corrugated paper such as 36 may have been removed prior to inserting the cap 44 A co-operating feature of novelty of the joint, which, however, may also be independently used and with other arrangements of the bitumen filler, resides in the provision of a metal separating slide plate 46 extending along the horizontal plane of division of

the adjacent offsets 47, 48 of the slabs, of which the former offset slidingly supports the latter. The plate 46 may have longitudinal edge flanges 49, 50 and tongues 51, 52 struck from the plate so as to co-operate with the flanges to afford holding means for the corrugated paper sheets such as 53. It will be seen that the plate 46 is of relatively simple construction and is inexpensive to manufacture.

I claim:

1. An expansion joint for concrete pavements including means extending through the joint opening to the subgrade of the pavement, the concrete being set around said means, said means including upright hollow compressible portions at different elevations, said portions being parallel and offset from each other, said means including an incompressible horizontal portion interconnecting the upright portions, the upper portion of said means extending into proximity to the pavement surface, and a plastic filler in the joint opening resting on said upper portion.

2. An expansion joint for concrete pavements including means in the joint opening around which the concrete is set, said means including a closure portion for the joint opening in proximity to the pavement surface, a yielding filler in the joint opening resting on said closure portion and retained thereby, said means having a horizontal portion extending through the concrete, and a compressible hollow means laterally spaced from the filler and connected with the horizontal portion.

3. An expansion joint for concrete pavements having separate slabs on opposite sides of the joint, said slabs having mating offsets, resting one upon the other along a horizontal surface, a partition extending along said surface between the offsets, the joint including upright openings between the slabs above and below said surface, a plastic filler in the upper joint opening, and a hollow compressible filler in the lower joint opening, said partition and the lower filler being set in the concrete.

4. An expansion joint for concrete pavements having separate slabs on opposite sides of the joint, said joint including upright openings at different elevations offset from each other, said joint including a horizontal surface of division interconnecting said openings so that one slab affords movable support to the other slab, a partition between the slab at said surface, and yielding means in said openings, said partition and said yielding means being set in the concrete.

5. A pavement including a transverse expansion joint, said pavement having separate slabs on opposite sides of the joint, one of said slabs having a shelf embodied in the joint for affording support to the opposite slab, said joint including upper and lower offset openings extending from said shelf, a partition for said slabs extending along the top of the shelf, compressible means extending from said partition for sealing the upper opening in relatively close relation to the pavement surface, and a plastic filler in the upper opening retained by said means, said partition forming the top for the lower opening, and a compressible means within the lower opening up to said partition, the pavement concrete being set along said partition and said compressible means.

In testimony whereof I affix my signature.

ROBERT B. GAGE.