Feb. 4, 1936. R. C. OLMSTED 2,029,892

ROADWAY CONSTRUCTION

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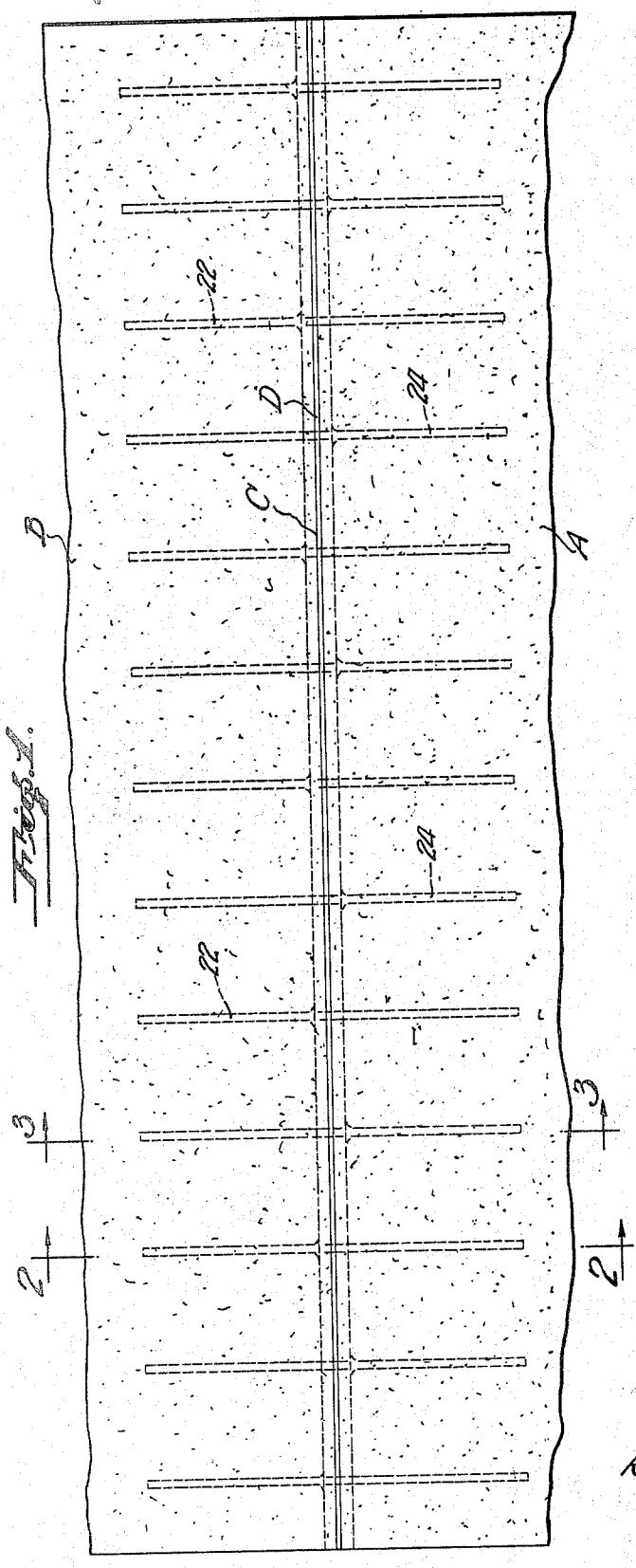


Fig. 1.

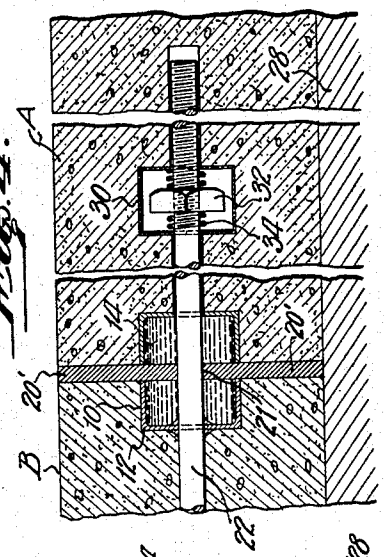


Fig. 4.

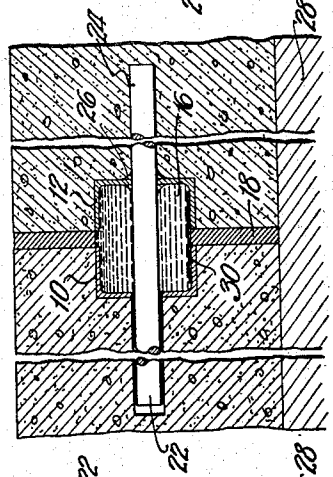


Fig. 3.

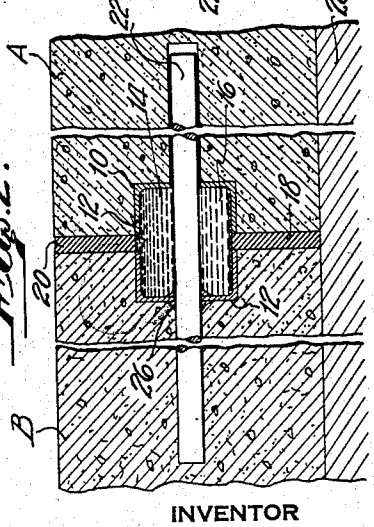


Fig. 2.

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Fig. 5.

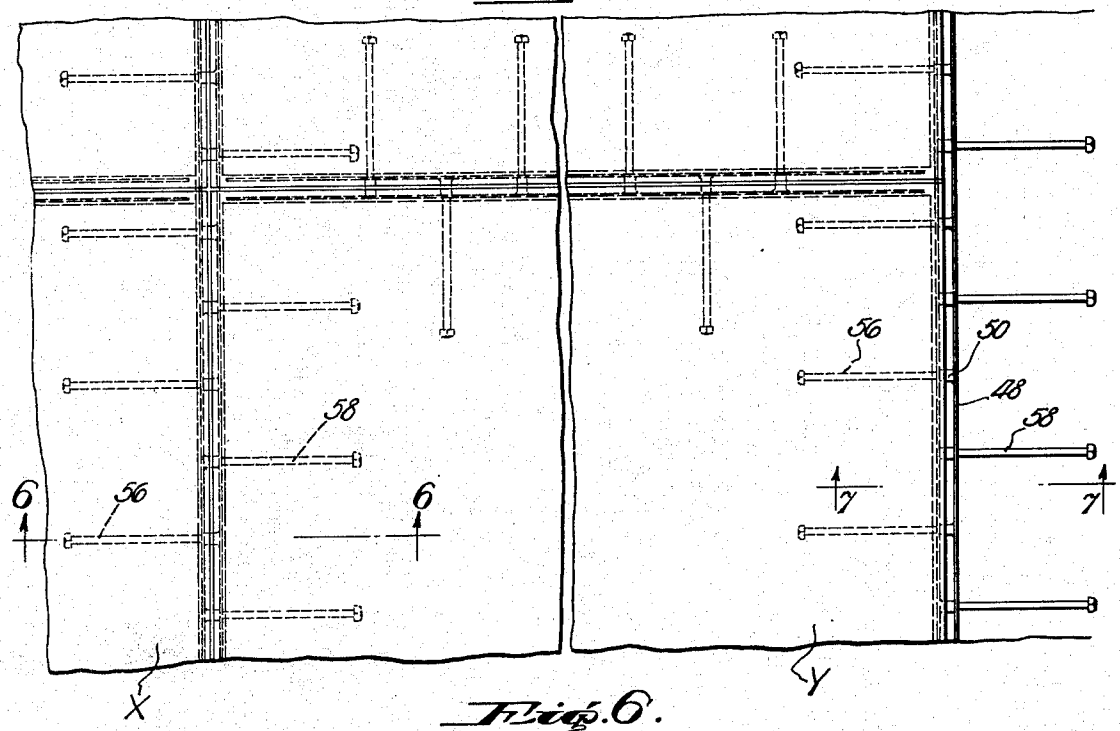


Fig. 6.

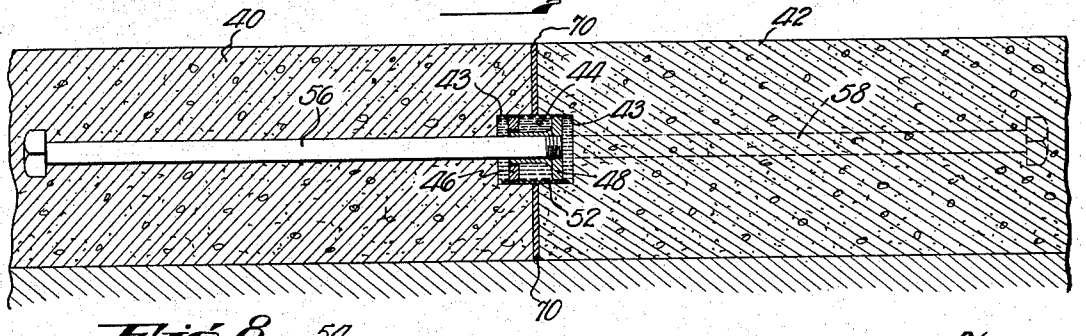


Fig. 8.

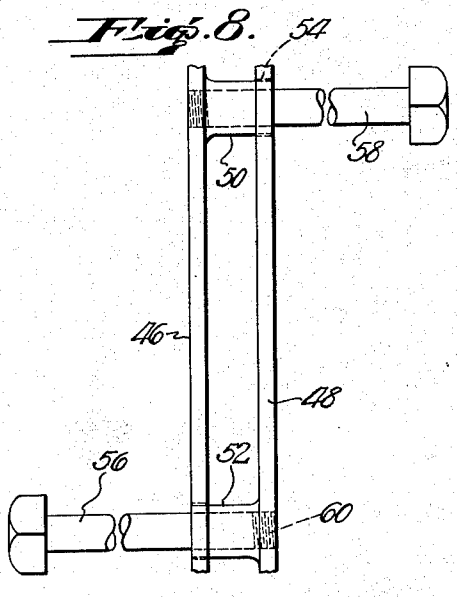
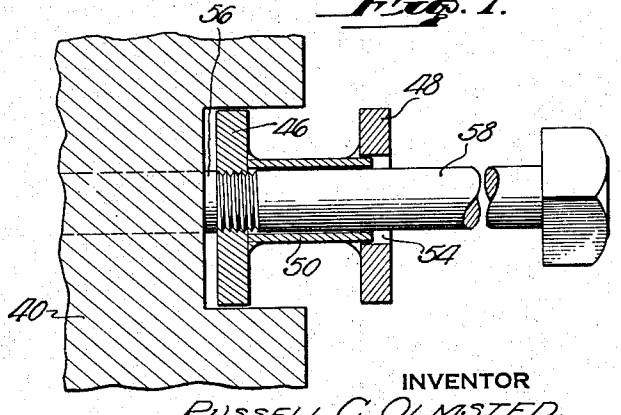


Fig. 7.



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ROADWAY CONSTRUCTION

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Application October 18, 1932, Serial No. 638,277

10 Claims. (Cl. 94—18)

This invention relates to new and useful improvements in roadways and similar passageways, and more particularly it pertains to a new and novel construction of expansion joint therefor.

Roadways, driveways and similar passageways, especially when constructed from concrete, are formed in sections commonly termed slabs. In the building of these passageways, it is the practice to leave a space between meeting edges of slabs, which space is filled with a suitable packing material intended to exclude the elements from the joint. The packing material generally employed is pre-cast to the required shape and size to fill the joint and is of a compressible material which will permit of expansion of the slabs with a consequent compressing of the packing material and without injury to the slabs.

Great difficulty has been experienced with such roadways in that while the joint between slabs or sections is maintained tight upon expansion of the slabs or sections, contraction of the slabs or sections results in an opening of the joints with the result that the elements enter the joint not only to the detriment of the slabs but to the entire roadway.

It has been noted that in some instances, particularly where a roadway is laid on a light or sandy sub-base, water entering the joint washes away the sub-base leaving the slabs unsupported for some distance back from the joint with the inevitable result that one or even all of the slabs may settle at the joints, causing unevenness and rapid disintegration of the roadway. In some instances, particularly where a roadway has been laid over marshy ground, entire slabs or sections have been known to slide completely out of the roadway due to the entrance of water through the joints and a washing away of the sub-base thereby.

It is an object of the present invention to provide an improved construction in roadways and expansion joints therefor which construction is inexpensive and at the same time highly efficient for the purposes intended.

A feature of the invention resides in a novel construction and arrangement of reinforcing structure which prevents sagging of the slabs or sections.

A further feature of the invention resides in a novel system of reinforcing structure whereby bodily shifting of any of the slabs or sections to such an extent as to become entirely separated from the roadway is prevented.

A further feature of the invention resides in a novel construction of expansion joint whereby the elements are effectively excluded from the joint under all conditions of expansion and contraction of the slabs or sections which form the roadway.

Other features of the invention relate to certain novel and improved constructions, arrangements and combinations of parts hereinafter described and particularly pointed out in the claims, the advantages of which will be readily understood and appreciated by those skilled in the art.

The invention will be clearly understood from the accompanying drawings illustrating the invention in its preferred form and the following detailed description of the constructions therein shown.

In the drawings,

Figure 1 is a fragmentary plan view of a roadway constructed in accordance with the present invention and illustrating an expansion joint between slabs or sections.

Figure 2 is a fragmentary sectional view, taken on the line 2—2 of Figure 1,

Figure 3 is a similar view taken on the line 3—3 of Figure 1,

Figure 4 is a transverse sectional view of a roadway illustrating a slightly modified form of the invention,

Figure 5 is a fragmentary top plan view on an enlarged scale and illustrating a still further modified form of the invention,

Figure 6 is a transverse sectional view taken on the line 6—6 of Figure 5,

Figure 7 is a transverse sectional view on an enlarged scale taken on the line 7—7 of Figure 5,

Figure 8 is a detail plan view illustrating a portion of the reinforcing structure employed in connection with that form of the invention illustrated in Figures 5 to 7 inclusive.

Referring again to the drawings, and particularly to Figure 1 thereof, the reference characters A and B designate two slabs of a roadway, which in the present instance is illustrated as formed of concrete. The reference character C designates the joint between the two slabs A and B, and D designates a packing within the joint C.

In carrying out the present invention in connection with the construction of a roadway such as illustrated in Figure 1, I provide recesses 10 in the adjacent edges of the slabs A and B. These recesses 10 may be lined with a channel iron or similar means indicated by the reference character 12, in which case the edges of the side walls of the channel will terminate substantially flush with the edge wall of the slab in which the channel is mounted.

When the slabs are formed around the channels, a chamber 14 is provided which extends throughout the width of the slabs and which may be closed at the ends in any desired manner. The chamber 14 thus formed serves as a container for a suitable sealing medium 16 preferably in the form of a plastic or semi-plastic material.

The reference character 18 designates a preformed packing element which is positioned between the meeting edges of the slabs A and B below the chamber 14, and 20 designates a similar packing above the chamber 14. These packings 18 and 20 are preferably of pre-formed type and formed of a material which is capable of compression.

In building the road suitable mold or form elements are so positioned as to provide the spaces between the slabs in which the packings 18 and 20 are positioned and after the roadway is completed, these packings are positioned, the mold element which forms the space to accommodate them being removed. Before placing the packing 20 in position the chamber 14 is filled with the composition 16 and which is sealed therein by placement of the packing 20 in position.

By reference to Figures 1 to 3 of the drawings it will be noted that the joint C is bridged by reinforcing elements 22 and 24. These reinforcing elements 22 and 24 are secured in the slabs A and B at one end and have free movement with respect to the slab in which the other end is mounted, that is to say in Figure 1, the reinforcing element 22 is anchored at one end in the slab B while the reinforcing element 24 is anchored at one end in the slab A. In each instance the opposite end of the reinforcing elements 22 and 24, i. e., the end of the reinforcing element 22 which lies within the slab A and that end of the reinforcing element 24 which lies within the slab B are freely mounted therein and have no connection with their respective slab. One convenient way that I have found to anchor these reinforcing elements 22 and 24 of the slabs B and A respectively is to either weld or otherwise fasten the reinforcing elements to the channel members 12 as indicated by the reference character 26 in Figures 2 and 3.

These reinforcing elements serve to take the strain and support each slab from the other at the meeting joints of the slabs regardless of the direction of travel over the roadway and serve to distribute the strains or stresses incident to the traffic on the roadway in opposite directions from the joint or meeting edges of the slabs. Furthermore, these reinforcing elements serve to prevent sagging of one slab with respect to another even though the sub-base may be washed away even to a considerable extent beneath the slabs closely adjacent the joints.

Another function of the construction just described resides in the maintaining of weather tight joints between the slabs and I will now proceed to describe the manner in which this is brought about.

Referring to Figures 2 and 3 let us assume that the slabs in these figures are in their normal position. If now for any reason the slabs A and B should expand, the packing 20 will be compressed and, of course, the joint between the slabs will be tight. If on the other hand the slabs should contract thereby producing a greater space between the slabs at the joint, the level of the semi-plastic mass 16 merely falls, but water entering the joint will float upon the top of the semi-plastic mass and can never reach the lower packing 18 or the sub-base 28. As a further seal the bottom of the recesses may be provided with a sheet 30 of suitable material such as tar paper or the like which also acts to close the upper end of the space in which the packing 18 is mounted.

The fact that the reinforcing elements 22 and 24 are anchored in one slab and have free sliding movement with respect to the other slab permits of ready expansion and contraction of the slabs without rupture or any possibility of breaking of the slabs adjacent the joints between the slabs.

The structure just described makes no provision for anchoring the slabs against bodily movement to an extent where they would become removed suitable distance from the remainder of the roadway and in Figure 4 I have illustrated a construction by which movement of the slabs to such an extent is prevented. In the construction shown in Figure 4, in laying the side slabs of the road the reinforcing elements whose ends project loosely into the side slabs also project into a housing 30. This housing may be in the form of a metallic or even cardboard box of sufficient strength to prevent the material from which the slabs are formed coming in contact with a nut 32 threaded upon the ends of the reinforcing element 22 until the material of the slabs has set. Interposed between the nut 32 and to opposite sides of the housing 30 there are suitable resilient members 34 preferably in the form of coil springs.

By this construction it will be apparent that should the sub-base 28 beneath the slab A wash away to such an extent that under ordinary conditions the slab A would slide far to one side of the roadway under ordinary constructions, the resilient member 34 will be compressed by reason of movement of the slab A relative to the reinforcing element 22, but immediately it becomes compressed the nuts 32 carried by the several reinforcing elements 22 will hold the slab A against further movement and will thus prevent the complete carrying away of the slab A as is the result when such a structure is not employed.

It will also be noted that in this form of the invention, I employ a slightly different form of packing strip. In this form, the packing is in the form of a single strip 20' which is provided with openings 21 through which the several reinforcing elements pass, the sealing medium being positioned upon opposite sides of the packing strip.

In Figures 5 to 6 of the drawings I have illustrated a slightly modified form of the invention and in this form the semi-plastic or semi-fluid sealing medium is positively forced into the joint between the slabs to fill the voids formed therein as a result of contraction of the slabs.

In the illustration, the slabs are designated 40 and 42, their meeting edges being provided with recesses 43, which when the slabs are positioned, form a housing or container for a semi-fluid or plastic sealing medium 44. In the recess of the slab 40 there is a bar 46 and in the recess of the slab 42 there is a bar 48 of a width which will substantially bridge the recess from top to bottom in each case. Each of these bars has a plurality of tubular extensions, the tubular extensions of the bar 46 being designated 50 while those of the bar 48 are designated 52. In each instance these tubular extensions project

through openings in the bar to which they are not attached as best illustrated in Figures 7 and 8, and are slidably mounted in openings in these bars.

The reference characters **56** and **58** designate reinforcing elements mounted in the slabs **40** and **42** respectively, and by an examination of Figure 8, it will be noted that in each instance the reinforcing element passes through the bar which is mounted in the same slab as the reinforcing element, through the sleeve or tubular extension of the bar carried by the other slab and has threaded engagement with the bar of the slab by which the reinforcing element is not carried as indicated by the reference numeral **60**.

From the foregoing it will be apparent that upon contraction of a slab the reinforcing elements carried thereby will be moved, and through their attachment to the bar in the slab in which they are not mounted will move said bar outwardly of the recess in which it is mounted. By reason of the tubular projections of the bars, contraction of the slabs will move the bars in a direction towards each other, while expansion of the slabs will tend to move the bars in opposite directions away from each other.

This form of joint operates in the following manner.

With the several parts in the position in which they are illustrated in Figure 6, which we will assume as the normal position of the parts under average temperatures, upon contraction of the slabs due to a suitable drop in temperature the joints between the slabs would tend to open up. However, in this construction, as the slabs move, through the medium of the reinforcing elements **56** and **58**, the bars **46** and **48** are moved towards each other. Inasmuch as the bars are of a width which substantially bridges their respective recess from top to bottom there is no immediate escape for the semi-fluid or plastic sealing medium around the bars, and the same is therefore forced into the voids resulting from the contraction of the slabs, thus filling these voids and providing a weather tight joint between the slabs. On the other hand, expansion of these slabs placing the packings **70** under compression, the bars **46** and **48** will be moved in opposite directions away from each other and any sealing fluid which may have previously been forced into the voids of the joint formed by contraction of the slabs will again flow into the housing or container therefor.

From the foregoing it will be noted that in this form of the invention, contraction of the slabs and a consequent opening of the joint will effect filling of the voids caused thereby with the semi-fluid or plastic sealing medium to prevent the entrance of weather and that when the slabs under expansion reduce the size of the joints between the slabs, any of the semi-fluid or plastic sealing medium which may be between the slabs will return to the container where it is retained until it is again forced into the joint by a subsequent contraction of the slabs.

As in that form of the invention illustrated in Figures 1 to 4 inclusive, this latter described form of the invention is so constructed that strains and stresses due to heavy vehicles passing over the joints, are distributed equally of the slabs to points sufficiently remote from the joints, that damage or injury to the slabs will not result even though a portion of the sub-base of the roadway be washed away in the immediate vicinity of the joints.

Furthermore, this form of the invention prevents the shifting of the slabs to a point remote from the roadway even though the entire sub-base at the outer portion of the roadway together with the roadway shoulders were to completely wash away, the extent of movement of the thus unsupported slab or slabs being equal only to the movement of the bar **46** into engagement with the bar **48**, for example, in Figure 7, it being understood that the reinforcing elements **56** being anchored in their respective slabs would act or serve as an anchor to prevent movement of the slabs in which the reinforcing elements **58** are mounted.

At the right hand of Figure 5 I have illustrated the manner in which a temporary roadway, for example, a two-lane roadway may be built with the idea of subsequently adding outer lanes to increase the width of the roadway to a three-lane or a four-lane roadway, and I will now proceed to describe the manner in which this is accomplished.

At the time of building the two-lane roadway such as illustrated in Figure 5 and in which the two lanes are designated X and Y, the bars **46** and **48** are positioned exactly as illustrated in Figure 7. The reinforcing elements **58**, however, are not employed.

The roadway being completed the dirt shoulders ordinarily employed are built up to the level of the roadway surface completely enclosing the bars **48** which due to their sleeve extensions project a slight distance beyond the side edge of the roadway. The roadway may be used indefinitely in this condition without resulting in damage of any kind to the bars **48**, their tubular extensions or the tubular extensions of the bars **46** which, although they project a slight distance from the roadway, will as before stated be completely covered by the dirt shoulders.

When it is desired to increase the width of the road by adding one or two more lanes, the shoulders are dug away and the reinforcing elements **58** are threaded through the tubular extensions **50** of the bars **46** and the roadway laid in the usual manner.

From the foregoing, it will therefore be apparent, that the form of the invention illustrated in Figures 5 to 8 inclusive provides a construction whereby a roadway may be increased in width at any desired time after a portion thereof has been completed and that the structure employed in the roadway as originally built may be carried out in the new sections added thereto.

While the invention has been herein illustrated in its preferred embodiments, it is to be understood that it is not to be limited to the specific details of construction herein illustrated and that the invention may be carried out in other forms than it is illustrated without departing from the scope of the claims hereto appended.

Having thus described the invention, what is claimed as new and what it is desired to secure by Letters Patent of the United States, is:

1. An expansion joint for concrete roadways formed of slabs, said joint comprising recesses formed in the abutting faces of the slabs, a precast packing positioned between and partially filling the space between the abutting faces of the slabs, and a viscous packing carried in said recesses and movable from the recesses to the space between the abutting edges of the slabs upon contraction of the slabs.

2. A joint for roadways formed of slabs, said joint comprising recesses formed in the abutting

faces of the slabs, and a plastic packing in said recesses and movable from the recesses into the space between abutting faces of the slabs upon contraction of the slabs, and movable from the space between abutting faces into the recesses upon expansion of the slabs, and a pre-cast compressible packing interposed between the abutting faces of the slabs.

3. A joint for roadways formed of slabs, said joint comprising recesses formed in the abutting faces of the slabs, and a plastic packing in said recesses and movable from the recesses into the space between abutting faces of the slabs upon contraction of the slabs, and movable from the space between abutting faces into the recesses upon expansion of the slabs, and a pre-cast compressible packing interposed between the abutting faces of the slabs upon opposite sides of the afore-mentioned recesses.

4. In a roadway joint for roadways formed of slabs having recesses in their abutting faces, plates mounted in said recesses and movable therein, bridging elements anchored in each slab and connected to the plate in the slab in which the bridging elements are not anchored whereby contraction and expansion of the slabs will cause movement of the plates respectively towards and away from each other, and an expansible and contractible packing in the space between abutting faces of the slabs and movable by said plates into the space between abutting faces of the slabs upon contraction of the slabs.

5. In a roadway joint for roadways formed of slabs having recesses in their abutting faces, plates mounted in said recesses and movable therein, bridging elements anchored in each slab and extending into the next adjacent slab and connected to the plate carried thereby whereby contraction and expansion of the slabs will cause movement of the plates respectively towards and away from each other, a pre-cast packing interposed between the abutting faces of the slabs, and a plastic packing movable by said plates into the spaces around the pre-cast packing upon contraction of the slabs.

6. In a joint for roadways including a plurality of slabs having channel-shaped recesses formed in their abutting faces, a channel member mounted in each of said recesses, and joint bridging reinforcing elements secured to each of said channel members, each of said reinforcing elements extending across the joint and a substantial distance into the next adjacent slab, but unattached thereto.

7. In a joint for roadways including a plurality of slabs having channel-shaped recesses formed in their abutting faces, a channel member mounted in each of said recesses, and joint bridging reinforcing elements secured to each of said channel members, each of said reinforcing elements extending across the joint and a substantial distance into the next adjacent slab, but unattached thereto, and a joint sealing medium interposed between the opposed faces of said slabs.

8. In a joint for roadways including a plurality of slabs having channel-shaped recesses formed in their abutting faces, a channel member mounted in each of said recesses, and joint bridging reinforcing elements secured to each of said channel members, each of said reinforcing elements extending across the joint and a substantial distance into the next adjacent slab, but unattached thereto, and a plastic sealing medium substantially filling said channel members.

9. In a roadway formed of slab-like members arranged with abutting faces, bridging elements bridging the joints between slabs said bridging elements being anchored to one slab and extending into the next adjacent slab and having sliding movement relative thereto, and means for limiting the sliding movement of said bridging elements relative to the slab in which they slide, said last mentioned means including a housing in the slab into which each bridging element extends and means mounted in the housing and carried by the bridging element extending therethrough, and resilient means interposed between said last mentioned means and adjacent walls of the housing.

10. In a roadway formed of slab-like members arranged with abutting faces, bridging elements bridging the joints between slabs said bridging elements being anchored to one slab and extending into the next adjacent slab and having sliding movement relative thereto, and means for limiting the sliding movement of said bridging elements relative to the slab in which they slide, said last mentioned means including a housing in the slab into which each bridging element extends and means mounted in the housing and carried by the bridging element extending therethrough, and coiled springs surrounding the bridging elements and interposed between said last mentioned means and opposite walls of said housing.

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