Feb. 8, 1938. H. A. TAUBENSEE 2,107,351

JOINT FOR CONCRETE STRUCTURES

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Fig. 1

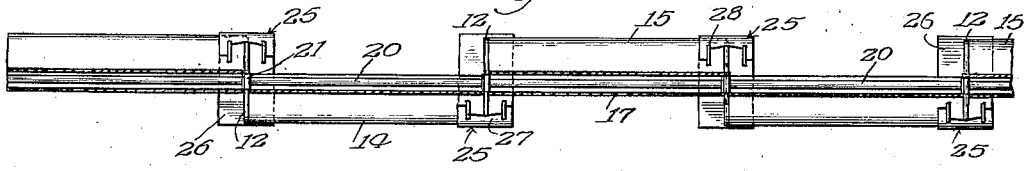


Fig. 2

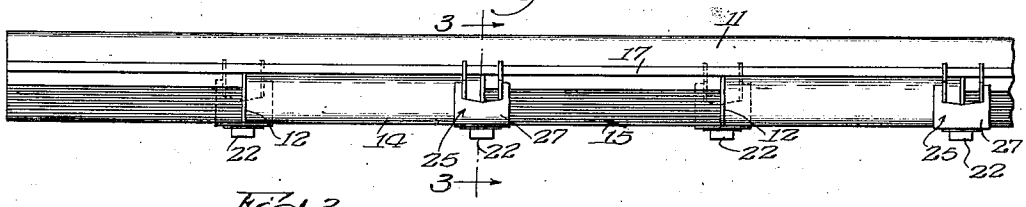


Fig. 3

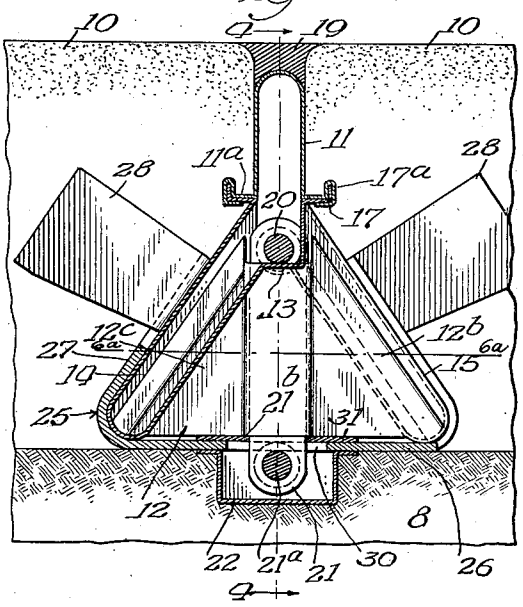


Fig. 4

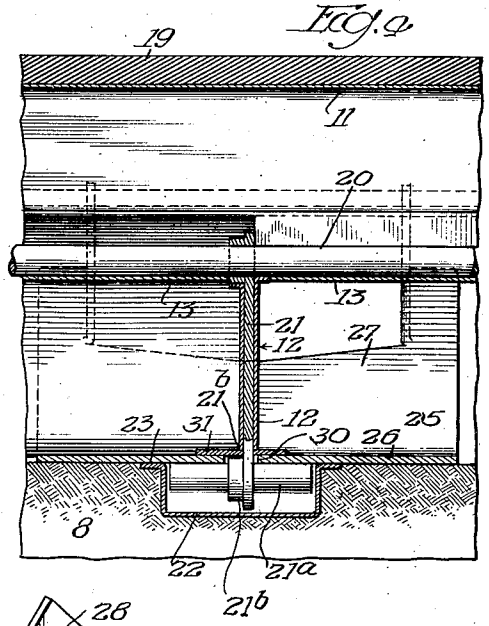


Fig. 6

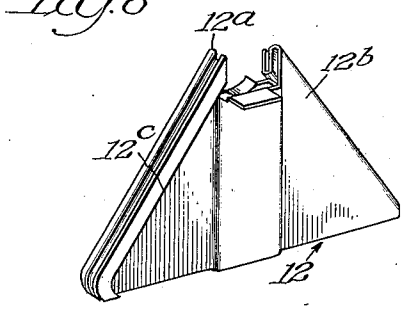
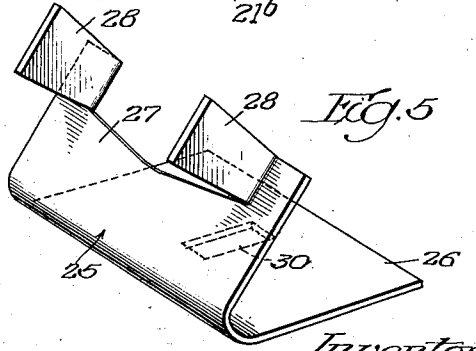


Fig. 5



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JOINT FOR CONCRETE STRUCTURES

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Fig. 6a.

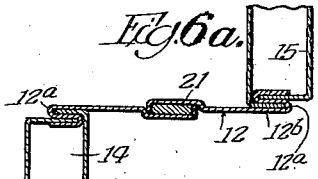


Fig. 7

Fig. 8

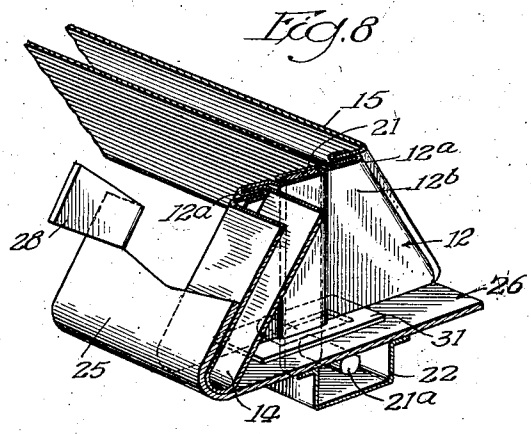


Fig. 9

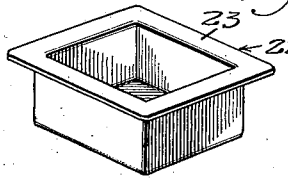


Fig. 10

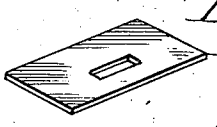


Fig. 12

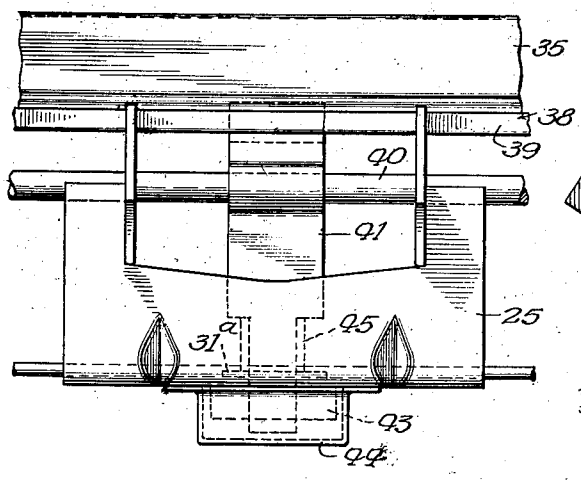
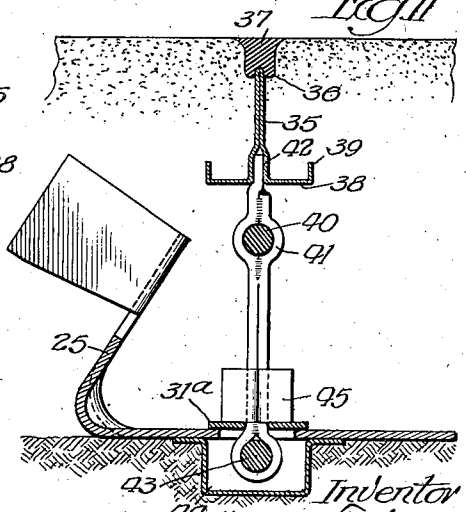


Fig. 11



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2,107,351

UNITED STATES PATENT OFFICE

2,107,351

JOINT FOR CONCRETE STRUCTURES

Henry A. Taubensee, Chicago, Ill., assignor of one-half to Ernest H. Geyer, Chicago, Ill.

Application November 1, 1935, Serial No. 47,743

12 Claims. (Cl. 94—18)

The invention relates to joints for use in concrete structures for highways.

One object of the invention is to provide an improved joint for expansion or contraction, which comprises a longitudinally extending bar serving as a load-transfer member between the concrete at the sides of the joint and located above the bottom of the concrete and for supporting load-transfer members or plates which are bonded to the concrete at the sides of the joint.

Another object of the invention is to provide an expansion joint which comprises a hollow expansible and contractible structure and a longitudinally extending load-transfer bar within the structure for carrying load-transfer plates which are bonded to the slabs at the sides of the structures, respectively.

Another object of the invention is to provide an improved contraction-joint which comprises a longitudinally extending load-transfer bar and hangers carried by the bar for movably supporting load-transfer plates or members.

Another object of the invention is to provide an improved expansion-joint which is of improved construction and functions efficiently in use.

Other objects of the invention and the various advantages and characteristics of the present joint will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Fig. 1 is a horizontal section of an expansion-joint embodying the invention; Fig. 2 is a side elevation; Fig. 3 is an enlarged transverse section on line 3—3 of Fig. 2; Fig. 4 is a longitudinal section on line 4—4 of Fig. 3; Fig. 5 is a perspective of one of the load-transfer plates; Fig. 6 is a perspective of one of the separator-plates between the ends of the upwardly convergent legs of the hollow structure; Fig. 7 is a sectional perspective of the longitudinal load-transfer bar and parts of the hollow-structure; Fig. 8 is a sectional perspective of the adjacent legs, the separator-plates between them, and a load-transfer plate; Fig. 9 is a perspective of one of the boxes for enclosing the lower end of a hanger; Fig. 10 is a perspective of the washer overlying the bottom of one of the load-transfer plates; Fig. 11 is a transverse section illustrating a contraction-joint embodying the invention; Fig. 12 is a side elevation of the contraction-joint; and Fig. 6a is a section on line 6a—6a of Fig. 3.

The joint which is shown in Figs. 1 to 11 of the drawings constitutes one embodiment or form of the invention and is essentially an expansion-joint. It is adapted to be disposed between slabs 10 of concrete laid on a bed or sub-base 8 of a road to permit expansion and contraction of the slabs resulting from temperature and moisture changes comprises hollow structure between the slabs. This structure comprises a series of hollow legs 14 and 15 which are alternately arranged in end-to-end relation to form upwardly convergent supports or struts. Each of these legs 14, 15 is formed of sheet metal and is U-shaped in cross-section. The upper margins of the sides of the legs have horizontal flanges 17 which extend outwardly and terminate in upturned vertical flanges 17a. A continuously extending inverted U-shaped cap-strip 11 is provided at its lower margin with flanges 11a which extend around and interlock with the flanges 17 and 17a of the hollow legs. This U-shaped cap-strip and the hollow legs form a hollow structure with side walls which are free to expand and contract responsively to expansion and contraction of the slabs of concrete. A bituminous filler 19 is usually applied over the closed top of the cap-strip 11 and between the slabs 10 of concrete. The interlocked flanges 11a, 17, and 17a form an interlock between the sides of the hollow structure and the slabs and a channel for catching any water which may seep between the cap-strip 11 and the slabs 10. The legs 14, 15 are alternately arranged to extend to the opposite sides of the joint so the lower ends of the alternating legs will be staggered and converge upwardly to the cap-strip. This arrangement renders the hollow structure self-retaining so it will remain in place without stake-pins or other means to prevent the structure from tipping while the joint is being laid and also during pouring of the concrete in connection with the formation of the slabs 10. Triangular separator-plates 12 are secured to the ends of contiguous legs 14, 15 to bridge the gap between their ends and prevent the flow of concrete from one side of the hollow structure to the other. These plates are preferably secured by suitable interfitting seams 12a to the adjacent ends of the legs 14, 15.

The metal forming the lower or inner wall of

each of the legs 14, 15 is extended horizontally or offset to form a continuously extending bearing 13 or shoulder for a load-transfer bar 20, which extends longitudinally and continuously through the hollow structure and is enclosed therein. The bearings 13 alternately overlie the underlying portions of the slabs 10 at the sides and under the legs 14, 15 so that the load-transfer bar 20 will be alternately supported by the slabs at the sides of and above the lower ends of the hollow structure. In consequence, they function as load-transfer members, between the slabs.

The bar 20 extends through and supports hangers 21, which are arranged to depend therefrom between the ends of the legs 14, 15. Preferably the separator-plates 12 are formed of sections 12^b, 12^c, between the lapped margins of which the hangers extend and are enclosed (see Fig. 6*a*). The lower ends of the hangers 21 extend into and are enclosed in boxes 22 having top flanges 23. These boxes are set into the bed 8 under the concrete slabs. Each hanger carries a supporting pin 21^a at its lower end, which is journaled in the hanger. Load-transfer plates or brackets 25 are provided adjacent the contiguous ends of the legs 14, 15. These plates or brackets 25 are preferably formed of plate metal. They are arranged in alternate relation and comprise transversely extending bases 26 which underlie the legs 14, 15 and the concrete under the legs, and extend over the tops of the boxes 22; upwardly and inwardly inclined sides 27 conforming to the outer side walls of the legs 14, 15; and out-struck portions 28 which extend transversely to the joint and serve to bind the sides of the brackets 25 to the slabs 10. The base 26 of each bracket is adapted to rest on one of the pins 21^a so that the bracket 25 will be supported through one of the hangers 21 from the longitudinal load-transfer bar 20 which is supported in the hollow structure and alternately by the slabs at the sides of the joint. Slots 30 are formed in the bases 26 to permit the brackets 25 to move laterally with the concrete slabs to which they are bonded responsively to expansion and contraction. Fibre washers 31 which fit around the hangers 21 close the slots 30 in the bases 26 of the plates or brackets 25 and are held on the bases by shoulders 21^b on the hangers.

The slabs of concrete at the sides of the joint have alternating recesses and projections fitting the downwardly divergent legs 14, 15. As a result, the continuous bar 20 is supported alternately by the underlying projections of the slabs under the legs of both slabs. During contraction or expansion of the slabs, the load-transfer brackets 25, which are bonded thereto, will move therewith and the bases 26 will ride on the rotatable pins 21^a which are supported from the bar 20 by the hangers 21. The outer sides of the hollow structure are interlocked with the slabs at the respective sides thereof by the upstanding flanges between the legs and the cap-strip so that during contraction of the slabs the outer walls of the hollow structure will be expanded.

In the construction described, the use of dowels for load-transfer between the slabs is eliminated. The longitudinal load-transfer bar is enclosed in the hollow structure and the load-transfer plates, which are bonded to the slabs, are efficiently and movably supported, so they can respond to the contraction and expansion of the slabs. This construction exemplifies an expansion-joint which is efficient in use.

The joint which is shown in Figs. 11 and 12 constitutes a second embodiment or form of the invention. It is a contraction-joint and comprises sheet metal strips 35 which extend downwardly from a longitudinal channel 36 which contains a bituminous joint-filler 37. The lower ends of the strips 35 are extended outwardly as at 38 and provided with upstanding flanges 39 to bond the strips to the concrete sections at the sides thereof and form a water-check. A load-transfer bar 40 is laid in the concrete longitudinally under the strips 35. This bar extends through hangers 41, the upper ends of which are extended into a space 42 between the lower margins of the strips 35. Pins 43 are journaled in the lower ends of the hangers. Boxes 44 in the bed of the road enclose the lower ends of the hangers and the pins 43. Load-transfer brackets, substantially the same in construction as the brackets 25 hereinbefore described, are supported by the pins 43 and are bonded to the slab at alternate sides of the hangers. Fibre washers 31^a fit over the bases of these brackets and around the hangers to close the slots in the bases. Hangers 41 are provided with shoulders 45 to hold down the washers and may be formed of a strip of wrought metal shaped to the desired form. When the pavement has been laid with this contraction-joint, it will split along a meeting line between the strips 35 and downwardly to the bottom of the slab. When this occurs, brackets 25 will transfer the load between the portions of the slab at the sides of the joint through hangers 41 and the longitudinal bar 40, which is supported by both of the severed portions of the slab.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination of contiguous horizontally extending concrete slabs, a bar between the upper portions of the slabs extending from one side of the slabs to the other depending and supported by portions of the slabs, separately formed hangers spaced along and carried by the bar, and load-transfer brackets having members bonded to one of the slabs and base-members slidably supported by the hangers.

2. The combination of contiguous horizontally extending concrete slabs, a bar between the upper portions of the slabs extending from one side of the slabs to the other depending and supported by portions of the slabs, separately formed hangers spaced along and carried by the bar, rotatable members carried by the lower ends of the hangers, and alternately arranged load-transfer brackets bonded to the slabs respectively and having base-members supported by the rotatable members.

3. The combination of contiguous horizontally extending concrete slabs, a bar between the upper portions of the slabs extending from one side of the slabs to the other; and supported by portions of the slabs, separately formed, depending hangers spaced along and carried by the bar, alternately arranged load-transfer brackets bonded to the slabs respectively and having base-members through which the hangers extend,

means on the lower end of the hangers for supporting the brackets, and boxes disposed under the base-members, and slabs and arranged so that they enclose the lower ends of the hangers.

4. The combination of contiguous horizontally extending concrete slabs, a bar between the upper portions of the slabs extending from one side of the slabs to the other and supported by portions of the slabs, separately formed, depending hangers spaced along and carried by the bar laterally arranged, load-transfer brackets bonded to the slabs respectively and having base-members with slots therein through which the hangers extend, means on the lower end of the hangers for carrying the base-members for sliding movement relative to the hangers, boxes disposed under the base-members, and slabs and arranged to enclose the lower ends of the hangers, and washers over the slots of the base-members and around the hangers.

5. The combination of contiguous horizontally extending slabs of concrete, a hollow expansion structure extending between the upper portions of the slabs and from one side of the slabs to the other, a load-transfer bar in and extending longitudinally of the structure and supported by underlying portions of the slabs, alternately arranged; load-transfer brackets bonded to the slabs respectively, and means carried by and depending from said bar for slidably supporting the brackets.

6. The combination of contiguous horizontally extending slabs of concrete, a hollow expansion structure positioned between the upper portions of the slabs and having the bottom portion thereof upwardly convergent alternately arranged hollow legs, a load-transfer bar in and extending longitudinally of the structure and located adjacent to the upper ends of the legs, alternately arranged load-transfer brackets associated with and underlying the legs of the structure and bonded to the slabs respectively, and means supported by said bar over which the brackets are slidable.

7. The combination of contiguous slabs of concrete, a hollow expansion structure positioned between the slabs and having a central upper portion and downwardly divergent legs extending downwardly from the central portion, a load-transfer bar extending longitudinally through the structure and located adjacent to the upper portions of the legs, alternately arranged load-transfer brackets bonded to the slabs at the sides of the structure respectively, and means supported by said bar for carrying the brackets.

8. The combination of contiguous slabs of concrete, a hollow expansion structure positioned between the slabs and having a central upper portion and downwardly divergent legs extending downwardly from the central portion, a load-transfer bar extending longitudinally through the central portion of the structure, alternately arranged load-transfer brackets bonded to the slabs at the sides of the structure respectively, and vertical hangers carried in a depending manner by the bar and having means on their lower ends underlying the brackets and by which said brackets are movably supported.

9. The combination of contiguous concrete slabs, a hollow expansion structure positioned between the slabs and comprising a closure-strip at its top and alternately arranged upwardly convergent hollow legs having portions of the slabs of concrete therebeneath and embodying inwardly extending shoulders under the closure strip, a longitudinal load-transfer bar extending longitudinally through the structure, and resting on and supported by the shoulders, alternately arranged load-transfer brackets associated with the legs respectively and bonded to the slabs at the sides of the joint respectively and comprising base-members under the legs, and means for slidably supporting the brackets from the bar.

10. The combination of contiguous concrete slabs, a hollow expansion structure disposed between the slabs and having a closure-strip at its top and alternately arranged upwardly converging hollow legs having portions of the slabs of concrete thereabove and therebeneath and embodying inwardly extending shoulders under the closure-strip, a load-transfer bar extending longitudinally through the structure and resting upon and supported by the shoulders, alternately arranged load-transfer brackets associated with the legs respectively and bonded to the slabs at the sides of the joint respectively, and comprising base-members under the legs, and vertical hangers depending from the bar and provided with means under the base-member for movably carrying the brackets.

11. The combination of concrete slabs, a hollow expansion structure disposed between the slabs and having a closure-strip at its top and also having, alternately arranged upwardly converging hollow legs beneath the strip and with portions of the slabs therebeneath, a load-transfer bar extending longitudinally through the structure adjacent the upper portions of the legs and supported by said underlying portions of the slabs, load-transfer brackets bonded to the slabs at the sides of the joint respectively and comprising base-members under the legs, vertical hangers depending from the bar and provided with means for movably carrying the base-members of the brackets, and boxes under the slabs and around the lower ends of the hangers.

12. In a contraction joint for concrete, the combination of a slab of concrete with a channel extending transversely across the top portion thereof and adapted to receive a plastic filler, a strip extending longitudinally of and disposed beneath the channel, a bar disposed beneath and extending longitudinally of the strip, depending separately formed hangers carried by and spaced along the bar and provided with cross elements at the lower ends thereof, and load-transfer brackets having upwardly extending members and base-members movably supported on said cross elements at the lower ends of the hangers.

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