Jan. 15, 1957 J. N. HELTZEL 2,777,370

CONCRETE EXPANSION JOINTS

Original Filed March 4, 1947

Fig. 1.

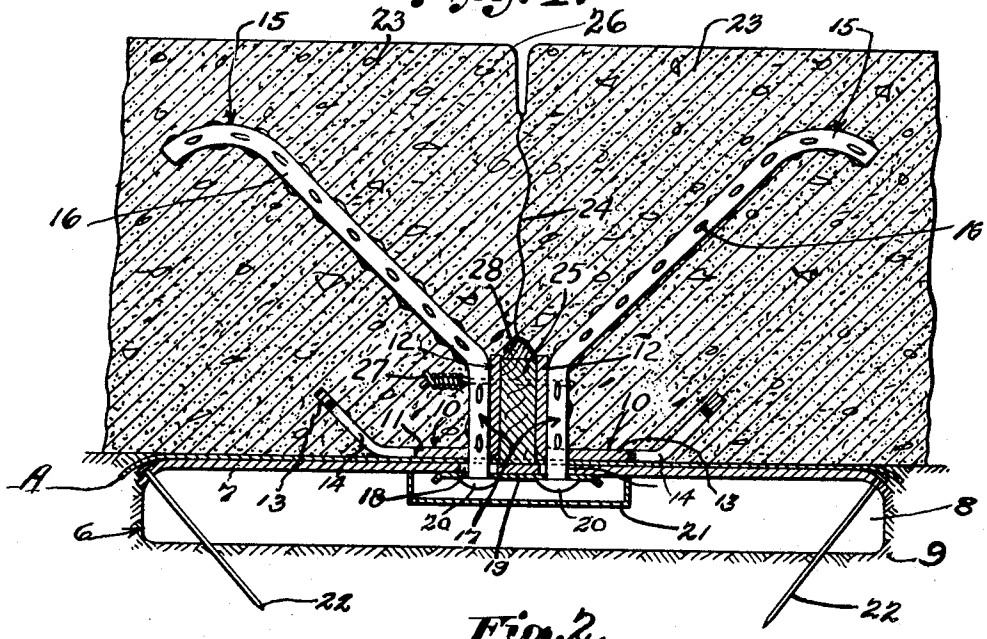
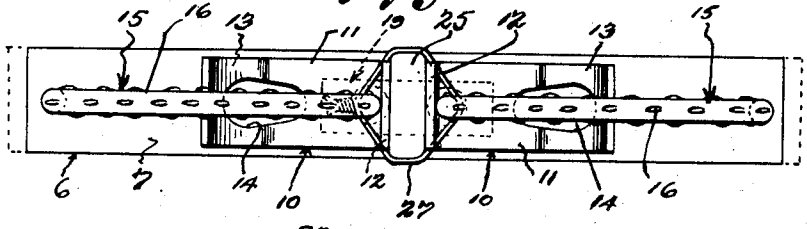


Fig. 2.



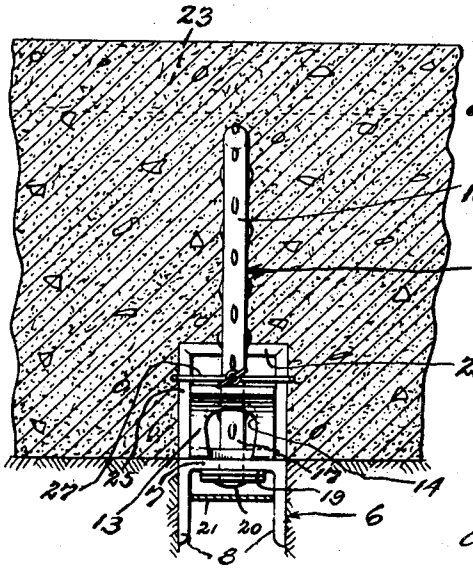


Fig. 3.

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CONCRETE EXPANSION JOINTS

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Original application March 4, 1947, Serial No. 732,170. Divided and this application May 22, 1951, Serial No. 227,638

8 Claims. (Cl. 94—17)

This invention relates to improvements in the so-called beam expansion joint. According to this joint construction a prefabricated metal beam is embedded in the subgrade of a road, airport runway, or any other place where a road or runway is to be formed, at a point predetermined by its location beneath a proposed expansion or contraction joint to be produced in a concrete slab or between concrete slabs.

This application is a division of my formerly copending application, Serial Number 732,170, filed March 4, 1947, and which has matured as Patent No. 2,698,560.

The principal object of the invention is to provide means for forming such an expansion and contraction joint including a U-shaped beam, concrete anchorage members mounted to be embedded in the concrete slab and slidable on the beam and having an expansion block interposed between the anchor members, the slab having a kerf in a vertical line with the expansion block whereby the concrete slab will crack on a line in registry with the expansion block.

A further object of the invention is to provide two sets of anchors, one pair being of plate-like construction and having surfaces thereof slidable on the upper flat surface of the U-shaped beam, the other pair of anchors having vertical legs which flare outwardly at an angle into the slab, the vertical legs extending downwardly through openings in the beam top and engaging in a strip form wear member held between the lower end heads of the second anchors and the underside of the beam top surface.

Another object provides rupturable means including a wire for holding the anchors in position prior to and during the pouring of the concrete, which wire upon expansion of the expansion block will break and allow free movement of the anchors, that is, after the concrete slab has been poured.

Other objects and advantages will become apparent when considered in connection with the accompanying drawing, which illustrates a preferred form of the invention, in which:

Fig. 1 is a view in front elevation of a contraction joint with certain parts shown in cross section;

Fig. 2 is a top plan view of a contraction joint unit of Fig. 1 before the slabs are poured; and

Fig. 3 is an end elevation of the contraction joint of Figs. 1 and 2, per se, with the bottom wall of the lubricant reservoir 21 and one of the slabs shown in section.

Referring specifically to the drawings in which like numerals have been used to designate similar parts throughout the various views, the rigid beam member is shown at 6 comprising a U-shaped member having a top 7 and side flanges 8, said beam being substantially submerged in the subgrade 9 and carrying the instrumentalities still to be described. The beam 6 is preferably made of metal and is fabricated in the shop for field installation.

A pair of slidable anchor plates 10 each having a horizontal portion 11 which is adapted to lie in contact with a piece of asphalt-impregnated cushion sheet A which

lies on the upper surface 7 of the beam member 6. The horizontal portion 11 of the anchor plates are bent upwardly into vertical portions 12, while the opposite ends thereof are upwardly inclined as at 13 to form anchorage portions adapted to be embedded within the concrete slab or the like of a roadway. The anchorage portions 13 and part of the horizontal portions 11 of the plates 10 are each provided with a relatively oval shaped opening 14 to form a better bond between the plates and the concrete slab.

Stress-distributing deformed anchor members 15 each have an outwardly bent and upwardly inclined or rising part 16 and a vertical lower leg portion 17, which latter is welded or otherwise secured to the outer side of the vertical portion 12 of the associated slide plate 10. The vertical leg portion 17 of each anchor member 15 projects through a hole formed in the horizontal portion 11 of the related plate 10 and then projects further through an elongated opening 18, formed in the top surface 7 of the beam. Each leg portion 17 then extends through an aligned hole in the subjacent strip form wear member 19, common to both anchor members 15 it being contemplated that the holes in wear member 19 through which 17, 17 extend will be elongated in opposite directions under pressure from 17, 17 when the slab portions at opposite sides are forcibly separated, although if wear member 19 is of stiff material, no invention would be required to pre-elongate one of said holes as shown at 35 in Fig. 4 of the Post Patent No. 2,072,381, dated March 2, 1937. The lower ends of the anchor members 15 terminate in heads 20 engaging with the undersides of the lower surface of the strip form wear member 19. Thus, the stress distributing anchor members 15, 16, 17 whose portions 17 are welded to the upstanding portions 12 of the slide plates 10 function to secure the slab sections for sliding movement on the beam 6.

On the lower side of the beam web is arranged a grease reservoir 21 which has its top sides provided by the top 7 and sides 8 of the beam 6. Reservoir 21 supplies grease to the heads 20 of anchor members 15 and to the wear member 19. Also, some of the lubricant from reservoir 21 will, by capillary action, eventually reach the top 7 of beam 6 and the undersurfaces of the slidable anchor plates 10 to facilitate shifting of the slab sections. Reservoir 21 also protects the parts noted from moisture.

The beam 7 is preferably held in position by means of stakes 22 driven diagonally into the subgrade 9.

The concrete slab is generally shown at 23, and in order to develop a break in the slab 23, as shown by the wavy line 24, an expandable moisture-absorbing member 25, shown in the form of a rectangularly shaped wooden block is inserted in the recess between the vertical portions 12 of the slidable plates 10 prior to the pouring of the slab 23. The moisture-absorbing member 25 will expand progressively as the moisture from the freshly laid concrete is absorbed by it.

During the construction of the slab, a kerf, or groove 26 is formed in the median top part thereof. This groove 26 may be open as shown, or it may be sealed with a sealing material. Also, of course, the groove 26 may be formed by installing a joint strip (not shown) before the concrete is poured.

It will readily be understood that the groove 26 promotes the break of the slab 23 on the line 24 with the highly desirable result that the thereby created slab sections can expand or contract as conditions demand and thus move apart or together lengthwise thereof, the same as would slabs which have been individually formed in the first instance.

The expandable block, or member 25 is employed as an element of means to prevent the anchor members 16 and plates 10 from shifting during the phase when there

is no structural strength as yet developed in the concrete mass. This end is accomplished by securing the vertical portions 12 of the plate members 10 together with the weldedly attached lower leg portions 17 of the anchors 16, by tying the same to expandable member 25 after the assembly of parts by a relatively small gauge wire or other suitable fastening member 27. The force exerted by the expandable member 25 and directed laterally will break the wire 27 when it is no longer needed to hold the assembly together. Thus, the break 24, forming the two slab sections, will not be delayed by the temporary securing member 27.

When member 25 expands, it expands in all directions, upwardly as well as laterally. Therefore to prevent the member 25 from transmitting upward pressure to the slab sections at opposite sides of the kerf 26 and split 24, upon upward expansion of member 25, a cushion member 28 is provided fitting over the relatively bluntly shaped upper edge of said wooden block member 25, which cushion member absorbs or cushions any upward pressure. Thus, any tendency of the slab portions at opposite sides of the kerf split 26, 24 to curl upwardly is prevented and a resultant transverse ridge formation in the roadway is avoided.

It will, of course, be readily realized that such a joint break-producing device as that described can be placed at various intervals throughout the length of the concrete slab to break the same into an expansion joint at predetermined designated intervals to produce a road or runway of superior construction.

It is important to note that the grease reservoir 21 extends transversely to opposite sides of the slab split 24 so as to house the terminals 20 of both leg portions 17. Also, since the top of said grease reservoir 21 is closed except for the elongated holes 18 in the top of beam 6 and the elongatable holes in wear member 19 at opposite sides of the wooden bar or block 25, grit and moisture will be largely excluded from said reservoir 21.

I have therefore provided a joint breaking arrangement of very simple construction which is dependent entirely upon the expansion of a member which absorbs moisture from the poured concrete, to break a joint at predetermined points along the entire surface of a road or the like.

It is to be noted, as shown in Fig. 1, that the outward pressure exerted by the wooden bar 25 is exerted against the lower areas only of the slab portions at opposite sides of the break line 24. This counteracts any tendency of the slab portions at opposite sides of joint 24 to curve upwardly.

While I have described the invention with reference to a desirable construction and one preferred embodiment of the invention, I desire it to be understood that changes or modifications of these details, falling within the scope of the following claims, may be resorted to without departing from the spirit or scope of the invention.

I claim:

1. In a contraction joint construction for roads, a beam embedded in the subgrade, a slab slidable on said beam, a pair of horizontally aligned plates embedded in the bottom surface of the slab and slidable on said beam, each of said plates having an upstanding flange portion, the opposed outer surfaces of said flange portions being in spaced opposition to each other and defining a bottom recess in said slab above said beam, an absorbent moisture expanded member in said recess and supported on said beam with opposite sides bearing against said opposed outer flange surfaces, the top surface of said slab having a crack line-indicating kerf between the planes of said flanges, said absorbent member during its expansion causing the slab to crack into two portions along the line of said kerf, an anchor member at each opposite side of the crack line and extending into the adjacent slab portion, said anchor members being functionally integral with the adjacent upstanding plate flange, said beam

having longitudinally extending slots at opposite sides of the crack line of said slab and through which slots and adjacent plates the respective lower end portions of said anchor members extend, heads on the lower ends of said anchor members below said beam slots, whereby the slab portions at opposite sides of said crack line are connected to said beam for relative sliding movement thereon, and said absorbent member-receiving recess between the slab portions being of a heighth exceeding that of the absorbent member, and a compressible cushion member interposed between the top of said absorbent member and the superjacent slab portions at opposite sides of said crack line to absorb upward pressure from the absorbent member when the latter expands so as to avoid a raising of the slab portions at opposite sides of the crack line.

2. In a contraction joint construction for roads, a beam embedded in the subgrade, a slab slidable on said beam, a pair of horizontally aligned plates embedded in the bottom surface of the slab and slidable on said beam, each of said plates having an upstanding flange portion, the opposed outer surfaces of said flange portions being in spaced opposition to each other and defining a bottom recess in said slab above said beam, an absorbent moisture expanded member in said recess and supported on said beam with opposite sides bearing against said opposed outer flange surfaces, the top surface of said slab having a crack line indicating kerf between the planes of said flanges, said absorbent member during its expansion causing the slab to crack into two portions along the line of said kerf, an anchor member at each opposite side of the crack line and extending into the adjacent slab portion, said anchor members being functionally integral with the adjacent upstanding plate flange, said beam having longitudinally extending slots at opposite sides of the crack line of said slab and through which slots and adjacent plates the respective lower end portions of said anchor members extend, heads on the lower ends of said anchor members below said beam slots, whereby the slab portions at opposite sides of said crack line are connected to said beam for relative sliding movement thereon, and a lubricant reservoir in said beam extending across said crack line and into which reservoir said inner anchor ends extend, and said absorbent member-receiving recess between the slab portions being of a heighth exceeding that of the absorbent member, and a compressible cushion member interposed between the top of said absorbent member and the superjacent slab portions at opposite sides of said crack line to absorb upward pressure from the absorbent member when the latter expands so as to avoid a raising of the slab portions at opposite sides of the crack line.

3. In a contraction joint construction for roads, a beam embedded in the subgrade, a slab slidable on said beam, a pair of horizontally aligned plates embedded in the bottom surface of the slab and slidable on said beam, each of said plates having an upstanding flange portion, the opposed outer surfaces of said flange portions being in spaced opposition to each other and defining a bottom recess in said slab above said beam, an absorbent moisture expanded member in said recess and supported on said beam with opposite sides bearing against said opposed outer flange surfaces, the top surface of said slab having a crack line indicating kerf between the planes of said flanges, said absorbent member during its expansion causing the slab to crack into two portions along the line of said kerf, an anchor member at each opposite side of the crack line and extending into the adjacent slab portion, said anchor members being functionally integral with the adjacent upstanding plate flange, said beam having longitudinally extending slots at opposite sides of the crack line of said slab and through which slots and adjacent plates the respective lower end portions of said anchor members extend, heads on the lower ends of said anchor members below said beam slots, whereby the slab portions at opposite sides of said crack line are connected to said

beam for relative sliding movement thereon, and said beam being of inverted channel form with slots in its web wall, and a lubricant reservoir into which said anchor ends extend, said reservoir in part formed by the web and side walls of said beam and extending across said crack line, there being a bottom reservoir wall carried by said side walls of said beam.

4. In a contraction joint construction for roads, a beam embedded in the subgrade, a slab slidable on said beam, a pair of horizontally aligned plates embedded in the bottom surface of the slab and slidable on said beam, each of said plates having an upstanding flange portion, the opposed outer surfaces of said flange portions being in spaced opposition to each other and defining a bottom recess in said slab above said beam, an absorbent moisture expanded member in said recess and supported on said beam with opposite sides bearing against said opposed outer flange surfaces, the top surface of said slab having a crack line indicating kerf between the planes of said flanges, said absorbent member during its expansion causing the slab to crack into two portions along the line of said kerf, an anchor member at each opposite side of the crack line and extending into the adjacent slab portion, said anchor members being functionally integral with the adjacent upstanding plate flange, said beam having longitudinally extending slots at opposite sides of the crack line of said slab and through which slots and adjacent plates the respective lower end portions of said anchor members extend, heads on the lower ends of said anchor members below said beam slots, whereby the slab portions at opposite sides of said crack line are connected to said beam for relative sliding movement thereon, and said absorbent member-receiving recess between the slab portions being of a heighth exceeding that of the absorbent member, a compressible cushion member interposed between the top of said absorbent member and the superjacent slab portions at opposite sides of said crack line to absorb upward pressure from the absorbent member when the latter expands so as to avoid a raising of the slab portions at opposite sides of the crack line, and said beam being of inverted channel form with slots in its web wall, and a lubricant reservoir into which said anchor ends extend, said reservoir in part formed by the web and side walls of said beam and extending across said crack line, there being a bottom reservoir wall carried by said side walls of said beam.

5. In a contraction joint construction for roads, adjacent separable slab portions adapted in service to separate and provide a joint space therebetween, a beam embedded in the subgrade across said joint space and slidably supporting said slab portions, a pair of horizontally aligned plates embedded in the respective bottom surfaces of the slab portions and slidable on said beam, said plates having opposed upstanding flange portions embedded in the slab portion edges at the site of said joint space, the opposed outer surface of said flange portions defining a bottom recess in said slab portions at the site of said joint space above said beam, an absorbent moisture expanded member in said recess and supported on said beam with opposite sides bearing against said opposed outer flange surfaces, said absorbent member during its expansion causing the slab portions to separate, an anchor member extending into each slab portion at the site of said joint space, said anchor members having lower end portions which are functionally integral with the adjacent upstanding plate flange, said beam having longitudinally extending slots at opposite sides of the joint space between said slabs and through which slots and adjacent plates the respective lower end portions of said anchor members extend, heads on the lower ends of said anchor members below said beam slots, whereby the slab portions at opposite sides of joint space are connected to said beam for relative sliding movement thereon, and said absorbent member-receiving recess between the slab portions being of a heighth exceeding that of the absorbent member, and a compressible cushion member interposed between the top of said absorbent member and the superjacent slab portions at opposite sides of said joint space to absorb upward pressure from the absorbent member when the latter expands so as to avoid a raising of the slab portions at opposite sides of the joint space.

6. In a contraction joint construction for roads, adjacent separable slab portions adapted in service to separate and provide a joint space therebetween, a beam embedded in the subgrade across said joint space and slidably supporting said slab portions, a pair of horizontally aligned plates embedded in the respective bottom surfaces of the slab portions and slidable on said beam, said plates having opposed upstanding flange portions embedded in the slab portion edges at the site of said joint space, the opposed outer surface of said flange portions defining a bottom recess in said slab portions at the site of said joint space above said beam, an absorbent moisture expanded member in said recess and supported on said beam with opposite sides bearing against said opposed outer flange surfaces, said absorbent member during its expansion causing the slab portions to separate, an anchor member extending into each slab portion at the site of said joint space, said anchor members having lower end portions which are functionally integral with the adjacent upstanding plate flange, said beam having longitudinally extending slots at opposite sides of the joint space between said slabs and through which slots and adjacent plates the respective lower end portions of said anchor members extend, heads on the lower ends of said anchor members below said beam slots, whereby the slab portions at opposite sides of joint space are connected to said beam for relative sliding movement thereon, and a lubricant reservoir in said beam extending across said joint space and into which reservoir said inner anchor ends extend, and said absorbent member-receiving recess between the slab portions being of a heighth exceeding that of the absorbent member, and a compressible cushion member interposed between the top of said absorbent member and the superjacent slab portions at opposite sides of said joint space to absorb upward pressure from the absorbent member when the latter expands so as to avoid a raising of the slab portions at opposite sides of the joint space.

7. In a contraction joint construction for roads, adjacent separable slab portions adapted in service to separate and provide a joint space therebetween, a beam embedded in the subgrade across said joint space and slidably supporting said slab portions, a pair of horizontally aligned plates embedded in the respective bottom surfaces of the slab portions and slidable on said beam, said plates having opposed upstanding flange portions embedded in the slab portion edges at the site of said joint space, the opposed outer surface of said flange portions defining a bottom recess in said slab portions at the site of said joint space above said beam, an absorbent moisture expanded member in said recess and supported on said beam with opposite sides bearing against said opposed outer flange surfaces, said absorbent member during its expansion causing the slab portions to separate, an anchor member extending into each slab portion at the site of said joint space, said anchor members having lower end portions which are functionally integral with the adjacent upstanding plate flange, said beam having longitudinally extending slots at opposite sides of the joint space between said slabs and through which slots and adjacent plates the respective lower end portions of said anchor members extend, heads on the lower ends of said anchor members below said beam slots, whereby the slab portions at opposite sides of joint space are connected to said beam for relative sliding movement thereon, and said beam being of inverted channel form with slots in its web wall, and a lubricant reservoir into which said anchor ends extend, said reservoir in part formed by the web and side walls of said beam and extending across said joint space, there being a bottom reservoir.

8. In a contraction joint construction for roads, adja-

cent separable slab portions adapted in service to separate and provide a joint space therebetween, a beam embedded in the subgrade across said joint space and slidably supporting said slab portions, a pair of horizontally aligned plates embedded in the respective bottom surfaces of the slab portions and slidable on said beam, said plates having opposed upstanding flange portions embedded in the slab portion edges at the site of said joint space, the opposed outer surface of said flange portions defining a bottom recess in said slab portions at the site of said joint space above said beam, an absorbent moisture expanded member in said recess and supported on said beam with opposite sides bearing against said opposed outer flange surfaces, said absorbent member during its expansion causing the slab portions to separate, an anchor member extending into each slab portion at the site of said joint space, said anchor members having lower end portions which are functionally integral with the adjacent upstanding plate flange, said beam having longitudinally extending slots at opposite sides of the joint space between said slabs and through which slots and adjacent plates the respective lower end portions of said anchor members extend, heads on the lower ends of said anchor members below said beam slots, whereby the slab portions at opposite sides of joint space are connected to said beam for relative sliding movement thereon, and said absorbent member-receiving recess between the slab portions being

of a heighth exceeding that of the absorbent member, a compressible cushion member interposed between the top of said absorbent member and the superjacent slab portions at opposite sides of said joint space to absorb upward pressure from the absorbent member when the latter expands so as to avoid a raising of the slab portions at opposite sides of the joint space, and said beam being of inverted channel form with slots in its web wall, and a lubricant reservoir into which said anchor ends extend, said reservoir in part formed by the web and side walls of said beam and extending across said joint space, there being a bottom reservoir.

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