June 28, 1966 F. P. DICKOW ET AL 3,257,916

CONCRETE PAVEMENT CONTRACTION JOINT

Filed Feb. 28, 1963 2 Sheets-Sheet 1

FIG. 1

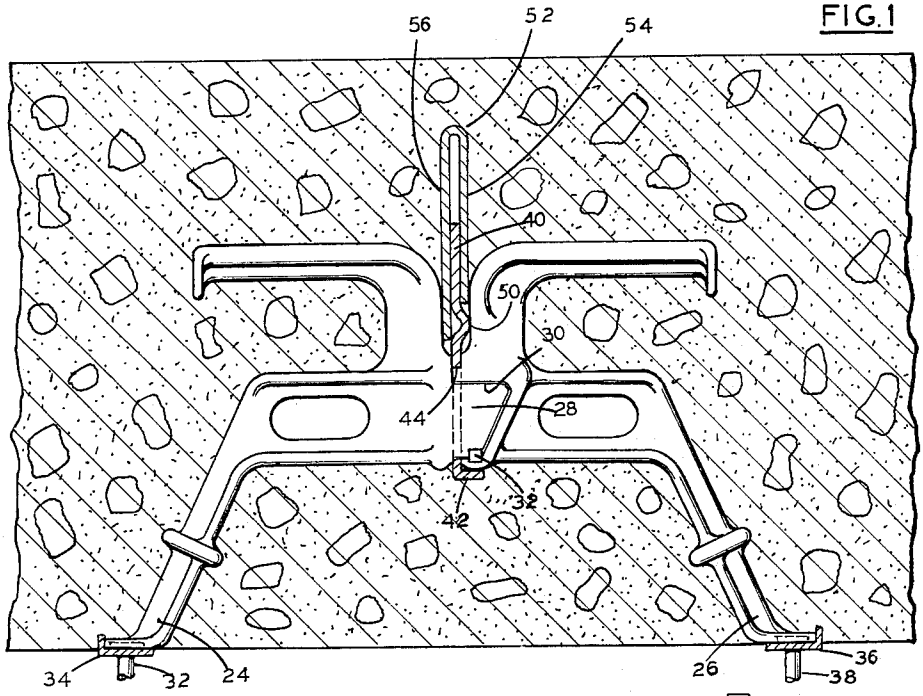


FIG. 2

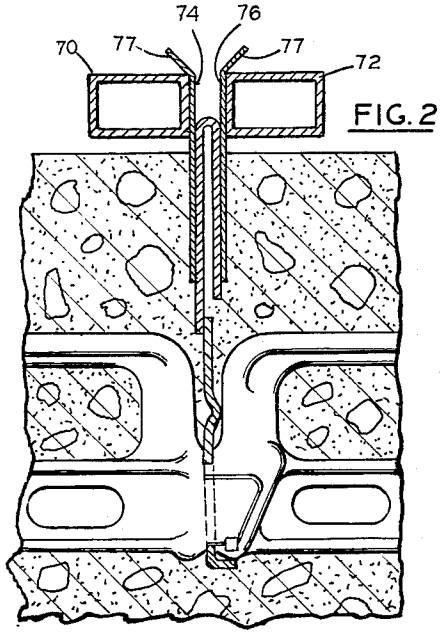
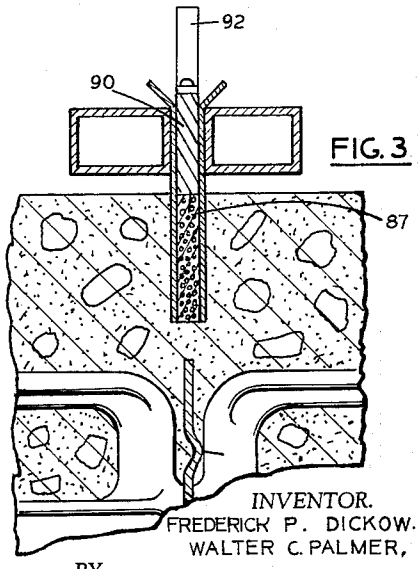


FIG. 3



INVENTOR.
FREDERICK P. DICKOW.
WALTER C. PALMER,

BY

ATTORNEY

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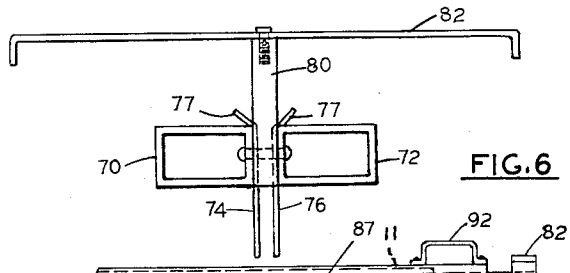


FIG. 6

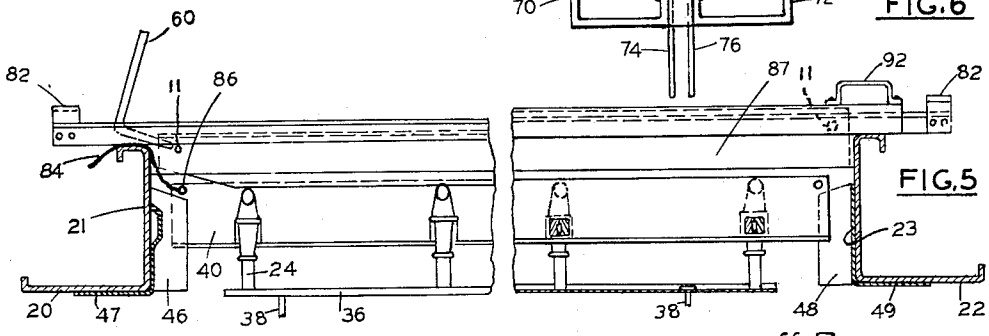


FIG. 5

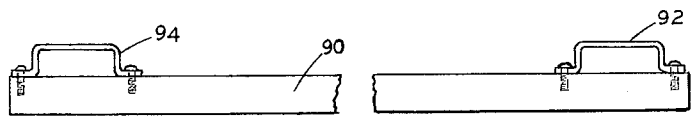


FIG. 8

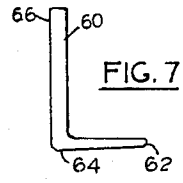


FIG. 7

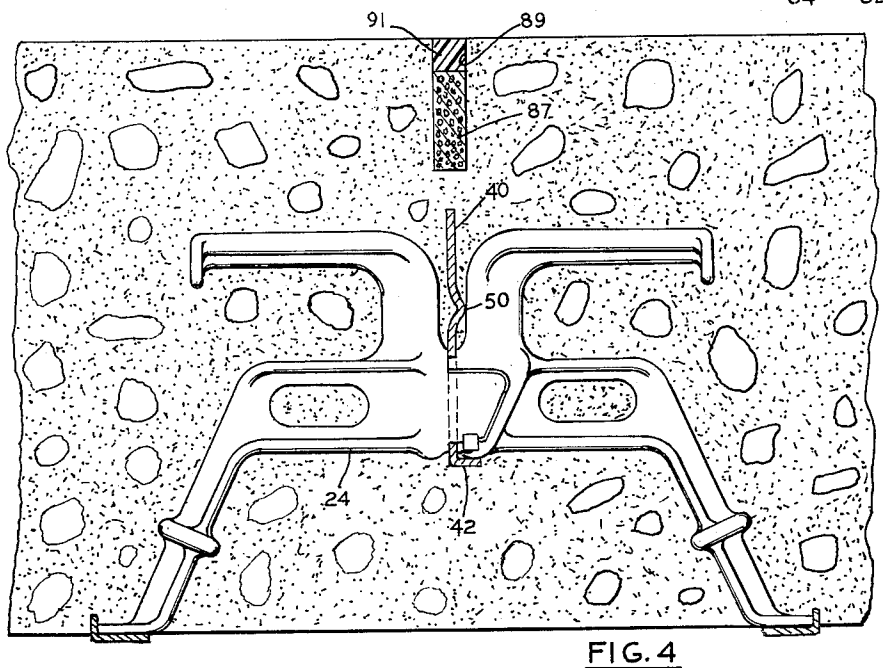


FIG. 4

INVENTOR.
FREDERICK P. DICKOW.
WALTER C. PALMER.

BY

ATTORNEY

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CONCRETE PAVEMENT CONTRACTION JOINT

Frederick P. Dickow, Auburn, and Walter C. Palmer, Durhamville, N.Y., assignors to The Eastern Company, Naugatuck, Conn., a corporation of Connecticut

Filed Feb. 28, 1963, Ser. No. 261,594
10 Claims. (Cl. 94—17)

This invention relates to concrete pavement contraction joints, and also the method of forming such joints, and apparatus adapted to facilitate formation thereof.

In the laying of concrete roadways it is the practice to lay a strip of concrete of a given width such as twelve feet wide and to provide at spaced intervals, during the course of laying a series of transverse contraction joints, which divide the concrete strip into sections or slabs of elongated rectangular configuration, so that when contraction takes place, there is produced a controlled transverse break between slabs. In preparing the slabs during the course of laying the concrete, it is desirable to not only provide for such controlled break, but also to provide at each location where the controlled break is to occur, a groove or slot extending inwardly from the surface, of sufficient depth to receive and hold a seal in the form of a sealing compound or the like, to prevent water from entering the slot and the controlled break therebelow. Each such controlled break is provided with a plurality of load transfer joints in the form of mating pairs of malleable iron castings, one casting of each pair being embedded in the concrete, on either side of the transverse line of the controlled break. The castings are provided with interfitting telescopic tongues and recesses to transfer the load between slabs across the controlled break, the interfitting tongues and recesses allowing relative movement between the slabs in response to expansion and contraction along the length thereof. One such load transfer joint is disclosed in a pending application #78,542 filed December 27, 1960, and assigned to The Eastern Company issued November 19, 1963, as Patent No. 3,111,068.

The present invention is directed toward forming, before hardening of the concrete, a slot extending downwardly from the surface, where the controlled break is provided for. More particularly, the load transfer joints by their interfitting tongues, support a transverse plate, the upper edge of which is well below the ultimate surface of the concrete slabs. The plate is adapted, during pouring of the concrete, to support an elongated inverted U-sectioned removable cap of heavy sheet metal which is slidably disposed over the upper edge of the plate. The cap is located in such position before pouring and adapted to be covered over during the pouring operation. Immediately after pouring, a tool having spaced guide plates adapted to embrace the cap is inserted into the soft concrete, and the cap is then removed. The void formed by removing the cap is filled while the guide plates are in position, by the insertion of a filler strip of light porous material such as balsa wood, neoprene, styrofoam or white pine. The guide plates are thereafter removed while such filler strip is held down in the slot thus formed by a hold down bar. The above operations are all completed prior to the hardening or setting of the concrete, and the joint forming tool having the guide plates and the hold down bar and the method of their use in providing joints of the character referred to constitute features of the invention.

The above and other novel features of the invention will appear more fully hereinafter from the following detailed description when taken in conjunction with the accompanying drawings. It is expressly understood that the drawings are employed for purposes of illustration only and are not designed as a definition of the limits

of the invention, reference being had for this purpose to the appended claims.

In the drawings wherein like parts are indicated by like reference characters:

FIGURE 1 is a sectional view through a transfer joint, as it would appear immediately after pouring of the concrete;

FIGURE 2 is a sectional view of the joint of FIGURE 1 after partial lifting of the cap and insertion of the joint forming tool;

FIGURE 3 is a sectional view of the joint of FIGURE 2 after removal of the cap and the insertion of a filler strip and the application of the hold down bar;

FIGURE 4 is a sectional view of a finished joint after the concrete has been allowed to set with sealing material in position;

FIGURE 5 is a diagrammatic view partly in side elevation and partly in section of a contraction joint assembly with the cap and tools indicated, the assembly having the central portion broken away and the left hand end of the hold down bar removed;

FIGURE 6 is an end view of the guide plate tool;

FIGURE 7 is a side elevational view of a cap lifting tool, and

FIGURE 8 is a side elevational view of the hold down tool broken to remove the mid section.

Referring to FIGURE 5 there are shown spaced paving forms 20 and 22 having upstanding forming faces 21 and 23, which may be of a height to correspond approximately to the thickness of concrete to be poured, which may be nine inches, or any standard thickness. The spacing between the forming faces may be twelve feet.

At specified intervals, where a contraction joint is called for, a contraction joint assembly is installed prior to pouring the concrete. Each such contraction joint assembly comprises a plurality of pairs of load transfer joint supports spaced apart on twelve inch centers. Such load transfer supports may comprise pairs of identical castings such as 24 and 26, having mating telescopic tongues and recesses 28 and 30. The pairs are held together initially by shearable locking pins 32. The feet of such castings are mounted on angle iron spacer members 34 and 36 secured to the subgrade of the road at intervals by steel pins 38. Before assembly of the mating tongues and recesses, a steel dividing plate 40, having a flange 42 along its lower edge, and apertures 44 through which the support tongues may project, is located in position so as to extend transversely across the road bed between the paving forms 20 and 22. The plate however terminates several inches short of the paving forms at either end, and end guide plates 46 and 48, having footings 47 and 49 disposed beneath the paving forms may be employed to brace the ends of the plate 40. In forming a concrete strip twelve feet wide, twelve pairs of load joint supports together with a dividing plate are employed at each joint where a controlled break is desired.

The plate 40 is provided with a longitudinal stiffening rib 50, disposed immediately above the tongues 28, and an inverted U-sectioned cap member 52 is slid over the upper edge of the plate 40 to the position shown in FIGURE 1. One flange or side 54 of the cap member is of less width than the other side 56 to accommodate the rib 50. The overall thickness of the cap member corresponds to the width of the slot above the controlled break that is to be formed. One end of the cap may be relieved as at 57 (see FIG. 5), and the length of the cap is such that its ends are spaced about an inch or more from the faces 21 and 23 of the forms 20 and 22.

The load transfer joints, the plate 40, and cap 52 as assembled in the manner shown in FIGURE 1, are in position ready for pouring of the concrete. The concrete is poured to a level two and a half inches or more over

plate 40 and approximately an inch above the cap 52 as indicated in FIGURE 1. As soon as the concrete is poured, and while still in a fluid state, and before the concrete can set, the cap whose ends are spaced from the paving form is lifted to the surface, by cap lifting tools 60 applied to the opposite ends of the cap. The cap lifting tools 60 comprise an angle lever, having an end 62 adapted to be inserted into the soft concrete to engage into and under the end of the U bend of the cap 52. The heel portion 64 of the tool is adapted to fulcrum on the upper flange of the paving form so that by rocking the lifting tool handle 66, the cap is lifted into sight from freshly poured concrete.

As soon as the cap is lifted to or slightly above the level of the poured surface, a joint forming tool comprising a pair of spaced rigid box columns 70 and 72 having spaced depending guide plates 74 and 76 mounted on the inside facing surfaces of the columns, are aligned with the lifted cap 50, and the plates 74 and 76, caused to knife into the concrete on opposite sides of the cap, the spacing of the plates corresponding closely with the thickness of the cap 50. The guide plates are of a length to reach from one paving form to the other, and are oppositely flared as at 77, along their upper edges. The supporting rectangular section columns 70 and 72 are of a length to extend beyond the opposite flanges of the paving forms. The ends of the columns are joined in spaced relation through the stem or spacer portion 80 of T shaped lifting handles 82. A short section of wire of small gage such as 84, passes through an aperture 86 in the plate 40 may be extended over the form before pouring to indicate the hidden location of the cap after pouring. The wires may be attached to the plate or a hole 11 in the cap. Upon location of the cap position, the end of the tool 60 is inserted into the concrete and underneath the cap fold, to raise the cap into sight as in FIG. 2, where it is held while the joint forming tool is inserted.

Once the guide plates of the joint forming tool are manually inserted into the concrete on opposite sides of the cap 52 and to the depth as permitted by the engagement of extended ends of the tool with the paving forms, the cap member is lifted completely from the concrete, and laid aside ready for reuse at a succeeding joint. A filler strip 87 is then inserted into the void thereby created between the guide plates. Such filler may be a strip of light porous material such as balsa wood, white pine or styrafoam or an equivalent, and of a thickness corresponding to the spacing between the guide plates 74 and 76 and of a width to extend into the slot approximately two inches. The length of the strip will correspond to the spacing between forms 20 and 22. An elongated hold down bar 90 of rectangular section and of a length greater than the spacing between forms 20 and 22, and of a width corresponding to the space between the guide plates 74 and 76, and having suitable handles 92 and 94 at either end, is then guided into position between the plates 74 and 76, and brought to bear upon the filler strip to force it into the slot to a depth such that its upper end is flush with the poured concrete. Such hold down bar is of a length sufficiently greater than the width between paving forms, but of a length less than the forming tools to clear the T handles thereof so that same may conveniently rest upon the paving forms, to assure the flush location of the filler strip. While the hold down bar is held against the paving forms to hold the filler strip in place, the joint forming tool is lifted from the concrete, and set aside in readiness for use at a succeeding joint.

As soon as the joint forming tool is lifted clear of the concrete, the concrete flows in to fill the voids below and around the filler strip as left upon the removal of the guide plate tool, while the filler strip is held in place by the hold down bar.

After the removal of the hold down bar, the surfaces adjacent and on either side of the filler strip are floated smooth, and the concrete at the joint left to cure. After the concrete cures, the top half inch of the soft wood or styrafoam filler strip may be removed as by a wire brush to form a sealing slot 89, and the joint thereafter sealed with an approved sealing compound 91 as indicated in FIGURE 4.

The guide plate tool as well as the hold down tool may be made of light metal such as aluminum, for ease in handling, and the box section column may be extruded sections of light metal.

It will be seen from the foregoing, that by use of the tools in the manner set forth, the cap is readily removed while preserving space for the insertion of the filler strip and that upon the insertion of the filler strip, and removal of tools the concrete may be allowed to cure, after which a portion of the filler strip may be removed to provide a slot for the sealing compound. Where a filler strip of neoprene in the form of a rectangular sectioned tube is employed, the strip may effect its own seal, it being understood that the insertion of such a strip is facilitated by the procedure herein above referred to. While balsa wood, white pine and styrafoam have been referred to for use as a filler strip, it will be appreciated that strips of other porous materials of similar properties may be employed.

While the preferred procedure for preparing the controlled breaks has been referred to in considerable detail, in conjunction with a description of the tools to be employed therewith, it is understood that the invention is not limited thereto. As various changes in procedure, and in the form of the tools may be made without departing from the spirit of the invention as will be apparent to those skilled in the art, reference will be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. The method of forming contraction joints in concrete roadways which comprises setting up crosswise of the roadway, prior to pouring, a contraction joint assembly having a series of spaced load transfer expansion joints with a transversely extending dividing plate supported thereon, slidably disposing an inverted U sectioned cap member over the upper edge of the dividing plate, pouring concrete over the joint assembly and cap member, inserting guide plates in the fluid concrete on opposite sides of the cap member, removing the cap member from between said guide plates, and inserting in lieu thereof a transverse filler strip, holding said filler strip with its upper edge flush with the surface of the surrounding concrete, while removing the guide plates, and thereafter floating the concrete adjacent the filler strip to provide finished concrete surfaces flush with the upper edge of the filler strip.

2. The method of forming contraction joints in concrete roadways which comprises setting up crosswise of the roadway prior to pouring, a contraction joint assembly having a series of spaced load transfer expansion joints with a transversely extending dividing plate supported thereon, slidably disposing an inverted "U" sectioned cap member over the upper edge of the dividing plate, pouring concrete over the joint assembly and cap member, inserting guide plates in the fluid concrete on opposite sides of the cap member, removing the cap member from between said guide plates, and inserting in lieu thereof a transverse flat section filler strip of porous material, holding said filler strip with its upper edge flush with the surface of the surrounding concrete, while removing the guide plates, thereafter floating the concrete adjacent the filler strip to provide finished concrete surfaces flush with the upper edge of the filler strip, removing a portion of the upper edge of the filler strip to form a transverse sealing groove, and introducing a sealing composition into the groove.

3. A concrete pavement contraction joint comprising a strip of concrete roadway, a dividing plate embedded in said concrete on a transverse vertical plane to provide a controlled break upon contraction of the strip of concrete, said plate having a width approximately half the thickness of the concrete strip and being disposed centrally of the thickness thereof, a compressible filler strip of substantially rectangular section disposed edgewise in the concrete strip above said plate and substantially in the plane thereof and extending across the width of the concrete strip, the upper edge of said filler strip being disposed below the surface of the concrete strip to provide a sealing groove, and sealing material disposed in said groove.

4. A concrete pavement contraction joint as set forth in claim 3, wherein the filler strip comprises balsa wood.

5. A concrete pavement contraction joint comprising a strip of concrete roadway, a dividing plate embedded in said concrete on a transverse vertical plane to provide a controlled break upon contraction of the strip of concrete said plate having a width approximately half the thickness of the thickness of the concrete strip and being disposed centrally of the thickness thereof, a plurality of load transfer expansion joints disposed along the length of said plate, a compressible filler strip of rectangular section disposed edgewise in the concrete strip above said plate and substantially in the plane thereof and extending across the width of the concrete strip, the upper edge of said filler strip being disposed below the surface of the concrete strip to provide a sealing groove, and sealing material disposed in said groove.

6. A pavement construction as set forth in claim 5 wherein the filler strip comprises porous compressible material in the form of balsa wood.

7. A tool for use in the formation of contraction joints in the construction of a strip of concrete roadway comprising a pair of long rigid rectangular sectioned members disposed in spaced parallel relation, said members being secured at their ends only to the depending stem portion of transverse handles of T configuration, said members being of a length substantially greater than the width of the strip of concrete roadway under construction and a pair of guide plates secured in spaced parallel relation to the inside facing surfaces of said members, said plates being of a length approximately that of the width of the strip of concrete under construction, said plates depending below said members to provide spaced parallel elongate blades, and extending above said members and being flared over the respective members to which they are secured.

8. A tool for use in the formation of contraction joints in the construction of a strip of concrete roadway comprising a pair of long rigid rectangular sectioned members disposed in spaced parallel relation, said members being secured at their ends only to the depending stem portion of transverse handles of T configuration, said members being of a length substantially greater than the width of the strip of concrete roadway under construction and a pair of guide plates secured in spaced parallel relation to the inside facing surfaces of said members, said plates being of a length approximately that of the width of the strip of concrete under construction, said plates depending below said members to provide spaced parallel elongate blades, and extending above said members and being flared over the respective members to which they are secured, and a hold down bar adapted for use in conjunction with said tool, said bar being of a greater length than said plates, and of a length short of the end handles of said members, said bar having a rectangular section, the thickness of which corresponds substantially to the spacing between said plates with slight clearance whereby said bar may hold down a filler strip, while the plates are being withdrawn from the concrete, said hold down bar having handles formed along its upper edge adjacent its opposite ends.

9. A concrete pavement contraction joint as set forth in claim 3, wherein the filler strip comprises white pine.

10. A concrete pavement construction as set forth in claim 5, wherein the filler strip comprises porous compressible material in the form of white pine.

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CHARLES E. O'CONNELL, *Primary Examiner.*

JACOB L. NACKENOFF, *Examiner.*

N. C. BYERS, *Assistant Examiner.*