Sept. 3, 1940. W. E. WHITE 2,213,725

JOINT FOR CONCRETE ROADWAYS

Filed June 18, 1938 3 Sheets-Sheet 1

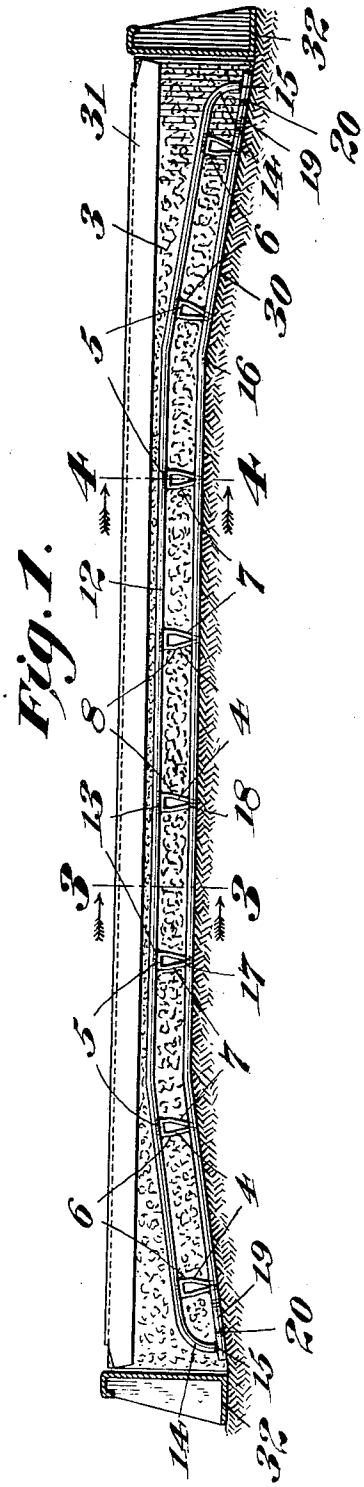


Fig. 1.

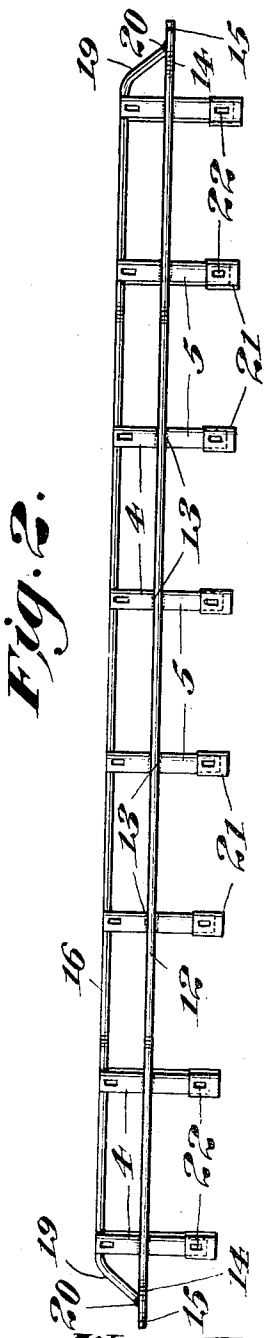


Fig. 2.

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Fig. 3.

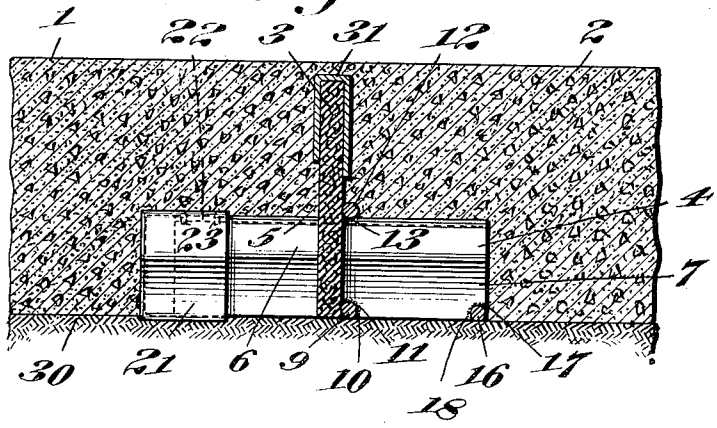
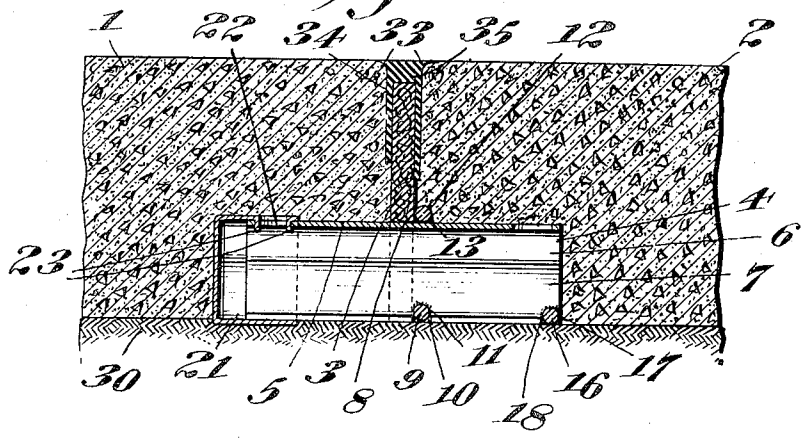


Fig. 4.



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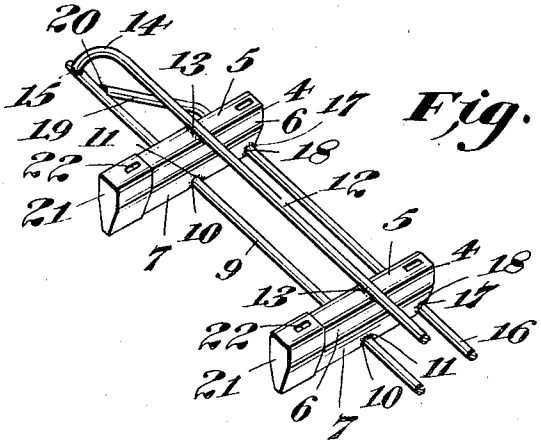


Fig. 5.

Fig. 6.

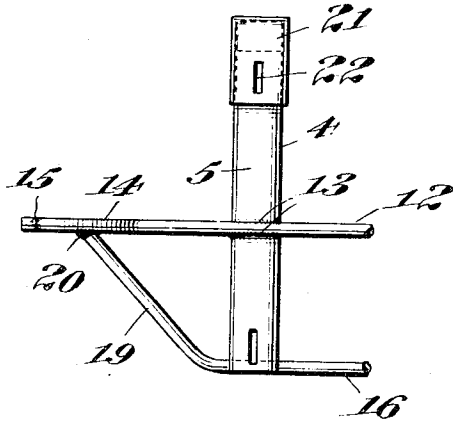


Fig. 7.

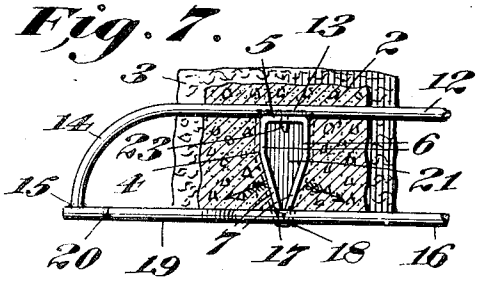
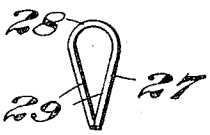


Fig. 8.



Fig. 9.



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Patented Sept. 3, 1940 2,213,725

UNITED STATES PATENT OFFICE

2,213,725

JOINT FOR CONCRETE ROADWAYS

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Application June 13, 1938, Serial No. 214,513

16 Claims. (Cl. 94—18)

My invention relates to improvements in joints for roads, floors or the like structures, and is more particularly adapted for use in the construction of joints for concrete roads.

In the construction of concrete roadways, the same are divided transversely and sometimes longitudinally into sections with interposed joints, so that the concrete may expand or contract under changes in temperature, thereby preventing cracks and blow-ups in the roadways; and in modern practice expansible joint strips and metal bars termed "dowels" are employed to a great extent to maintain the adjacent ends of the slab sections in proper alignment and to transfer the load from one slab to the other.

These dowels extend across the joint and have their ends embedded in the concrete at an intermediate point in the adjacent ends of the two concrete slab sections. One end of each of the said dowels is usually arranged to bond with the concrete of one slab section while the material of the other section moves or slides on the other end of the dowels as the sections expand or contract.

It is very important that these dowels be properly placed and aligned and that they accurately maintain their positions during the pouring and setting of the concrete.

Heretofore various means have been employed for properly positioning the dowels and maintaining them in position, such for instance as chairs or stakes which usually consisted of bent wires or sheet stampings that were adapted to rest upon or were driven into the sub-grade to support the ends of the dowels.

These chairs, stakes or the like become embedded in the concrete and while they remain there permanently they perform no useful function except as merely temporary supports for the reinforcing bars or dowels. Not only does this procedure involve a waste of material and time consumed in properly positioning and aligning the individual dowels, but the chairs or stakes are frequently pushed aside and displaced under the impact of the concrete during the pouring operation. The ends of the dowels have also been supported from hangers extending downwardly from a supporting bar or the like above the road which were removed immediately after the concrete was poured. This removal of the hangers very often throws the dowels out of alignment.

One of the objects of my invention relates to the manner of constructing a dowel assembly to be used in conjunction with the joint strip of expansible material in a concrete roadway which can be entirely fabricated in the shop and then shipped to the point where the road is under construction, as a unit.

Another object of my invention is to provide a shop fabricated unit for doweling joints in concrete pavements or the like, in which the dowels are assembled and permanently fixed in correct placement to each other when the unit is seated directly on the sub-grade of the road, and also provide means for holding the strip of expansible material for the road joint in proper alignment.

Another object of my invention relates to forming the dowel unit in such a manner that the dowels when secured to the frame or chord members will form struts for a trussed structure.

Another object of my invention is to form a shop fabricated unit which can be shipped to the job and installed directly on the sub-grade without additional assemblage.

A further object of my invention relates to the formation of the dowels of sheet metal of relatively large size as compared with the prior art with converging lower side bearing surfaces thereby increasing the bearing area and dividing the pressure on the concrete into components on each side of the lower surface of the dowels.

Other objects of my invention will hereinafter appear.

Having thus given a general description of the advantages of my invention, I will now in order to make the same more clear refer to the annexed three sheets of drawings forming a part of this specification and in which like characters of reference indicate like parts.

Figure 1 is a side elevation of my improved road joint assembly showing it disposed in the position it will assume seated on the sub-grade of the roadway between the side forms which are shown in section with the installing cap in place just before the concrete is poured;

Fig. 2 is a top plan view of the dowel unit;

Fig. 3 is a transverse section taken on the line 3—3 of Fig. 1 but drawn on a large scale, showing the concrete in place just after it has been poured and leveled off;

Fig. 4 is a transverse section taken on the line 4—4 of Fig. 1 of the finished joint after the installing cap has been removed and the recess filled with asphalt or the like;

Fig. 5 is a perspective view of one end portion of the dowel unit;

Fig. 6 is a top plan view of one end of the dowel unit;

Fig. 7 is a side elevation of one end of the dowel unit; and

Figs. 8 and 9 show two end views of modified forms of dowels I may use.

Referring now to the various characters of reference on the drawings, the numerals 1 and 2, designate two adjoining slabs or sections of concrete roadway or the like between which is interposed the joint strip 3 which may be formed of fibre treated with a bituminous composition, cork, rubber or any other suitable material adapted to provide means to allow for expansion or contraction of the sections of concrete.

A series of dowels are indicated at 4 each formed of sheet metal having a flat top central portion 5 with downwardly extending legs which are parallel to each other as at 6, for a portion of their length and then bent inwardly at their lower ends as at 7 to form converging side bearing surfaces in the concrete.

These dowels 4 are disposed in a central position transversely of the joint strip 3 which have openings 8 formed therein at its lower edge adapted to fit the dowels which are held in spaced parallel alignment by means of a frame preferably formed of rods, comprising a bottom central chord 9 which extends through a notch 10 formed in the lower central portion of the lower edges of the legs of the dowels and welded thereto as at 11. A top chord 12 in vertical alignment with the central bottom chord 9 is welded as at 13 to the flat top portion 5 of the dowels having its ends bent to a curve downwardly as at 14 and welded to the end portions of the bottom chord as at 15.

To further stiffen the structure the lower edges of the leg portions 7 of one end of the dowels are connected together by means of a tie rod or chord 16 which is in horizontal alignment with the central chord 9 and extends through a notch 17 and welded thereto as at 18 with its ends 19 bent inwardly and welded to the end portions of the bottom chord as at 20.

By constructing the dowel unit in this manner the dowels are rigidly held in fixed spaced relation to each other at all times and a trussed structure is formed in which the dowels act as struts for both the vertically and horizontally disposed chords

The dowels of the unit when installed are adapted to extend into each of the concrete road sections substantially an equal distance on each side of the joint strip, and as shown more clearly in Figs. 3 and 4, the dowels are adapted to bond with the concrete section 2 and slide in the section 1. For this purpose an expansion cap 21, rigidly held in position by the concrete, loosely receives the free end of each of the dowels. These expansion caps are preferably formed of thin sheet metal material and to prevent them from becoming lost or displaced during shipment or installation, each dowel is formed with a slot 22, near one or both of the ends of the flat top central portion 5, while the expansion cap 21 is formed with tangs 23 for engaging the end walls of the said slots which will bend or be sheared off as the concrete expands or contracts.

It will be understood that although the ends of the dowels are bonded in one of the two adjoining sections of concrete both sections are free to expand or contract under varying temperatures.

In Figs. 8 and 9 I have illustrated two modified forms of dowels I may use formed of sheet metal in which 24 indicates a dowel having a flat top 25 with inwardly inclined legs forming converging side bearing surfaces 26, and 27 a dowel also formed of sheet metal having an arc shaped top portion 28 with inwardly inclined legs or side walls 29.

My dowel unit structure will be entirely assembled in the shop with or without the joint strip 3, which is adapted to be mounted on the expansion cap end portion of the dowels at this time before the expansion caps 21 are attached, or the hole 8, in the joint strip 3 may be made large enough to allow it to be passed over the caps in the shop or in the field.

In installing my device the assembled dowel unit with the joint strip 3 mounted thereon is seated in position directly on the sub-grade 30 intermediate the side forms 32, as clearly indicated in Fig. 1 of the drawings and stakes (not shown) may be driven into the sub-grade on each side of the joint strip 3 to further hold the unit in place if desired. A removable U-shaped installing cap 31 is then placed over the top edge of the joint strip 3 to protect it during the concrete pouring operation. The concrete is then poured and leveled off to the height shown in Fig. 3. The installing cap 31 is then removed and the top edges of the two adjoining slab sections 1 and 2 are rounded off as indicated at 33; this leaves a space 34 on each side of the top portion of the joint strip 3 and above the same which is filled with soft asphalt or a similar substance 35 as indicated in Fig. 4.

Heretofore it has been the usual practice to use plain dowel bars of relatively small size in roadway joints which have obvious weaknesses. In order for such a load transmission device to function properly with any degree of efficiency it is necessary that the dowels be placed closely together. These dowels are usually embedded in the central portion of the body of the slabs of concrete and on account of their small size do not provide satisfactory bearing areas as the load pressures are localized immediately above or below the dowels at the edges of the slabs at the joint.

In my device, as shown in the drawings, the dowels are hollow sheet metal members of relatively large size which are seated directly on the sub-grade in the lower portion of concrete roadway instead of in the central portion of the slabs and are provided with converging lower bearing surfaces of considerable area in which the pressure is transmitted and divided into components on opposite sides of the converging bearing surfaces of the dowels as indicated by the arrows in Fig. 7. Furthermore, the shape of the dowels does not interfere with the flow of concrete around the same during the pouring operation.

Although I have shown and described my invention in considerable detail, I do not wish to be limited to the exact and specific details shown and described, but may use such substitutions, modifications or equivalents thereof as are embraced within the scope of my invention or as pointed out in the claims.

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

1. An expansion joint for concrete roadways or the like having separate slab sections on opposite sides of the joint, a joint strip between the slabs, a dowel unit adapted to be seated directly on the sub-grade comprising a plurality of dowels formed of sheet metal having inwardly inclined lower bearing surfaces extending transversely through the lower edge portion of the joint strip for connecting the ends of the

slab sections, and chord members for holding the dowels in spaced parallel alignment.

2. A dowel unit for concrete roadway joints or the like comprising a truss structure having top and bottom chords, a plurality of dowels each having a cross-section of substantially the same height as the dowel unit positioned centrally at spaced intervals between the said chord members and welded thereto, and a chord for connecting one end of the dowels.

3. A dowel unit for concrete roadway joints or the like comprising a plurality of dowels formed of sheet metal each having a flat top with downwardly extending legs bent inwardly at the lower portions, a top and bottom chord welded to the central portion of the dowels for holding the said dowels in fixed spaced relation to each other, a chord in horizontal alignment with the centrally disposed bottom chord having a welded connection with one end of the dowels, and means for securing the ends of the chords together.

4. A dowel unit for concrete roadway joints or the like adapted to be seated directly on the sub-grade comprising a truss structure having a centrally disposed bottom chord member, a top chord member in vertical alignment and in parallel relation with the bottom chord member having its ends bent downwardly and welded to the bottom chord member, a horizontally disposed chord in spaced parallel relation with the bottom chord having bent ends welded to the end portions of said bottom chord, and a plurality of hollow dowels each having a height at least as great as the space between the top and bottom chords formed of sheet metal having converging lower side bearing portions with lower edges seated directly on the sub-grade on each side of the joints positioned at spaced intervals between the chord members and welded thereto adapted to form the struts for the truss member.

5. A dowel unit for concrete roadway joints or the like adapted to be seated on the sub-grade comprising a truss structure having top and bottom chords, a plurality of straight hollow dowels extending from the top to the bottom chords formed of sheet metal each having converging lower side bearing surfaces positioned at spaced intervals and welded to the top and bottom chord members, and a horizontally arranged chord having a welded connection with one end of the dowels.

6. A dowel unit for concrete roadway joints or the like adapted to be seated directly on the sub-grade comprising a truss structure having top and bottom chord members, a plurality of dowels positioned centrally at spaced intervals and extending between the top and bottom chord members and welded thereto adapted to form the struts for the truss member, said dowels each formed of hollow sheet metal having a flat top with downwardly extending legs with their lower portions bent inwardly to form bearing surfaces in the concrete with lower edges engaging the sub-grade on each side of the joints, and a chord connecting one end of the dowels and the bottom chord and welded thereto.

7. An expansion joint for concrete roadways or the like having separate slab sections on opposite sides of the joint, a joint strip between the slab sections, a plurality of dowels in spaced parallel alignment extending through the joint strip for connecting the adjacent ends of the slab sections, said dowels each formed of sheet metal having a central top portion with downwardly extending leg portions bent inwardly to form a converging side bearing surface in the concrete and adapted to have their lower edges seated directly on the sub-grade on each side of the joint strip, top and bottom chords for connecting the intermediate portions of the dowels, a chord for connecting one end of the dowels together, and a welded connection between the chords and the dowels.

8. An expansion joint for concrete roadways or the like having separate slab sections on opposite sides of the joint, a joint strip between the slabs, a plurality of dowels seated on the sub-grade of the roadway in spaced parallel alignment and extending through the joint strip for connecting the adjacent ends of the slab sections, said dowels each formed of sheet metal having a central flat top portion with downwardly extending leg portions which are parallel to each other for a portion of their length and then bent inwardly to form a converging side bearing surface in the concrete, top and bottom chords having a welded connection with the intermediate portion of the dowels for holding said dowels in fixed relation to each other, and a chord having a welded connection with one end of the dowels.

9. An expansion joint for concrete roadways or the like having separate slab sections on opposite sides of the joint, a joint strip between the slabs, a plurality of dowels seated on the sub-grade of the roadway in spaced parallel alignment adapted to extend through the joint strip for connecting the adjacent ends of the slab sections, said dowels each formed of sheet metal having a central top portion with downwardly and inwardly extending leg portions adapted to form a bearing surface in the concrete, a slot formed in the end of the top portion, an expansion cap mounted on one end of the dowel, tangs formed integral with the expansion cap for engaging the slot for securing the cap to the end of the dowel, and chords for connecting the intermediate portion and one end of the dowels together.

10. A dowel unit for concrete roadway joints or the like comprising a truss structure having a centrally disposed bottom chord, a top chord vertically disposed and in spaced parallel relation with the bottom chord having its end portions bent down and welded to the end portions of the bottom chord, a chord in horizontal spaced parallel alignment with the bottom chord having its ends bent inwardly and welded to the end portions of the bottom chord, and a plurality of dowels each having a converging lower surface positioned at spaced intervals between the chord members and welded thereto adapted to form the struts for the truss member.

11. A dowel unit for concrete roadway joints or the like comprising a truss structure having top and bottom chords, a plurality of hollow dowels formed of sheet metal centrally disposed and positioned at spaced intervals between the top and bottom chord members and welded thereto adapted to form the struts for the truss member, and a chord for connecting one end of the dowels together.

12. An expansion joint for concrete roadways or the like having separate slabs on opposite sides of the joint, a joint strip between the slabs, a truss member adapted to be seated directly on the sub-grade of the road and to be embedded in one slab of the roadway comprising

a truss structure having top and bottom chord members, a plurality of hollow dowels for connecting the slabs together each formed of sheet metal having converging lower side bearing surfaces positioned in spaced relation to each other between the top and bottom chord members adapted to form struts for the truss structure, and a chord for connecting one end of the dowels together.

13. An expansion joint for concrete roadways or the like having separate slab sections on opposite sides of the joint, a joint strip between the slabs, a dowel unit seated on the sub-grade of the road comprising a truss structure embedded in the end of one of the slabs, dowels forming the struts for the truss structure each having an end portion adapted to extend through the joint strip into the adjacent slab section, said dowels seated on the sub-grade on both sides of the joint strip each formed of sheet metal having a flat top and converging lower side bearing surfaces adapted to divide the bearing area into components at the opposite sides of the said bearing surface.

14. An expansion joint for concrete roadways or the like having separate slab sections on opposite sides of the joint, a joint strip between the slabs, a dowel unit having its dowels seated on the sub-grade on both sides of the joint strip comprising a plurality of hollow dowels extending substantially the full height of the dowel unit formed of sheet metal each having converging lower side bearing surfaces for supporting the road strip and connecting the adjacent ends of the slab sections, and chord members welded to one end and the intermediate portions of the dowels for holding the said dowels in fixed spaced relation to each other.

15. A dowel for connecting the abutting ends of slabs of a pavement structure or the like formed of sheet metal having a top channel shaped portion with its flanges extending downwardly and inwardly to form converging bearing surfaces.

16. A dowel for a pavement structure or the like, comprising a hollow body portion formed of sheet metal having a central elongated top portion integrally connecting downwardly and inwardly extending leg portions adapted to form a bearing surface, a slot formed in the end of the central elongated top portion, an expansion cap mounted on one end of the dowel, and tangs formed integral with the expansion cap for engaging the slot for securing the cap to the end of the dowel.

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