Sept. 20, 1938. R. W. CLEMMONS 2,130,992

LOAD DISTRIBUTING EXPANSION JOINT FOR ADJACENT SOLID SECTIONS

Filed April 8, 1936

Fig. 1.

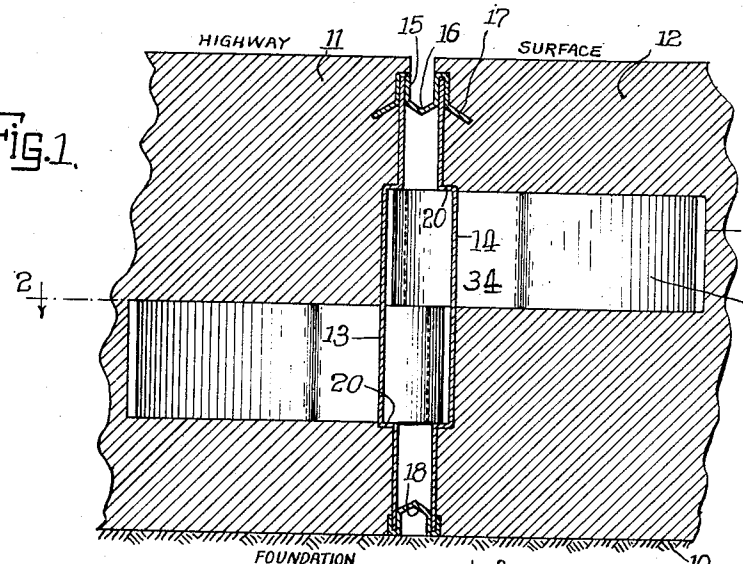


Fig. 5.

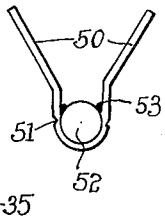


Fig. 2.

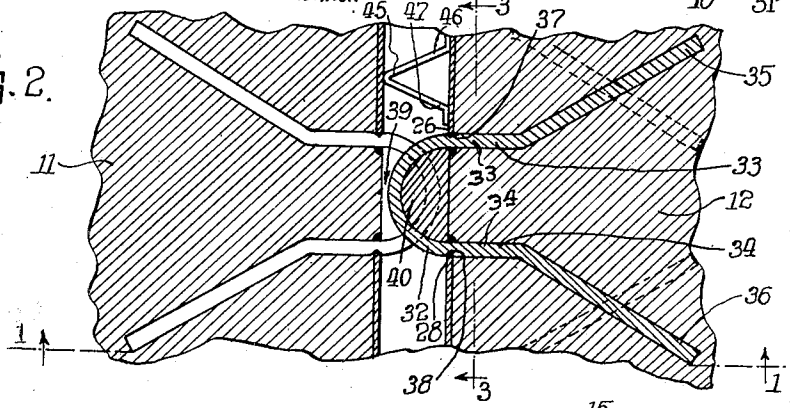


Fig. 3.

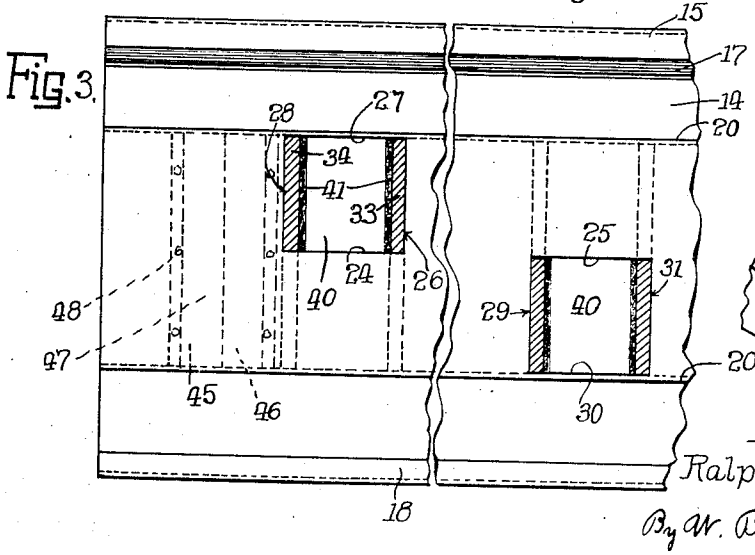
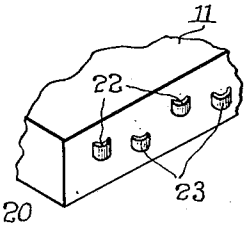


Fig. 4.



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2,130,992

LOAD-DISTRIBUTING EXPANSION JOINT FOR ADJACENT SOLID SECTIONS

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Application April 8, 1936, Serial No. 73,227

21 Claims. (Cl. 94—18)

The present invention relates to an expansion joint structure for the abutting sections of concrete highways, sidewalks, or other platform type of sections, either cast in situ or pre-formed and set in place.

The invention has particular reference to novel cooperating lugs anchored in abutting ends of adjacent spaced units such as slabs or sections, arranged to slip on each other for allowing for shift or expansion, and to bear one on another to aline the units or to transmit the load on one unit in part to the abutting unit. The invention also contemplates various means for positioning the necessary lug devices at a joint location so that concrete or other substance may be cast to place the elements in proper relation to each unit or to both units simultaneously.

The invention has particular reference to road building operations and it will therefore be explained with reference to such use, but it is to be understood that the invention can be modified and can be used in other places, as will appear from the scope of the appended claims.

In highways it is customary to cast concrete sections about 10 to 20 feet long and about 8 or 9 inches thick, with provision of space or separation for shift or expansion. The expansion in the joint is about ⅛ inch from extreme cold to extreme heat. Heretofore means has been provided to aline the sections, such for example as placing pieces of pipe across the joint, extending into each abutting end. The pipe slips on a concrete surface. This not only wears down the pipe and the concrete but it produces a space for water to enter and allows corrosion to take place. It is also expensive.

The present invention aims to provide means which are in effect load-bearing lugs in the ends of the sections, to keep the sections in alinement, to pass the load from one section to another, for slippage on each other, to permit the necessary expansion and contraction, to exclude water from the joint, and to facilitate construction effort.

In the accompanying drawing:

Fig. 1 is a fragmentary view in vertical cross-section of two abutting ends of sections of a concrete highway taken on the line 1—1 of Fig. 2.

Fig. 2 is horizontal cross-section of the same structure taken on the line 2—2 of Fig. 1, showing one of the lug elements entirely in cross-section.

Fig. 3 is a face view of one of the joint-forming plates on the line 3—3 of Fig. 2, before the concrete shown in Figs. 1 and 2 is cast into place.

Fig. 4 is an incomplete miniature view in perspective showing one example of the preferred general position of lugs in the end of one cast section embodying the invention.

Fig. 5 is a modified form of anchor lug having a full round metal block mounted in the arc of bent strip steel.

In laying a concrete highway it is customary to mount spaced elongated sheet metal end plates as mould ends against which the ends of the sections are cast. These are sealed at the top and bottom by copper seals which yield with the expansion and contraction, and which provide at the top a space or recess for insertion of asphalt or the like as a joint-filler.

In the present invention new types of end-plates for the mould are employed with parts having relation to the lugs to be anchored in the concrete. Specifically, the end-plates of the moulds are held in a more accurate spaced relation by the preferred use of a plurality of spacers. Holes of pre-arranged form and location are formed in the plates. These holes are such as to receive and hold in fixed position a plurality of sealing plugs which provide the load lugs which are to project at one end from the concrete section, and which at the other end are to be mounted or cast into the concrete.

For example, in Fig. 1, 10 designates the foundation on which the highway is cast. The numerals 11 and 12 represent two contiguous or abutting ends of adjacent sections cast against the respective mould plates 13 and 14. At the top these plates are held together in spaced relation on the lengthwise edges by a copper seal 15 which yields at 16, and has wings 17 anchoring it into the concrete. At the bottom a comparable seal 18 is shown. Between these copper spacing seals other spacers may be provided.

The plates 13 and 14 are offset in their middles by a channel-like depression forming square shoulders, all designated 20. The channels open towards each other forming a wider space between the plates than at the lengthwise edges. For convenience this wider space is called the load-zone. The plates are punched in the load zone to receive and hold the load-lugs. The additional spacers referred to are mounted in the load-zone to assure a more accurate width for the load-zone and one greater than the length of the lugs.

The ultimate goal is to provide pairs of lugs, a lug on one section to bear and slide on a lug on the adjacent section. These pairs of lugs are alternately inverted in position along the length of the joint so that each section bears on the other by reason of one of the alternate pairs of

lugs. Thus the sections interfit and slide horizontally and do not permit of vertical motion between them until the sections so separate that the lugs slip off each other. Since this can occur by natural displacements, the length of the projecting lugs may be predetermined according to conditions. It will be observed in Fig. 1 that the channels in the plates give a wide load-zone. Each lug projects slightly into the end of the opposing section of concrete under a shoulder **20**. By making these channels deeper, and the lugs longer, preparation can be made for a greater degree of separation before the sections are subject to relative vertical displacement. For practical purposes where there is a good foundation **10** the channel need not be deep and may even be dispensed with. A slight depth of channel is desirable in giving rigidity to the plates.

In Fig. 4, a schematic view of the end of a section of concrete or other slab **21** is shown with an upper series of lugs **22** staggered with a second series of lugs **23**, the bottom of the top series and the top of the bottom series being in the same general line, whether it is a plane, or a curved surface, as may be desired in an arched section. In Fig. 3, this plane is marked by the lines designated **24** and **25** as the load-bearing line. These lugs may occur at intervals to provide about 18 inches or 2 feet between pairs of lugs.

The facial appearance of the plate is best shown in Fig. 3, representing plate **14** before the section **12** is cast. The plate has previously been punched in formation with holes here shown as rectangular. An upper hole has the edges **24**, **26**, **27** and **28**, and a lower hole has the edges **25**, **29**, **30** and **31**. There are a series of spaced upper holes for the series of lugs **22** and a series of spaced holes for lower lugs **23**, in the desired staggered relation for the lugs. The edges **27** and **30** are coincident with a shoulder **20**.

Independent lug elements are forced into these holes to be effectively held therein so that the lug elements between the plates are properly positioned, and so that their roots, so to speak, can be supported for anchorage in the concrete to be cast about them. The lug elements may have a variety of forms. The preferred form is a built-up unit comprising a length of strip steel, say ¼ inch thick and 2 inches wide, bent to the form shown in Fig. 2. It has a semi-circular arc **32**, straight parallel portions **33** and **34**, and flaring legs **35** and **36**. The outside surfaces of he unit are slightly marked or grooved, as with a V-cut, shown at **37** and **38**, to be engaged by the edges such as **26** and **28** of the receiving hole in the plate **14**. These grooves are preferably located on the parallel portions **33** and **34**, or at their junction with the arcuate end **32**. The grooves also serve to define the exact position of the lug in the plate, leaving the predetermined clearance space **39** in advance of the lug end **32**. Solidity of the lug is obtained by added metal inside the arcuate end. This is preferably provided by a short length of half-round steel **40** secured in place by welding **41** (Fig. 3), shown also in section in Fig. 2. The half-round is preferably made the full height of the strip width in order to provide a seal to keep water and concrete from entering the holes in plates **13** and **14**. The welding may be increased over that shown by spotting or continuous welding at other points of contact, but care is preferred to keep the bearing surfaces flat, and also to keep the size of the lug within limits for insertion into the holes in the plates, as a solid plug or seal. It should be observed that the tip of the curved top surface of the lug lies under a shoulder **20**, so this should be cleared of excess welding to permit the lug to slide under and against the shoulder.

The material punched out for the holes in the plates **13** and **14** might be kept partly attached to the plate, as at one edge of the hole, in order to be bent inwardly to provide spacing means for the plates near the load-zone. However, it is preferred to use separate spacing means extending along the entire height of the load-zone and spaced alongside each hole to assure proper expansion space at the lugs. Such means are shown in Figs. 2 and 3, as a V-shaped member **45** with planar wings **46** and **47**. These wings holes, may be arranged so that both plates are are preferably spot-welded to the plates as shown at **48**. They may be located on but one plate, or on both plates, and also, in connection with the holes, may be arranged so that both plates are identical, and cooperative in pairs.

In road-building with these cooperative devices, the foundation **10** is prepared. The plates **13** and **14**, preformed with spacers **45**, and with the necessary holes, are placed together and the open spaces at the edges are closed with the copper seals **15** and **18**. Ordinary means are employed to hold this compound joint-member in upright position. Either before or after positioning, the lug-elements are forced into the holes and they snap into a definite position by the co-action of the grooves **37** and **38** with the respective edges **26** and **28** of the plate holes. The holes are so positioned that the lugs are in vertical pairs as shown in Fig. 1 and Fig. 2. The legs provide anchorage means projecting into the mould area into which the concrete is cast. When the same has set, the lugs remain as first positioned and the joint is perfected. Horizontal displacement only, is permitted. Some lugs may be set in pairs at right angles to the position illustrated in order to prevent lateral displacement of the sections, but since the probable amount of shift laterally is not objectionable nor common, it is not likely to be desirable in highway construction. However, it is to be understood that for sidewalks, or platforms it may be desirable to have some pairs of lugs bear vertically against each other, and other pairs bear laterally against each other, permitting only of lengthwise separation of sections, or slabs, or other units so joined.

It is to be understood that various modifications of the specific disclosures herein made, may be employed without departing from the invention herein described and claimed. For example, the half-round stock **40** may advantageously be more than half-round, such as circular, and project into the cast section, as shown in Fig. 5. The legs **50** need not be flaring but may converge, or be parallel or be provided with notches to assure better anchorage. A similar bent strip is used with legs **50**, notched at **51** for the edges of the plate, and bent around a block of round bar steel **52**, welded at **53**.

These and other modifications may be made by those skilled in the art without departing from the invention as expressed in the appended claims.

I claim:

1. An expansion joint construction comprising two adjacent units, a plurality of adjacent separate and spaced pairs of superposed load-bearing lugs with one member of each pair carried by the

opposing units, each pair having one lug bearing slidably on its companion, and each unit having at least two lugs capable of bearing in opposite directions on its companion lug, and another pair of like lugs similarly mounted and related, but inverted with respect to the first pair.

2. A pair of cooperating units for an expansion joint construction each comprising a metal strip bent reversely upon itself to provide a generally U-shaped member with two anchor legs at an angle to each other at one end of the unit for embodiment in a cast material, and a flat-surfaced load-bearing lug structure at the other end to project from said cast material, said two units being adapted to be placed in off-set relation and oppositely directed and anchored in adjacent cast sections so that each flat-surfaced lug slides on the other.

3. A unit for an expansion joint construction comprising a metal strip bent reversely upon itself to provide a generally U-shaped member with two anchor legs at an angle to each other at one end of the unit for embodiment in a cast material, and other metal added at the lug-end at the base of the U and between the bent sides of the strip.

4. A unit for an expansion joint construction comprising a metal strip circularly bent reversely to provide a U-shaped member with two spaced anchor legs at an angle to each other at one end of the unit for embodiment in a cast material, and a semi-circular bend at the other end of the unit, and a block of half-round metal stock fitted into said end and secured to form a solid semi-circular lug for projection from the cast material presenting a flat bearing surface comprising the end area of the half-round insert and the edge of the metal strip.

5. A unit for an expansion joint construction comprising a metal strip circularly bent reversely to provide a U-shaped member with two spaced anchor legs at an angle to each other at one end of the unit for embodiment in a cast material, and added metal fitting between said legs at the base of the U to form a semi-circular lug for projection from the cast material presenting a flat area continuous with the edge of the bent strip.

6. A mounted unit for an expansion joint construction comprising a unitary member having one end substantially no wider than the width at an intermediate point, and having a bifurcated other end comprising two angular legs provided for anchorage in cast material, whereby the unit may be plugged as a seal into a hole in a mould element at least up to the said intermediate point to project as a lug from material cast in the mould, and a mould element having a web member provided with a hole into which said unitary member is plugged and mounted.

7. In combination a sheet metal mould plate for casting concrete, said mould plate having spaced holes therein, and a load-bearing plug element for closing one of said holes, said plug having a groove therein to be engaged by an edge of the metal plate, whereby to hold the plug in the mould plate in a fixed predetermined position, the plug element on the outside of the mould plate providing a load-bearing surface, and inside the mould having anchor legs.

8. An expansion joint-forming device for use as in casting sections of concrete highway, comprising two cooperative plates defining opposite faces of a space for a slip-joint, said plates having a series of holes in each plate, means to space the plates apart, a hole in one plate being above and opposite a hole in the other plate, and bearing lugs passing through each set of opposite holes and positioned to bear and slip on each other within the space between the plates, each of said lugs having a construction at the other end suitable for anchorage in material cast about it.

9. An expansion joint-forming device for use as in casting sections of concrete highway, comprising two elongated cooperative spaced metal plates defining opposite faces of a space for a slip-joint, said plates being formed to provide a wider space lengthwise between them near the middle than at the lengthwise edges with connecting shoulders between the narrow and wider zones, and spaced cooperative pairs of opposing individual lug elements mounted at spaced points in said plates at the wider zone, each pair being positioned to bear between said shoulders, one member of each pair being mounted in each plate, and both members bearing slidably on each other in said mounted position, each lug element extending through its mounting plate for anchorage in material cast about it.

10. An expansion joint-forming device for use as in casting sections of concrete highway, comprising two elongated cooperative spaced metal plates defining opposite faces of a space for a slip-joint, and cooperative spaced pairs of load-bearing individual lug elements mounted in said plates, each pair having one member mounted in each plate, and both members bearing slidably on each other in said mounted position within said space, each lug element extending through its mounting plate for anchorage in material cast about it.

11. An expansion joint for adjacent sections of material comprising two spaced adjacent sections each having a longitudinal recess whereby to form a zone of wider spacing with shoulders connecting with the narrower spacing, spaced pairs of load-bearing individual lugs mounted in the wider section in position to bear slidably between and on the shoulders, each pair having its members bearing slidably on each other, one member of each pair being anchored in one of the opposing sections.

12. An expansion joint for adjacent sections of material comprising two spaced adjacent sections each having a longitudinal recess whereby to form a zone of wider spacing with shoulders connecting with the narrower spacing, spaced pairs of load-bearing individual lugs mounted in the wider section in position to bear slidably between and on the shoulders, each pair having its members bearing slidably on each other, one member of each pair being anchored in one of the opposing sections, some pairs being inverted relative to others.

13. An expansion joint for adjacent sections of material comprising two spaced adjacent sections each having a longitudinal recess whereby to form a zone of wider spacing with shoulders connecting with the narrower spacing, spaced pairs of load-bearing individual lugs mounted in the wider section in position to bear slidably between and on the shoulders, each pair having its members bearing slidably on each other, one member of each pair being anchored in one of the opposing sections, alternate pairs being inverted.

14. A unit for an expansion joint construction comprising a metal strip bent reversely to provide a U-shaped member with two spaced anchor legs at an angle to each other at one end of the

unit for embodiment in a cast material, and extra metal filling the space between said legs at the reversal end and secured thereto, to form a solid lug for projection from the cast material, said extra metal being flush with the bent strip to provide a flat bearing-surface.

15. An expansion joint-forming device for use as in casting sections of concrete highway, comprising two cooperative plates having a series of holes in each plate, means to space the plates apart, a hole in one plate having at least a portion above at least a portion of a hole in the other plate, and separate bearing lugs passing through said holes in such a way as to provide overlapping contacting oppositely directed lug ends positioned to bear and slip on each other as the lugs may be moved, each of said lugs having a construction at the other end suitable for anchorage in material cast about it.

16. An expansion joint-forming device for use in casting sections of concrete highway, comprising two elongated cooperative spaced metal plates, cooperative separate and spaced pairs of opposing load-bearing lug elements mounted in said plates, one member of each pair being mounted in each plate, and both members bearing slidably on each other in said mounted position, each lug extending through its mounting plate for anchorage in material cast about it, and each plate being recessed at least opposite the end of the lugs in the opposing plate for receipt of said end.

17. An expansion joint for adjacent sections of material comprising two spaced adjacent sections, each section carrying one of a plurality of separate and spaced pairs of opposing projecting load-bearing lugs slidable on each other, each section being recessed to receive the end of the lug projecting from the other section.

18. An expansion joint for adjacent sections of material comprising two spaced adjacent sections, each section carrying one of a plurality of separate and spaced pairs of opposing projecting load-bearing lugs slidable on each other, each section being recessed to receive the end of the lug projecting from the other section, some pairs being inverted relative to others.

19. An expansion joint for adjacent sections of material comprising two spaced adjacent sections, each section carrying one of a plurality of separate and spaced pairs of opposing projecting load-bearing lugs slidable on each other, each section being recessed to receive the end of the lug projecting from the other section, alternate pairs being inverted.

20. A slip-jointed section of concrete slabs as for highways comprising two opposing sections of concrete having a space between the ends providing for expansion and contraction, each section having spaced individual lugs cast into the concrete and projecting into the said space and in said space provided with load-bearing surfaces, the lugs in one section being some below and some above the lugs in the other section to provide contacting pairs with the load-bearing surfaces of the lugs of each pair in slidable contact.

21. A slip-jointed section of concrete slabs as for highways comprising two opposing sections of concrete having a space between the ends providing for expansion and contraction, each section having spaced individual lugs cast into the concrete and projecting into the said space and in said space provided with load-bearing surfaces, the lugs in one section being some below and some above the lugs in the other section to provide contacting pairs with the load-bearing surfaces of the lugs of each pair in slidable contact, each lug having within the concrete slab anchor means comprising a length of strip metal having its flat face extending in the direction of the thin dimension of the slab.

RALPH W. CLEMMONS.

CERTIFICATE OF CORRECTION.

Patent No. 2,130,992. September 20, 1938.

RALPH W. CLEMMONS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 53, for "he" read the; and second column, line 17, strike out the words "holes, may be arranged so that both plates are"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of October, A. D. 1938.

Henry Van Arsdale

(Seal)

Acting Commissioner of Patents.