May 12, 1936. W. H. EICHELMAN ET AL 2,040,367

EXPANSION JOINT

Filed Sept. 7, 1933 2 Sheets-Sheet 1

Fig. 1.

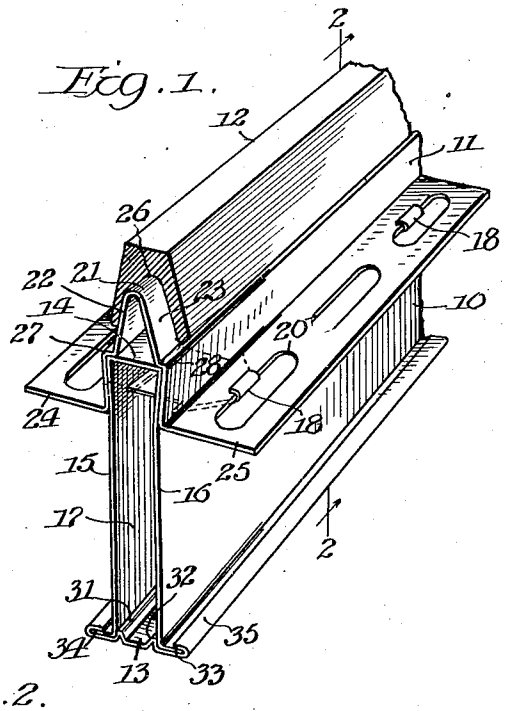


Fig. 2.

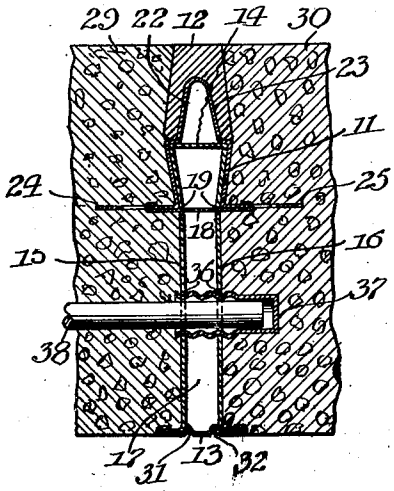


Fig. 4.

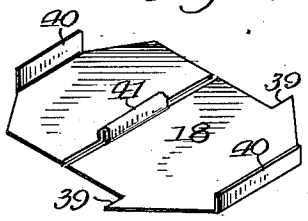
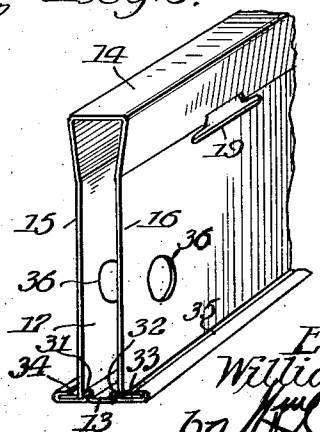


Fig. 3.



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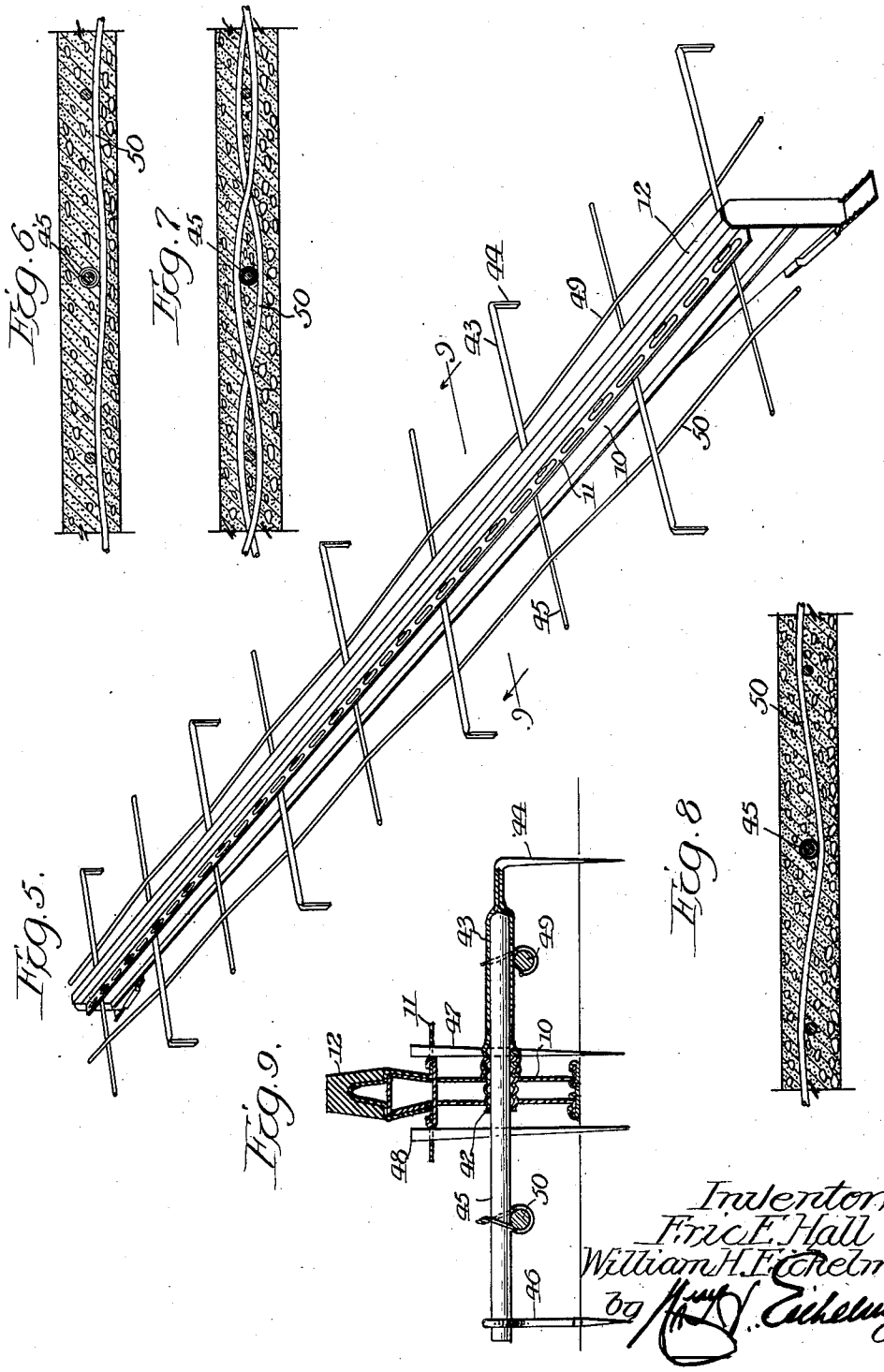
EXPANSION JOINT

Filed Sept. 7, 1933 2 Sheets-Sheet 2



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2,040,367

UNITED STATES PATENT OFFICE

2,040,367

EXPANSION JOINT

William H. Eichelman, Des Plaines, and Eric E. Hall, Chicago, Ill.; said Hall assignor to said Eichelman

Application September 7, 1933, Serial No. 688,446

10 Claims. (Cl. 94—18)

Our present invention relates to improvements in expansion joints, such as shown and described in our co-pending applications, relating to this subject, filed August 12, 1932, Serial No. 628,576, and which has matured into United States Letters Patent No. 1,958,391, issued May 8, 1934, and United States Letters Patent No. 1,978,305, issued October 23, 1934, and filed February 23, 1933, Serial No. 657,978; May 8, 1933, Serial No. 669,814; and May 19, 1933, Serial No. 671,896; and is for use with monolithic concrete construction, precast slabs and the like, and likewise has for its paramount object, the provision of an expansion joint, which, when placed between adjacent slabs will compensate for the relative opposed lateral movements of the adjoining slabs and still effectively join and allow the independent and relative vertical movement of the slabs, sealing the space between the slabs against the possible entrance of foreign matter such as water, ice or dirt.

In the applications above referred to we have disclosed means employing a seal combined with a support or stool, the latter being constructed to effect a compressible space below the seal between the ends of the adjacent concrete sections, and in which the seal is provided with lateral extensions or anchors which are respectively imbedded in adjacent concrete sections; the seal itself extending between the adjacent faces of the slabs and being flexible to accommodae for relative movement of the slabs, the seal being protected by a compressible filler.

It is now our object to construct the stool to insure and provide sufficient strength therein to withstand the weight of the concrete during pouring of the concrete and positively maintain the required compressible space between adjacent road sections, and, in addition, retain the seal against collapse, thus insuring proper application of the latter to the road and proper functioning thereof after application.

It is an object of this invention to provide a stool structure capable of accomplishing the above advantages, and which may be bent or flexed into conformity with the outline or contour of the crown of the road.

In addition, it is an object of this invention to secure the seal to the stool so that a unitary structure is provided in which the securing means provides reinforcement against collapse of the seal prior to and during pouring of the road, yet will allow flexing of the seal and collapse of the stool upon expansion of the road sections, and, in addition, will allow for contraction of the road sections after collapse of the stool without impairing the effectiveness of the seal.

A further object of the invention is to provide a compressible filler, as a cap for the seal, which may act as a screed and, in addition, provide means to close the space above the seal and between the adjacent ends of the concrete road sections, the filler being premolded and shaped to lock or key the latter to the road sections against accidental displacement, and to protect and accept a part of the element providing the seal.

It is another object of the invention to provide a joint structure capable of accomplishing the above and other objects; and further, to combine therewith means for supporting this structure relatively to the road bed, certain elements of the supporting structure functioning to transmit and distribute the live load from one road section to another, and in addition, allowing for the relative linear movements of the road section due to temperature changes, this structure being capable of fabrication prior to its being placed in position to function as a part of the road structure.

Having the foregoing objects in mind, and others as will be more specifically pointed out in the following specifications and appended claims, we have illustrated a preferred embodiment of our invention in the accompanying drawings, in which:—

Fig. 1 is a perspective view of a section of a joint constructed according to one embodiment of our invention;

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a perspective view of one of the elements shown in Figs. 1 and 2;

Fig. 4 is a perspective view of a key employed for affixing the seal to the stool.

Fig. 5 is a perspective view showing a joint section having the means associated therewith for transmitting road loads from one road section to another;

Figs. 6, 7, 8 show modified arrangements of certain elements illustrated in Fig. 5; and,

Fig. 9 is a section taken on line 9—9 of Fig. 8.

The joint structure contemplates the utilization of a stool 10, seal 11, and a compressible member 12.

The element forming the stool 10 is of sheet material and formed to provide a boxlike structure having a bottom wall 13, a top wall 14 and side walls respectively designated 15 and 16. This last mentioned structure provides a bulkhead

against which the concrete, of which the roadway is formed, is poured.

It will be noted that the side walls 15 and 16 are separated from each other to produce an air space 17, which thus provides a space which will compensate for the expansion of the roadway sections by permitting movement of the adjacent ends of said sections in this space.

The element 11 forming the seal is arranged upon the upper end of the stool 10 and seated upon the upper wall 14, the seal being held against displacement relatively to the stool through the agency of a plurality of clips or keys respectively designated 18—18, which are passed through openings 19—19 formed in the side walls 15 and 16 of the stool. These keys or clips extend a suitable distance beyond the side walls 15 and 16 of the stool to thus provide support for the flanges of the seal, hereinafter to be referred to.

The seal generally designated 11 is formed of a strip of copper or other flexible material and is bent longitudinally as indicated at 21 to thus form the side walls respectively designated 22 and 23, the latter of which terminate in longitudinally extending flanges 24 and 25 having the apertures 20 formed therein.

The flanges 24 and 25 are designed to be imbedded in the concrete to key the seal with the respective sections of the roadway.

Manifestly, as the concrete is poured it will pass through the apertures 20 and thus form a connection between the respective roadway sections and the seal. The keys or clips 18 are, as before stated, located with respect to the flanges 24 and 25 of the seal so as to act to support these flanges at intervals of the length of said flanges. These keys have their opposite ends bent into engagement with an edge of the apertures 20 to thus securely lock the seal during installation and prior to the pouring of the concrete.

The compressible member 12 is formed of suitable material, preferably of a bituminous character, which will yield upon compression or when a force is being applied thereto, and thus successfully seal the joint and prevent the entrance of water or other foreign matter between the joint and the ends of adjacent concrete road sections. This compressible member 12 has its under surface formed to provide a longitudinally extending groove 26, which is provided for the receipt of the bend 21 of the seal and the walls respectively designated 22—23 of the seal generally designated 11. This compressible member 12 is preferably tapered in cross section, it being wider at its base, to thus cooperate with the respective and adjacent roadway sections to key or secure same against accidental removal from between these sections.

The stool generally designated 10 is formed of relatively thin gauge stock, of a strength, however, sufficient to withstand the weight of the concrete during the pouring operation, yet will collapse upon expansion of the concrete sections, leaving the seal only in a functionally operative condition. The upper end of the stool is inserted into the space between the walls 22 and 23 of the seal and it will be noted that the upper wall of the stool extends between the side walls 22 and 23 of the seal and thus will reinforce the seal against collapse during the pouring operation. Further, the seal 12 is provided with longitudinally extending shoulders 27 and 28 which rest upon the corners formed at the juncture of the upper wall 14 and the side walls 15 and 16 of the stool.

By referring to Figure 2 it wil be noted that the keys generally designated 18 hold the side walls 22 and 23 of the seal in a distended condition, and since the key is passed through apertures such as 19 formed in the stool, and not secured in any manner thereto, the side walls of the stool may be compressed by expansion of the roadway sections 29 and 30 into the space 17 causing distortion of the stool, and the lower end of the seal per se thereafter allowing the seal to function and move with the roadway sections upon expansion and contraction thereof, independent of the stool.

The lower wall 13 of the stool is formed with a plurality of parallel longitudinally extending ribs respectively designated 31 and 32 against which the walls 15 and 16 of the stool abut, and are reinforced thereby against collapse.

The lower ends of the walls 15 and 16 are formed with laterally extending flanges respectively designated 33 and 34 and the opposite edges of the bottom wall 13 are, as indicated at 35, formed to envelope the flanges 33 and 34 and thus hold the walls between the longitudinally extending ribs 31 and 32 and said portions 35.

The walls 15 and 16 of the stool are further provided with a series of openings 36 which are formed in the walls at intervals throughout the length of the stool and are provided for the reception of a threaded thimble 37, which is employed to accommodate a dowel or shear bar, such as that designated 38, and in addition hold the walls 15 and 16 in spaced relation to each other during the pouring of the concrete. These thimbles alternately project from the side walls 15 and 16 of the stool.

The opposite ends of the dowel or shear bars 38 are imbedded in one or the other of the road sections and thus will move in said thimble, with the respective road sections upon expansion or contraction thereof.

By referring to Fig. 4 it will be seen that the keys generally designated 18 for keying the seal to the stool are formed to provide limiting shoulders 39—39 which limit or regulate the position which the keys 18 may assume with relation to other elements of the structure, and it will be further noted that the opposite ends of each of the keys is provided with a lip such as designated at 40, which lips are provided to form means which is passed through the apertures 20 in the respective flanges 24 and 25 of the seal and are then bent thereon to thus connect the key with the seal. The keys 18 may, if so desired, be constructed to provide for extension thereof to thus allow the keys to be distended a required distance to compensate for contraction of the road sections occurring during the setting of the concrete. To accomplish this last mentioned advantage, the material of the key may be bent upon itself, as indicated at 41, which will allow the key to be distended, yet will offer resistance to collapse of the seal per se during the pouring of the concrete.

From the foregoing description of the joint structure it is obvious that the stool is formed at its upper end to provide means for reinforcing the seal to thus prevent distortion or collapse of the seal during the pouring operation.

It is further to be understood that we employ the keys 18, not to assist in preventing the occurrence of collapse of the stool during the pouring operation, but to prevent separation of the stool and the seal, and thus produce a unitary struc-

ture which may be fabricated at the shop and sent to the job in an assembled condition.

Since the upper and lower walls of the stool, 13 and 14, are formed of a material which is of a ductile character, it is evident that after the initial setting of the concrete and the subsequent compression of the side walls of the stool, that this stool portion of the structure is rendered ineffective to function as a stool, thus causing the seal to be thereafter supported wholly by the respective concrete or roadway sections.

It is also evident that since the cross-sectional contour of the compressible member is tapered or wedge-shaped, with the larger dimension as its base, this construction will provide means for keying the compressible member between the respective roadway sections such as those designated 29—30.

Since the entire joint structure is formed of relatively thin gauged material, and keyed together as above described, the joint as a unit may be readily sprung to an arch and into conformance with the arch of the crown of the roadway.

It is believed patent that the construction of the seal provides means which will readily compensate for contraction and expansion of the roadway sections and effectively prevent dirt and other foreign substances from finding their way between the respective roadway sections, and thus will at all times maintain the necessary space between the roadway sections to allow for expansion of the latter.

In Fig. 9 is illustrated the manner in which the joint per se, the dowel bars or shear bars and certain load transference bars are arranged and supported prior to the pouring operation. The structure illustrated may be assembled and then placed in position upon the road grade, which will materially assist in speeding up the laying of the road. This structure involves the use of the stool 10, the seal 11 and the compressible member 12, the latter of which is secured in any suitable manner with these last mentioned elements so as to provide a unit comprised of these elements.

A threaded nipple 42 is employed which substantially corresponds with the thimble illustrated in Fig. 2, however, differs from the thimble structure shown in Fig. 2 in that the nipple 42 is of a tubular character and thus will allow the dowel socket 43 to be threadedly connected with the thimble 42 and allow the dowel bar 45 to enter the dowel socket 43. This dowel socket 43 has one end thereof flattened and bent to provide an anchor 44, which, as illustrated, is driven into the ground or grade surface to assist in supporting the joint per se in proper relation to the road bed.

The dowel bar 45 is inserted into the dowel socket to thus support one end thereof, the opposite end of the dowel bar may be supported by an anchor such as 46, which is also driven into the ground to further assist in supporting the joint in place.

Stakes such as those designated 47 and 48 are passed through certain of the apertures 20 formed in the flanges 24 and 25 of the seal and are thence driven into the ground or grade to further assist in rigidly supporting the structure against displacement during the pouring operation.

The use of load distributing bars such as 49 and 50 is also contemplated, which may be wired or otherwise secured to the dowel bars. These load distributing bars may be arranged relatively to the dowel or shear bars such as 45 and the sockets 43 in the manner shown in Fig. 6 or may be arranged in a woven relation, as illustrated in Figs. 7 and 8.

The structure involving all of the last mentioned elements may, as before stated, be fabricated prior to its application to the road grade, which manifestly will materially increase the speed at which the road may be completed.

The load distributing bars designated 49 and 50 engage the dowels 45 and, therefore, distribute the load laterally from the dowel bars to the slab or roadway section, the load applied by the dowel bars at the point of bearing being distributed by shear to the distributing bars by direct transference of the load to the slab through the agency of the distributing bars.

From the foregoing description it is believed apparent that the upper wall 14 of the stool and the keys 18 function in a manner to prevent collapse of the seal 11, yet will, upon expansion of the road sections, be compressed and thus transfer support of the seal 11 from the stool to the respective road sections, such as those designated 29 and 30. It is also believed evident that the shape of the compressible member will cause it to be keyed between the road sections and thus prevent same from becoming displaced with relation to the road sections and other elements of the structure.

It is also patent that the structure illustrated in Fig. 9 provides a means whereby all of the elements illustrated in this figure may be fabricated or assembled with each other and then placed in position relative to the road grade and be held in place against displacement during the pouring operation: the structure providing means for transferring and distributing the road load from the dowel bars to the adjacent concrete roadway sections, and further providing means preventing the premature distortion of the joint itself, thus providing a rigid structure capable of being more conveniently handled, and which in addition will assist in maintaining the walls of the joint in spaced relation during the pouring operation and the initial setting up of the concrete.

Having thus described the invention, what we claim and desire to cover by Letters Patent, is:—

1. In a device of the kind described the combination of a flexible seal having means for connecting adjacent ends of monolithic sections and sealing a space located between said sections, and a support for said seal, said seal being comprised of a piece of material bent to form an inverted V-shaped portion having flanges extending laterally from said V-shaped portion, said support having spaced side walls and a connecting wall located at the upper edges of said side walls, said connecting wall being located between the walls of the V-shaped portion and providing both means for preventing flexing of said seal, and means for supporting said seal.

2. An expansion joint for concrete roads and the like comprised of a flexible sealing member for sealing adjacent monolithic sections and a stool providing a support for said seal, said last mentioned member being compressible and having side walls and a top wall, the top wall formed of ductile material providing means for preventing flexing of said seal and maintaining the seal distended, and a distendable key for securing said seal to said stool, said key passing through apertures in the side walls of the support and affixed to said seal beyond the confines of said support.

3. An expansion joint for concrete roads and the like comprising a flexible seal for closing the

space between adjacent sections of concrete, a stool providing a support for said seal, said last mentioned member being compressible and having a top wall formed of ductile material providing means cooperating with said seal to prevent flexing of said seal and to maintain said seal initially distended, and a key anchoring said seal to said stool, said key providing additional means for reinforcing said sealing member against premature collapse.

4. An expansion joint for concrete roads and the like comprising the combination of a member providing a seal, a support for said seal, a key for anchoring said support to the seal, said support being apertured for reception of said key, and said key being distendable relatively to said support.

5. An expansion joint for concrete roads and the like comprising a box-like stool, a flexible seal supported upon one wall thereof, said wall of said stool extending across the space between the opposite walls of said stool and positioned within the seal between the upper and lower confines of said seal and reinforcing said seal against premature collapse during the setting of the joint and the pouring of the concrete.

6. In a device of the kind described the combination of a seal having a flexible portion and a stool therefor, said stool being comprised of spaced side walls, the seal being mounted upon one edge of said side walls and having the flexible portion thereof arranged above and across the space between said side walls, and independent means carried by said stool resisting the extension of the flexible portion of said seal created by the relative spreading movement of said side walls of said support.

7. In a device of the kind described the combination of a flexible sealing element and a support therefor, said support having spaced side walls and a continuous connecting wall maintaining said side walls in spaced relation to each other, said sealing element being mounted upon and supported by said connecting wall, and said connecting wall of said support being located with respect to said sealing element to restrict the flexing of the sealing element.

8. A sealing member consisting of a plastic body adapted to be located between spaced slab sections, resilient means for maintaining said plastic body in engagement with the slab sections, anchors connecting the resilient means with the slab sections to cause movement of the plastic body with the slab sections, said plastic body being formed to extend over the top and down along the sides of said resilient means, and the faces of the outer walls of the plastic body being inclined outwardly and downwardly to form diverging walls spaced wider at the base than at the top to form a key in the fluid concrete which when set prevents the accidental removal of the plastic body from the space intervening between the adjoining slabs.

9. A sealing member consisting of a plastic body adapted to be located between spaced slab sections, resilient means for maintaining said plastic body in engagement with the slab sections, anchors connecting the resilient means with the slab sections to cause movement of the plastic body with the slab sections, said plastic body being formed to extend over the top and down along the sides of said resilient means, the base of said plastic body being spaced from said anchors to receive and seal that portion of the slab section introduced into said space, and the faces of the outer walls of the plastic body being inclined outwardly and downwardly to form diverging walls spaced wider at the base than at the top to form a key in the fluid concrete which when set prevents the accidental removal of the plastic body from the space intervening between the adjoining slabs.

10. A sealing member consisting of a plastic body adapted to be located between spaced slab sections, resilient means for maintaining said plastic body in engagement with the slab sections, said plastic body being formed to extend over the top and down along the sides of said resilient means, and the faces of the outer walls of the plastic body being inclined outwardly and downwardly to form a key in the fluid concrete which when set prevents the accidental removal of the plastic body from the space intervening between the adjoining slabs.

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