Dec. 10, 1940. A. C. FISCHER 2,224,148

EXPANSION JOINT

Filed May 29, 1936

Fig. 1.

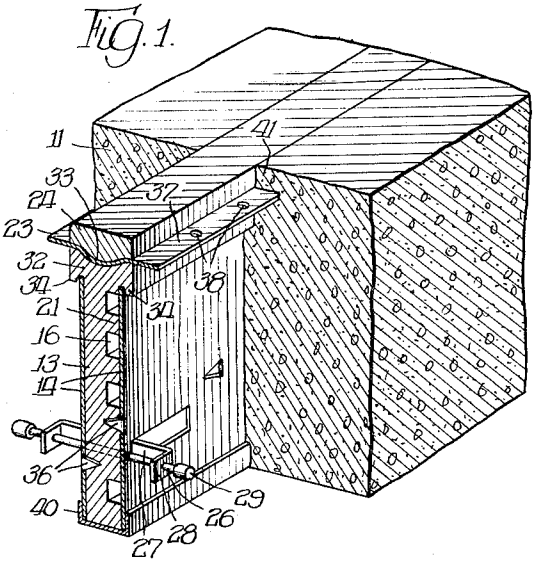


Fig. 2.

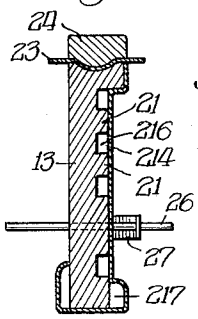


Fig. 8.

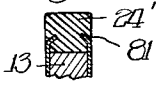


Fig. 9.

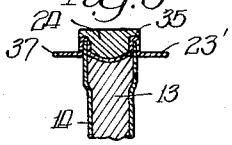


Fig. 10.

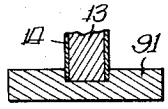


Fig. 3.

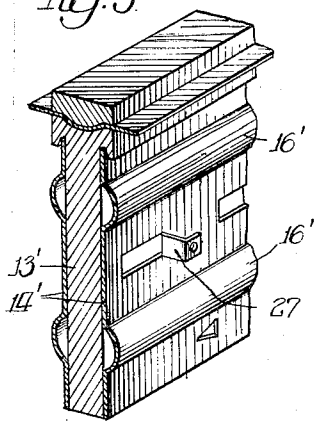


Fig. 4.

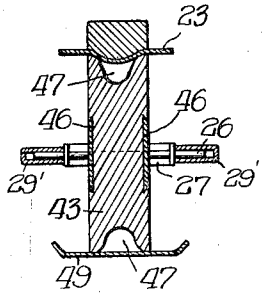


Fig. 5.

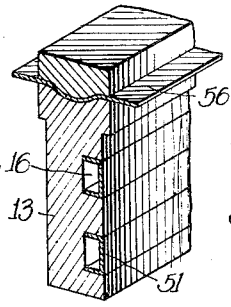


Fig. 11.

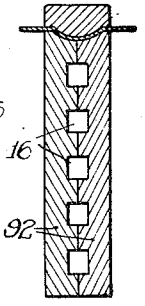


Fig. 6.

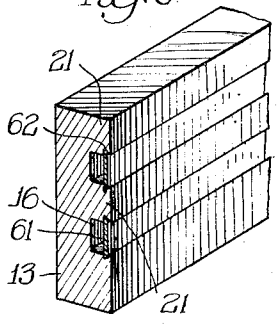


Fig. 7.

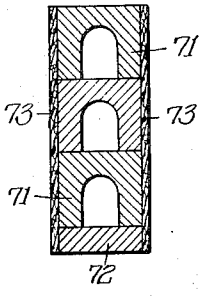
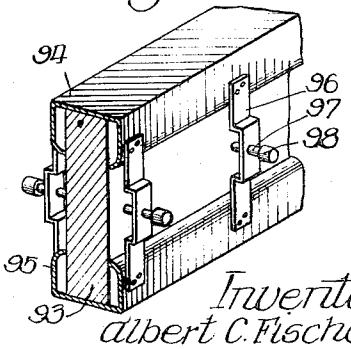


Fig. 12.



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Patented Dec. 10, 1940

2,224,148

UNITED STATES PATENT OFFICE

2,224,148

EXPANSION JOINT

Albert C. Fischer, Chicago, Ill.

Application May 29, 1936, Serial No. 82,593

10 Claims. (Cl. 94—18)

This invention relates to expansion joints and especially to fillers suitable for the formation of such joints in concrete paving. As it is well known, concrete expands and contracts due to climatic changes. As a result, it is necessary to provide some means to keep the concrete from buckling or cracking on account of this expansion and contraction. It has been the practice for some years to provide expansion joints at frequent intervals so as to divide the pavement into relatively small slabs, each separated from the adjacent slab by a spacer of composition or the like, which will yield to the expansion of the concrete.

All motorists have had the experience, especially after the first warm spell, of feeling a bump at every expansion joint due to the extrusion of the composition upwardly from said joint. In recent years considerable attention has been devoted to avoiding such extrusion, but the proposed structures have for the most part been too expensive or subject to some other criticism. For example, it has been proposed to provide the filler with an asphalt core and a side plate shaped with longitudinal channels therein, said channels forming voids in the joint for the reception of the core material when the road expands. Such side plates, in addition to increasing the cost, have been subject to the serious objection of causing spalling, or splitting at the edge, of the concrete. Apparently this spalling has been due to leaving a relatively thin lip of concrete extending over the channel portion and insufficiently supported by the remainder of the concrete.

An object of the present invention is to provide filler units for expansion joints which will not cause an objectionable degree of extrusion above the joint and will not cause spalling or cracking of the concrete.

Another object of the invention is to provide such a filler which will be more economical than fillers of the same general type heretofore proposed.

Another object of the invention is to provide more economical and improved arrangements for holding dowel bars properly alined for being embedded in adjacent concrete slabs to hold them in alinement while permitting their expansion.

In general it may be noted that these objects are preferably accomplished by the use of side plates which either have no longitudinal channels or have such channels rounded in contour and which if dowel bars are to be used have dowel bar supports stamped out from the bodies of the plates. If the side plate is not channeled, the expansion space can be provided very economically by forming longitudinal grooves in the core structure so positioned that these grooves will be closed along their open sides by the side plate or by a special insert.

Other objects will be apparent from the following description and from the drawing, in which:

Fig. 1 is a fragmentary prospective view of one of the preferred forms of this invention with portions broken away.

Fig. 2 is a vertical sectional view of a modification similar to that shown in Fig. 1.

Figs. 3, 5, 6, and 12 are fragmentary prospective views of other modifications of this invention, showing the end of the structure in section.

Figs. 4, 7, and 11 are vertical sectional views of additional modifications of the invention; and

Figs. 8, 9, and 10 are fragmentary vertical sectional views of details which may be used as modifications for any other forms of the invention shown.

Although this invention may take numerous forms, only a few have been chosen for illustration. All of these forms are especially adapted for use in building concrete roads or similar structures requiring provision for expansion with climatic changes. In building concrete roads it is a common practice to form sections 11 spaced apart by a dividing wall, as shown in Fig. 1. The structure including this spacing wall, or sometimes the wall alone, is commonly called an expansion joint because it is constructed to yield to the expansion of the sections and permit them to expand. According to most forms of the present invention, this expansion joint includes a core 13 and one or more side plates 14, one or the other of which is specially shaped to provide one or more voids 16, into which the material of the core may flow as the concrete sections expand.

The purpose of these voids is to prevent extrusion of the core structure upwardly to form a bump in the road. Such core structures have commonly been made of material which is capable of flowing in hot weather or when sufficient pressure is applied thereto. A great deal of inventive thought has been devoted to the purpose of avoiding the upward extrusion of this flowable material. Most of the attempts to avoid the upward extrusion have been characterized by unduly high cost or by other faults such as a tendency to cause spalling of the concrete or in other words a splitting of the concrete adjacent the edge.

According to the various forms of this inven-

tion, such spalling is prevented by avoiding having any angular void-forming projections extending into the concrete. Such projections form a sharp line of possible cleavage and leave the overhanging portion insufficiently supported.

In the forms of the invention which are most economical and which are therefore preferred on the whole, the side plates are entirely smooth except for special features which are mentioned below, and the voids are formed by depressions or grooves in the core 13. These depressions or grooves in the core 13 may be formed by being pressed into such cores but it is preferred that the core be formed by extrusion from a die having a cross-section such as to provide the grooves. In other words, the core may be extruded with upstanding ribs 21, which form grooves between them.

In order for these grooves to form voids in the finished roadway, it is necessary that the concrete be kept out of them during pouring of the concrete. This is done by closing off the open side of the grooves in any suitable manner. In Fig. 1 the grooves are closed off by a side plate 14 extending along almost the entire of one side surface of the core 13. Thus, a single side plate 14 closes off all of the grooves and forms a plurality of voids 16. The side plate 14 may be sheet metal or it may be a fabric, paper, or molded surface member.

Above the core 13 there is preferably provided a horizontal seal strip 23 above which is adhered a compressible or flowable filler unit or crown 24. In order to support the horizontal seal 23 more securely, the core 13 may be provided with an enlarged head 32 if desired. In any event, it is preferred that the horizontal seal be provided with a depressed portion 33 which fits into a corresponding depressed portion of the core 13. The horizontal seal is preferably cemented in place, and the depressed portion 13 tends to key it in the proper position and also provides a larger surface for adhesion. It is preferred that the head 32 have downwardly extending flanges 34 to help retain side plates 14 in place.

The use of such a side plate 14 has two other advantages, namely that it may be extended as shown in Fig. 9 to support the horizontal seal 23', on the top of which may be positioned a crown 24, and that it may be used for supporting dowel bars 26.

The novel support of these dowel bars 26 is in itself an important feature of this invention. To this end tongues 27 are cut or punched from the side plates 14 and shaped substantially as seen in Fig. 1, with a flange 28 parallel to the expansion joint but spaced therefrom. Holes are cut or punched through the flanges 28 and through the alined portion of the walls 14 for the reception of the dowel bars 26. Of course, these dowel bars will not ordinarily be inserted until the expansion joint reaches the job. In accordance with prior practice, caps 29 may be provided over the ends of the dowel bars 26 to permit telescoping action between the dowel bars and the paving sections. In place of conventional caps 29, it is preferred that caps 29' be provided which, as seen in Fig. 4, rest against the brackets 27 while leaving space between the end of the dowel bars 26 and the inner end of the cap 29. However, if the cap is made of a flowable material this spacing may not be necessary. In the past a cap has been provided on each end of the dowel, but according to one feature of the present invention only one dowel cap is necessary, provided sufficient space is reliably maintained for expansion movement between its end and the end of the dowel, as by including a flowable material in the end of the cap, or by securing the dowel to one side plate 14 and the cap to the other, or simply by having the parts fit tightly enough to stay as they are adjusted until moved by the great forces of expansion.

When desired, the side plates 14 may be perfectly plain flat sheets of metal involving a minimum cost. Where a side plate 14 is provided which extends up to the horizontal seal 23', as in Fig. 9, and helps to support the same, it is preferred that the horizontal seal be bent upwardly around and downwardly over the side plate 14, as seen at 35 in Fig. 9, or at least downwardly over it. This locks the side plate in place as does the flange 34 in Fig. 1, so that it is not essential that it be otherwise secured to the core 13. However, when any other securing means is desired, ears 36 may be punched from the side plate 14 at any suitable number of points to be pressed into the core 13. Such ears alone will be enough in the absence of rough handling. Of course, any other securing means either of an adhesive type or of a piercing type may be substituted for the ears 36. Likewise a U-shaped bottom seal 40 may be provided for clamping the side plates on, in which case the ears 36 may well be omitted.

The horizontal seals 23 and 23' are each provided with laterally extending flanges 37, which may extend outwardly either directly from the central portion of the seal or from the bottom of the interlocking flange 35. It is thus seen that the horizontal seal 23 comprises a continuous sheet of metal (preferably copper) embedded in both sections of concrete and so shaped as to be capable of flexing to permit the concrete to expand or contract. Since these flanges 37 are embedded in the concrete they may be provided with suitable holes 38 to anchor them in the concrete more firmly.

It should be noted that the flanges 37, being solid metal, do not dangerously weaken the concrete, since the overhanging edge portion 41 of the concrete is fully supported by the flange 37 resting firmly on the lower portion of the concrete. Likewise the brackets 27 do not seriously weaken the concrete since they are positioned at isolated points rather than being longitudinally extended to form a longitudinal line of weakness. Furthermore flanges 37 and brackets 27 are solid metal rather than hollow members which would necessarily have considerable yield.

Although two side plates have been shown in Fig. 1, it should be understood that in many instances a single side plate may be used. If desired, such a side plate may be shaped like the plate 214 in Fig. 2 to provide additional voids 217 as well as the voids 216 and to form a wider base to facilitate handling and use of the expansion joint and to form a bottom seal in the finished concrete. This figure also illustrates the proper support of a dowel bar 26 with one side plate and its bracket 27. Of course, in any figures the brackets 27 may be omitted and no dowel used, or the dowel bar 26 could simply be passed through the side plate 214 and the core 13. It should be observed that in all instances the spacing of the ribs 21 should be such that one will coincide with the hole formed in the plate by punching the tongues 27 therefrom so that this hole will not fall opposite a groove and

hence permit concrete to fill the voids formed by said grooves. The core 13 both in Fig. 1 and Fig. 2 has been shown with one of the ribs 21 quite wide to be sure that it blocks off the holes formed by the tongues 27. However, it is not necessary that the rib be any wider than the hole it blocks if it is accurately positioned.

In Fig. 3 is shown a form of core 13' which is not formed with grooves 16 therein. In this instance the side plates 14' are formed with outwardly rounded void-forming projections 16'. In the past voids have been formed by somewhat similar projections which, however, were of rectangular cross-section. The result was the formation of a ledge of concrete extending over the void-forming projection, which ledge was not adequately supported by the projection and was therefore prone to splitting off especially since the longitudinal upper outer corner of the projection would form a fairly sharp well defined line of cleavage in the concrete. Plates 14' are preferably provided with the brackets 27 and pointed securing ears 36, although this is not necessary.

As shown in Fig. 4, brackets 27 may also be provided on narrow side plates 46 set into or otherwise secured (as by ears 36) to a special core 43. This core is provided with large grooves 47 along its top and bottom, these grooves forming voids and being closed along their open sides by upper and lower horizontal seals 23 and 49 which may buckle into the grooves when the pavement expands. The toes of lower seal 49 may be turned up as shown to seal into the concrete.

In Fig. 5 is shown a core 13 which may be identical with or similar to that shown in Fig. 1. Instead of using side plates extending the height of the core, there may be provided individual channel shaped sheet metal members 51 for each of the grooves or voids 16. Such channel members 51 may be secured in place by friction or by being sprung into grooves that are slightly undercut, or they may be adhered in place. Since side plates are not used for supporting the horizontal seal, a seal 56 has been shown which does not have the depending flange 34.

Instead of channel shaped plates 51, there may be provided an individual flat side plate 61 for each groove or void 16. Such side plates may be formed of thin flat sheets of metal and may be secured in place by being snapped into longitudinally extending notches 62, which may be formed near the outer edges of the ribs 21.

Fig. 7 shows still another type of core having voids formed therein. In this instance the plurality of U-shaped core members 71 may be extruded and secured one over another as illustrated. A flat slab 72 may be positioned at the bottom or not, as desired. These members 71 and 72 may be secured together by adhesion, with or without being adhered together directly. They may be secured together by surfacing members 73, which may be plates having brackets 27 thereon or plain flat plates or merely fabric binders.

When the horizontal seal 23 or 23' is not provided and when side plates are used, a crown 24' may be secured in place above the core 13 by flanges 81 extending into the crown 24', as seen clearly in Fig. 8. This structure is equally applicable to the side walls 14 of Fig. 1 or 214 of Fig. 2, or 14' of Fig. 3.

The crowns 24 and 24' may be formed of a flowable material, or, better still, of a compressible resilient material, such as rubber which will expand to maintain the seal as the pavement contracts. It is preferably a solid tough material to withstand the wear of traffic. Although it is preferred that such crown be secured in place during the manufacture of the expansion joint before it is shipped, it may be secured after reaching the job; or after the concrete has been set, such crown may be poured into the space provided therefor, in which case, however, a temporary filler will usually have been provided in place of the crown to form the edges of the concrete sections.

Whenever desired, as for the purpose of sealing the bottom of the space between paving sections, a base 91 may be provided as seen in Fig. 10. This base also holds the joint upright while it is being prepared for use. Such a base may be made of wood, metal, asphaltic mixtures, rubber, or any other suitable material. It may be used with any of the forms of invention shown. For example, if used with the Fig. 4 form, it would probably take the place of the base 49 shown therein.

In Fig. 11 has been shown a modified form of expansion joint in which two extruded or molded members 92 similar to core 13 have been placed face to face so that each closes the open sides of the void-forming grooves 16 of the other. Of course, one of the members 92 could be flat. This type of joint is exceedingly low in cost and may be very desirable anytime the advantages of the side plates 14 are not required. The two members 92 may be adhered together.

In Fig. 12 has been shown a modified form of expansion joint, in which the filler 93 is of a simple rectangular cross-section and is provided with a void-forming C-shaped cap 94. There is preferably also provided a similar C-shaped base 95 and a plurality of dowel supporting brackets 96 extending between the cap 94 and base 95 and secured to each as by spot welding. The usual dowels 97 and dowel caps 98 may be provided.

In line with minimizing the danger of spalls, the upper corners of the base 95 and likewise the upper corners of the base plate 216 in Fig. 2 may be rounded. However, because these corners are positioned at such a low depth in the concrete, such rounding of the corners may not be necessary.

There are many known materials that may be used for the flowable cores of this invention. Probably the preferred is a fibrated mineralized asphalt commonly used in expansion joints. Rubber and rosin mixtures or plain rubber may also be used, though the latter will ordinarily flow and compress simultaneously. The invention is really independent of the material used, and they are mentioned merely as examples. Of course, the choice of material does help to provide an inexpensive construction.

From the foregoing, it is seen that various forms of expansion joint are provided, all of which can be constructed ecoonmically and all of which provide having internal voids to permit expansion of the concrete sections without extrusion of the core material above the pavement. Likewise all of the forms minimize the danger of spalling or splitting of the edges of the concrete due to having said edges inadequately supported.

The disclosures of this application are illustrative and the invention is not to be limited by them. In fact, if modifications or improvements are not at once obvious, they may be devised in the course of time to make additional use of the broad ideas taught and covered by this application. The claims are intended to point out novel

features and not to limit the invention except as may be required by prior art.

I claim:

1. An expansion joint filler including a flowable core formed with a channel having an open side in the vertical face thereof and a facing member closing the open side of said channel to form a void in said filler, said core having an enlarged head having a depending flange for securing said facing member in place.

2. An expansion joint filler including a flowable core having a plurality of channels therein, each channel having an open side in the vertical face of the core, a sheet metal facing plate on the side of said core enclosing the open sides of said channels, said plate having a plurality of tongues pressed out therefrom and having alined holes in said tongues and the body of said plate for supporting dowel bars therein in parallel relation.

3. An expansion joint filler including a yieldable core and a pair of sheet metal side plates on opposite faces of said core, at least one of said side plates including tongues cut from the material of said plates and extending outwardly from the plate and parallel thereto with a dowel receiving formation therein spaced from the plate and the other of said plates also having dowel receiving formations alined with the first mentioned dowel receiving formations to hold a plurality of dowels parallel and in the desired angular position with respect to said filler.

4. An expansion joint filler including a flowable spacing member having a plurality of grooves formed along its side and separated by integral ribs, and a vertical sheet metal side plate resting against said ribs and closing the open sides of said grooves to form expansion voids in said joint, and means on said sheet metal plate penetrating into the ribs on said spacing member for effecting attachment therebetween.

5. An expansion joint filler including a flowable spacing member having a plurality of grooves formed along its side and separated by integral ribs, and a sheet metal side plate resting against said ribs and closing the open sides of said grooves to form expansion voids in said joint, said plate having ears cut and bent therefrom and extending into said ribs for securing said plate to said spacing member.

6. An expansion joint filler including a flowable spacing member having a plurality of grooves formed along its side and separated by integral ribs, and a sheet metal side plate resting against said ribs and closing the open sides of said grooves to form expansion voids in said joint, said plate having tongues cut and bent therefrom opposite to a rib and said tongues and plate being provided with alined dowel receiving formations and serving to hold a plurality of dowel bars in proper parallel relation.

7. An expansion joint form and filler including a flowable core formed with a channel having an open side in the vertical face thereof and a facing member closing the open side of said channel to form a void in said filler, said core having an enlarged head having a depending flange for securing said facing member in place, and means for permanently sealing the expansion joint space above said flowable member.

8. An accessory for an expansion joint comprising a plate having tongues cut from a part thereof and bent therefrom whereby said tongues are displaced to a plane substantially parallel to the plane of said plate, said tongues being provided with formations substantially spaced from the body of the plate for receiving dowel bars.

9. An expansion joint including void-forming metal members on opposite side faces thereof and brackets supported by the metal member on each side of the joint extending substantially parallel to the plane of said last-mentioned metal member and provided with a dowel receiving formation substantially spaced from the metal member and stamped from a portion thereof.

10. An expansion joint form and filler including a flowable spacing member, a void-forming metal member on each side of said spacing member and brackets supported by the metal member on each side of the joint extending substantially parallel to the plane of said last-mentioned metal member and provided with a dowel receiving formation substantially spaced from said spacing member and cut therefrom to hold a plurality of dowel bars in accurate parallelism.

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