Aug. 6, 1940. C. H. BAUER 2,210,355

FORMATION OF EXPANSION JOINTS

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Fig. 1

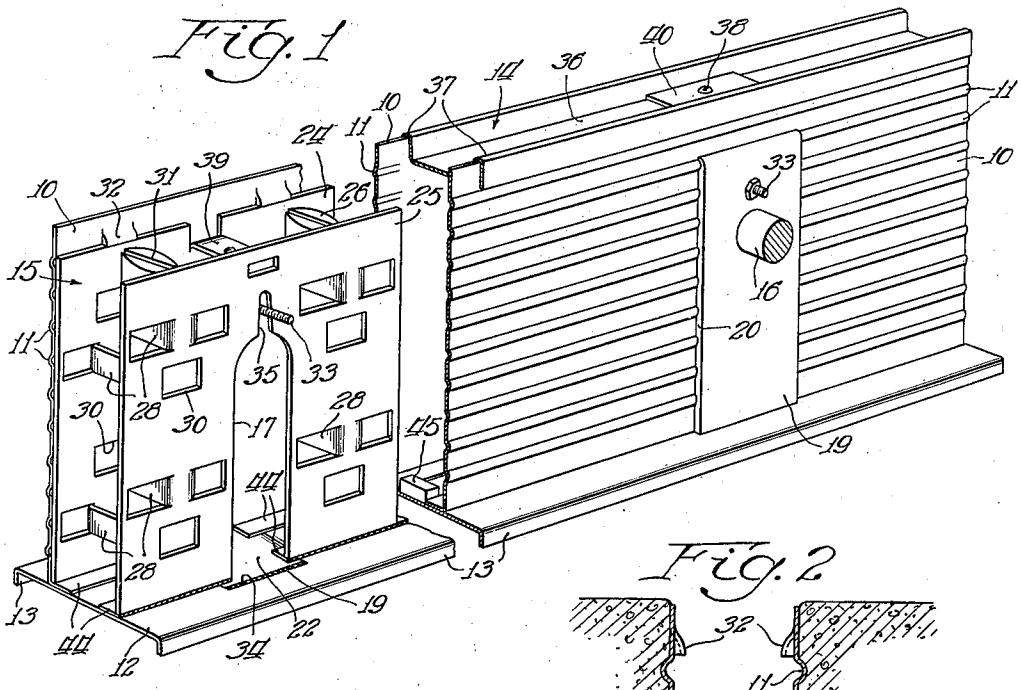


Fig. 2

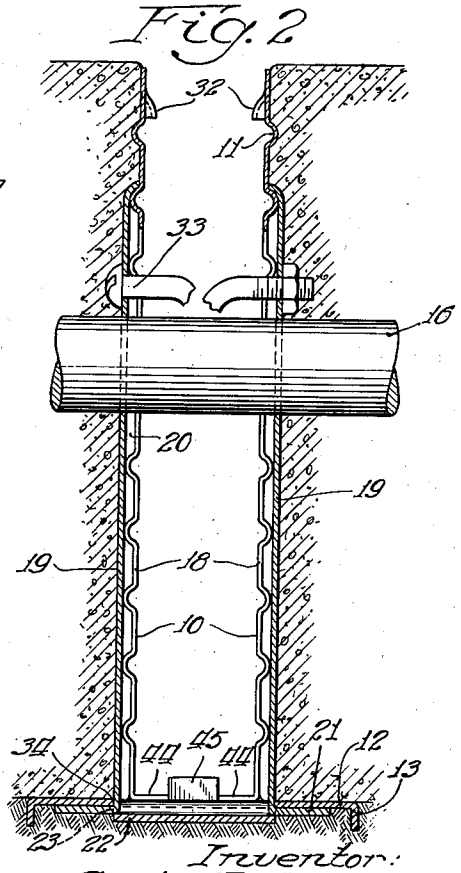


Fig. 6

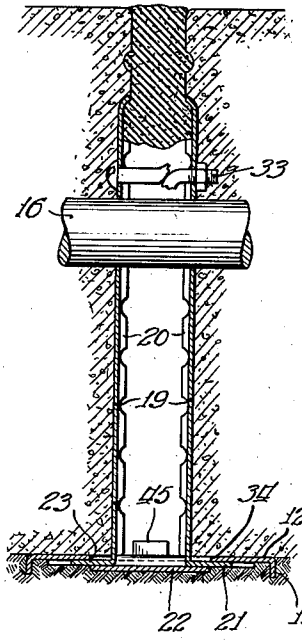
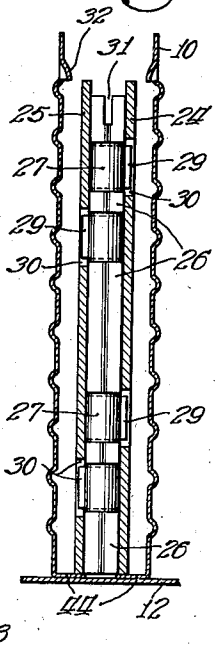


Fig. 7



Inventor:
Carl H. Bauer
By: Roland C. Rehm
Atty.

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Fig. 3

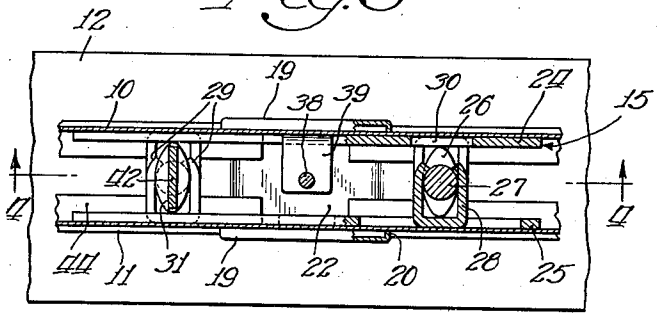


Fig. 4

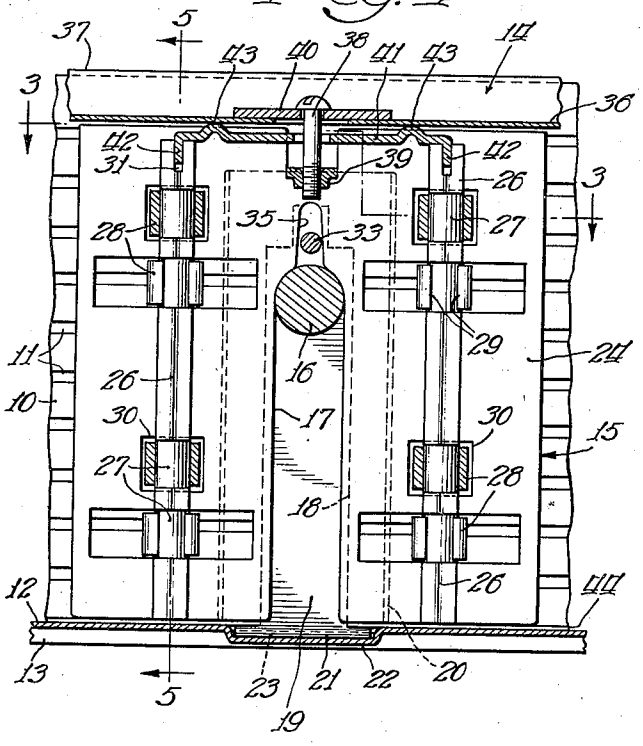
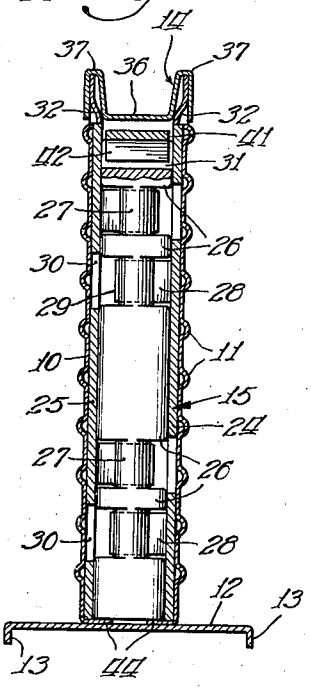


Fig. 5



Inventor:
Carl H. Bauer
By: Roland C. Behm
Atty.

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UNITED STATES PATENT OFFICE

2,210,355

FORMATION OF EXPANSION JOINTS

Carl H. Bauer, Chicago, Ill.

Application February 28, 1938, Serial No. 193,085

11 Claims. (Cl. 94—18)

This invention relates to the formation of expansion joints, particularly in concrete structures such as roads, sidewalks, etc.

The nature of the invention may be readily understood by reference to one illustrative construction embodying the invention and shown in the accompanying drawings:

In said drawings:

Fig. 1 is a perspective view partly broken away showing an assembly for forming a joint;

Fig. 2 is a transverse section through a roadway showing a form in place;

Fig. 3 is a plan section through a portion of an assembly form taken on the broken plane 3—3 of Fig. 4 showing a contracting form support;

Fig. 4 is a vertical longitudinal section taken on the plane 4—4 of Fig. 3;

Fig. 5 is a transverse section taken on the plane 5—5 of Fig. 4;

Fig. 6 is a view of a portion of the slot in the pavement after the forms have been removed; and

Fig. 7 is a transverse section similar to that of Fig. 5 through a portion of the form-supporting member when in contracted condition.

The invention is here illustrated in connection with the formation of an expansion joint in a concrete road pavement. In such pavements it has been the practice to form narrow transverse slots (generally about ¾ of an inch in width) in the concrete at such intervals as may be necessary to prevent damage upon expansion of the pavement. After formation, the slot must be closed against entrance of water and dirt. Asphaltic compounds used for this purpose have not been entirely satisfactory because they do not always expand (after compression by the pavement during hot weather) but remain in compressed condition and on subsequent widening of the slots in cool weather allow dirt and water to enter the slot, thereby defeating the purpose of the joint. Obviously it is of equal importance to prevent entrance of water and dirt into the slot from below. It has been proposed to seal the slot at the bottom by employing a sheet metal form box (closed at the bottom) which is allowed to remain in the slot after completion of the pavement. However, it is deemed better practice not to leave sheet metal at the sides of the slot because this prevents a direct bond or contact of the slot enclosing material with the concrete. Sheet metal forms of this type are also expensive because they must be made throughout of non-corrosible metal, such as copper or brass.

The illustrative apparatus embodies devices to seal the bottom of the slot and make it possible to use a resilient joint filling material, such as rubber, which occupies only the upper portion of the slot (see Fig. 6) and may be, therefore, readily removed and replaced when its resilient qualities are impaired. Slot closing materials of this character effectively prevent the entrance of water and dirt into the slot.

The illustrative apparatus also embodies collapsible forms of such character as to be readily adapted, without special design, to any pavement section.

The illustrative form is advantageously assembled as a unit prior to use and is easily placed in the desired position prior to pouring of the concrete. The assembled unit comprises sides in the form of relatively thin metal sheets 10 embossed or corrugated as at 11 to provide increased stiffness and to give the concrete broken surfaces which securely key the joint closing material in place. The sheets are in this instance designed to be removed after setting of the concrete and therefore may be made of cheap sheet iron. They are mounted on a base 12 which advantageously extends a substantial distance underneath the concrete on opposite sides of the joint (see Fig. 2). The base member is flanged at 13 to increase its stiffness. It remains in place after removal of the forms to seal the bottom of the slot and is, therefore, advantageously made of non-corrosible metal, such as copper or brass.

The forms are closed by removable top 14 which excludes concrete, dirt, etc., from the space between the forms during the making of the pavement.

The side walls of the form are in this instance supported and held in separated condition against the pressure of the concrete by collapsible form supports 15. These are of standard dimensions and do not require modification for varying dimensions in a road section. Only the sheet metal form sides 10 need be cut to conform to road section but since these are formed from sheet metal, adjustment to the road section may readily be effected. The base 12 is, of course, cut to a length which conforms with the width of the road section. The supporting units 15 are five or six inches in width and are placed at intervals between the forms. They may advantageously be located at each dowel bar 16 and for that purpose are provided with a slot 17 to straddle the dowel bar and to permit the support to be removed after the concrete has set.

The side forms 10 are also advantageously slotted as at 18 to straddle the dowel bar and to permit their removal after the concrete is set.

Plates 19 are advantageously employed to close the latter slots to exclude concrete from the interior of the form. These plates are pierced to receive the dowel bars and are assembled thereon prior to insertion of the dowel bars in place. They remain after removal of the forms but since they do not extend to the top of the slot in the pavement, they do not interfere with the proper bonding or anchoring of the joint closing material in the upper portion of the slot (Fig. 6). As is here shown, the side edges of the plates are formed with notched flanges 20 which conform to the contour of the side plates. The lower edges of the plates are flanged at 21 and are seated in depressions 22 in the form base with other flanges extending through slots 23 at the side edges of said depressions. The plates connected as they are to the dowel bars thus serve to hold the base plate tightly against the bottom of the concrete slabs to prevent the entrance of dirt and water. Upon expansion of the concrete, the plate flanges 21 are free to move inwardly in the slots 23 without breaking the seal or releasing the base 12 (see Fig. 6).

The contractible form supports in this instance comprise a pair of plates 24 and 25 made of relatively heavy gauge metal, in this instance held apart by spreading elements 26 in the form of cams of elliptical section (see Fig. 3). In a plurality of regions 27, each of the cams is reduced to circular section (Fig. 3) in which regions the cams are embraced by opposite flanges 28 struck up from the plates and bent inwardly at their ends 29 to prevent separation of the plates. Preferably the opposite plate is slotted as at 30 in registry with the ends 29 to permit the latter to enter the slots, thereby permitting maximum contraction of the spacing of the side plates as illustrated in Fig. 7. The upper portions of the cam elements 26 are provided with means, in this instance slots 31, by which they may be rotated from expanded to contracted position, as shown in Fig. 7, and vice versa.

In the assembled unit, the form supports are advantageously held in place by flexible lugs 32 struck up from the side plates 10. The latter are held against movement by the plates 19 which, so long as the form supports are in expanded condition, are held tightly against the side forms 10. Small bolts 33 connect the upper portions of the plates 19 and are adjusted to assume the outward pressure of the expanded form supports and thereby to hold the side forms snugly against the form supports in the assembled unit. Separation of the plates at the bottom is prevented by their engagement with the base at 34 (see Fig. 2). The bolts 33 remain after removal of the forms, but it is desirable to break them to prevent interference with the movements of plates 19 on expansion and contraction of the concrete. They are small and are easily broken. The side plates and form supports are slotted as at 35 to clear the bolts.

The top 36 of the cover 14 is advantageously depressed in its central portion and formed with offset channels 37 which fit over the upper edges of the side forms. The cover is advantageously held in place by bolts 38 which enter threaded lugs 39 struck inwardly from one of the form support plates. Preferably the threaded opening in lug 39 is given a tapered entrance (see Fig. 4) to facilitate threading of the bolt therein. The head of bolt 38 and the washer 40 lie in the depressed portion of the cover, and therefore, do not present any projections above the top of the form.

The cam members 26 of the form support are held in expanded condition by appropriate keys. One form of key is illustrated at 41 (Fig. 4). Its end flanges 42 enter the slots 31 in the keys and prevent their rotation. The form cannot be collapsed until the keys are removed. Preferably the keys are provided with upwardly extending projections 43 against which the cover 36 bears to hold the key in place during handling of the assembled unit. These projections are preferably varied in height depending upon the depth of the form in relation to the height of the form supports. If the forms be deeper than those illustrated in Fig. 4, for example, the keys 41 are advantageously made higher to abut the under face of the cover.

The form supports 15 are advantageously made to be used over and over again. They may be employed with form sides of various dimensions and types. The form sides whether made of wood or sheet metal are relatively inexpensive and need not be used again. Generally the cost of cleaning and preparing the forms for re-use exceeds the cost of new forms. When thin gauge sheet metal is employed, it is advantageously stiffened by corrugations or other means to resist the pressure of the concrete in the regions between the form supports. Preferably the lower edge of the side forms is provided with an inwardly turned stiffening flange 44 and the base 12 is provided at intervals between the form supports with lugs 45 against which the flanges abut (see Fig. 2) to support the side forms against the pressure of the concrete.

The forms thus assembled provide a compact unit in which all elements are held firmly in place by their mutual cooperation. The plates 19 form supports 15, and bolts 23 cooperate to hold the side forms on the base. The latter with the lugs 32 hold the form supports in place, and the cover is bolted in the form supports.

After the concrete is set the forms may be removed by removing the cover and keys 41, and then rotating the cams 26 to collapse the forms. When the latter are collapsed, they will clear the lugs 32 and may be easily lifted out. Then the side forms 10 may be moved inwardly to clear the concrete and plates 19 and may then be lifted out. After removal of the side plates, a strip of resilient joint closing material is inserted in the upper portion of the slot (see Fig. 6). This material keys itself or anchors itself in the grooves or other irregularities formed by the side plates in the surface of the concrete. The bottom of the slot is maintained tightly closed as explained above by the non-corrosible base plate 12 which though held firmly against the bottom of the concrete by the plate 19, allows relative expansive movement of the concrete.

This application is a continuation in part of my copending application, Serial No. 147,818.

Obviously the invention is not limited to the details of the illustrative construction since these may be variously modified. Moreover it is not indispensable that all features of the invention be used conjointly since various features may be used to advantage in different combinations and sub-combinations.

Having described my invention, I claim:

1. In a joint of the character described comprising in combination a concrete pavement having an expansion slot therein, a bottom plate

closing the bottom of said slot and extending over the faces of the concrete adjacent said slot, a dowel bar extending across said slot, supports for said bottom plate carried by said bar on each side of said slot, said supports each having a flanged extremity extending through a slot in said bottom plate to support the latter and to permit relative movement during contraction and expansion of said concrete, said plate being otherwise free of connection with the concrete to permit the latter to move without distortion of said plate.

2. A contractible form supporting member comprising in combination a pair of face plates, vertically extending cam shafts between said plates axially rotatable to force said plates apart, and bearing members carried by said plates and embracing said cam members to connect said plates and cam members together.

3. A contractible form supporting member comprising in combination a pair of face plates, elongated vertically extending cam shafts extending between said plates and having a generally elliptical section and axially rotatable for forcing said plates apart, said plates having lugs stuck therefrom and loosely embracing said cam members to connect the latter and said plates together.

4. A contractible form supporting member comprising in combination a pair of face plates, elongated cam members extending between said plates and having a generally elliptical section for forcing said plates apart and permitting them to be brought together, said cams having bearings of circular section, lugs stuck up from said plate and embracing said bearings to hold said plats and cams together, said plates having perforations therein opposite said lugs to receive the latter when said plates are brought together.

5. In a form for making slots in concrete pavements and the like having dowel bars adapted to extend across the slot to be formed in the pavement, the combination comprising removable side plates having slots therein to straddle the dowel bars, a bottom plate on which said side plates rest, a collapsible form support between said side plates, said form support being separable from said side plates and having means for contracting the thickness of such form support to permit it to be withdrawn from the form, supporting members carried by said dowel bars on the outside of said side plates for supporting said bottom plate and having means for engaging said side plates to prevent separation thereof from said bottom plate, and means on said side plates for engaging said form support to hold the latter in place, said means being releasable on collapse of said form support to permit removal of the latter.

6. An assembled form unit for use in making expansion joint slots in pavements and the like comprising in combination a base adapted to extend under the concrete adjacent the slot, removable side forms made of relatively thin sheet metal and slotted to pass dowel bars extending across the slot, contractible form supports between said side forms for supporting said side forms and separable therefrom, said side forms having lugs to hold said form supports against displacement in the unit and arrange to clear said form supports upon contraction of the latter, a cover for said side forms removably connected to said form supports, and plates adapted to be supported by the dowel bars for closing the slots in said side forms, means for releasably connecting said side forms to said plates, said plates having means for slidably supporting said base to allow for expansion and contraction of the concrete.

7. In a form for making narrow slots in concrete pavements and the like having dowel bars adapted to extend across the slot to be formed in the pavement, the combination comprising removable side plates having slots therein to straddle the dowel bars, a bottom plate on which said side plates rest, supporting members carried by said dowel bars on the outside of said side plates for supporting said bottom plate and having means for engaging said side plates, a pair of connected form supporting plates between said side plates and holding the latter in engagement with said supporting members to prevent separation of the side plates from the bottom plate, said form supporting plates being held apart by vertical cam shafts rotatable to permit the form supporting plates to move toward each other and thereby to release said side plates.

8. A form for making narrow expansion slots in concrete slabs for roads and the like comprising in combination side forms made of such thin sheet metal that they can economically be discarded after use, a side form support including a pair of separate face plates adapted to bear against the side forms to support the latter and free to be moved bodily toward each other, a camming device between said plates adapted to bear directly against their inner faces and movable to a position for spreading said plates apart to support the side forms and movable to another position to permit said plates to be moved bodily toward each other and away from the side forms, means for connecting said plates and said camming device together into a unit, said means being arranged to permit free bodily inward and outward movement of said plates, said camming device lying within the upper edges of said plates and being provided with means lying within said upper edge for operating the camming device.

9. A form for making narrow expansion and contraction slots in concrete slabs for roads and the like comprising in combination side forms of relatively thin sheet metal, a pair of face plates adapted to bear against the side form members to support the latter, a rotatable cam member having narrow and wide portions thereon located between said face plates and adapted to bear directly against their inner faces, means for connecting said cam member to said face plates to unite them in a unitary structure but allowing free bodily inward and outward movement of said plates, and means for rotating said cam member to bring the narrow or wide portions of the cam into operative engagement with said face plates.

10. A collapsible support for forms for making narrow expansion slots in concrete structures and the like comprising in combination a pair of separate face plates adapted to bear against the forms and free to be moved bodily toward each other, a camming device between said plates adapted to bear directly against their inner faces and movable to a position for spreading said plates apart and movable to another position to permit said plates to be moved bodily toward each other and away from the forms, means for connecting said plates and said camming device together into a unit, said means being arranged to permit free bodily inward and outward movement of said plates, said camming device lying within the upper edges of said plates and being provided with means lying within said upper edge for operating the camming device.

11. A collapsible support for forms for making

narrow expansion and contraction slots in concrete structures and the like comprising in combination a pair of relatively thin face plates adapted to bear against form members, a rotatable cam member having narrow and wide portions thereon located between said face plates and adapted to bear directly against their inner faces, means for connecting said cam member to said face plates to unite them in a unitary structure but allowing free bodily inward and outward movement of said plates, and means for rotating said cam member to bring the narrow or wide portions of the cam into operative engagement with said face plates.

CARL H. BAUER.