Oct. 18, 1938. J. W. HELTZEL 2,133,387

EXPANSION JOINT

Filed Dec. 28, 1934

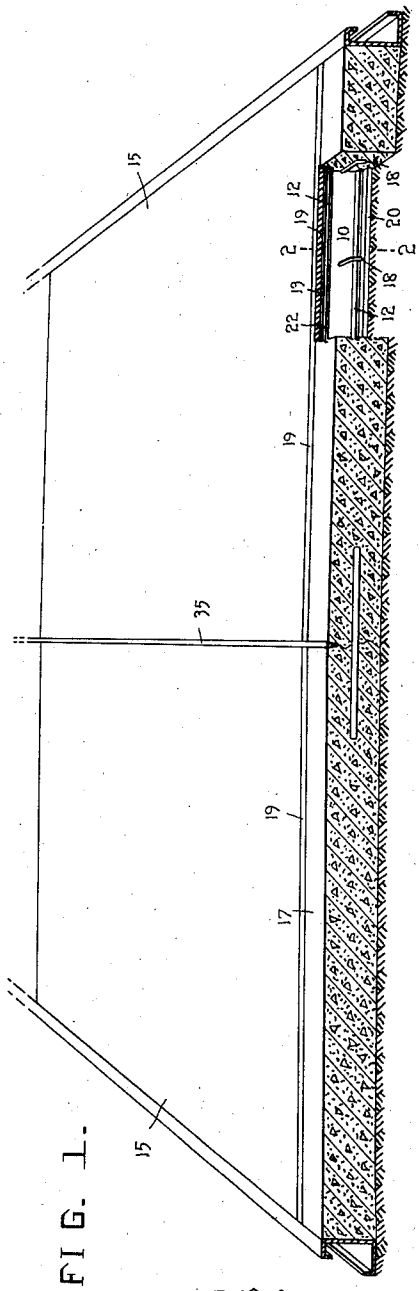


FIG. 1.

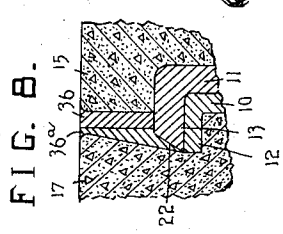


FIG. 8.

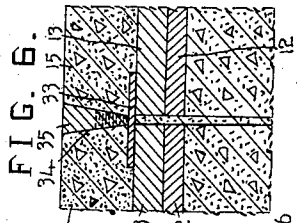


FIG. 6.

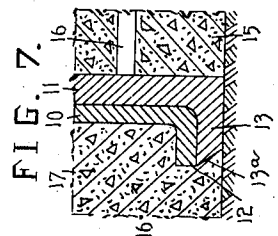


FIG. 7.

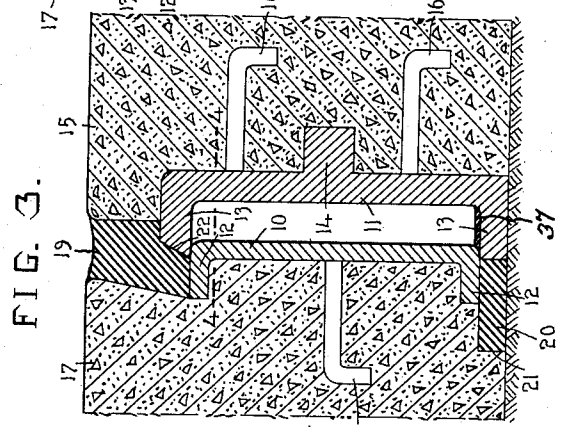


FIG. 3.

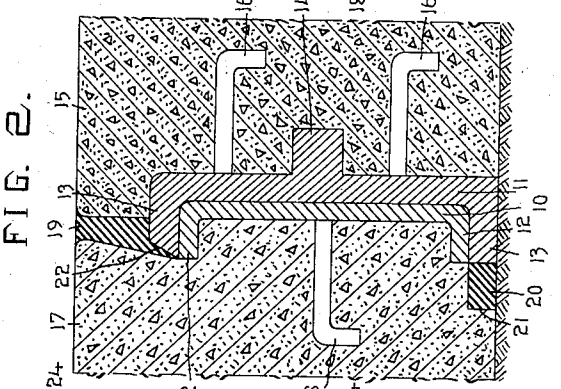


FIG. 2.

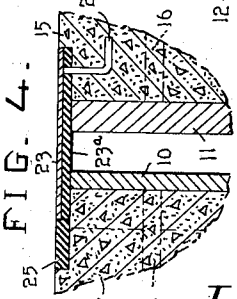


FIG. 4.

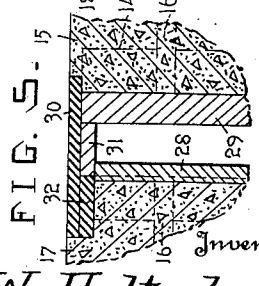


FIG. 5.

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EXPANSION JOINT

Joseph William Heltzel, Warren, Ohio

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8 Claims. (Cl. 94—18)

The present invention relates to expansion joints for use in road construction to divide the road surface into slabs or blocks and admit the relative movement thereof during expansion and contraction of the road.

In the past, expansion joints were usually constructed by placing asphaltic material into a slot in the roadway. This type of joint has been found wanting in that when the road expands a large part of the liquid contained in the joint is forced upwardly on the roadway, forming a hump. In the present invention the depth of this filler may be only approximately one-seventh of the depth of the slab; thus any material which may be forced upwardly out of the slot will be negligible.

Another shortcoming in the old type of joint is that when the road expands, the filler forced out is not replaced. The old filler forced out remains out when the road contracts, leaving a void, which becomes filled with dirt. With the repetition of expansion and contraction, the void in the plastic joint becomes filled with solid matter.

Another shortcoming of the old type of joint has been that about one-half of the joint material consists of solid matter, and when expansion takes place, the amount of expansion available is only about one-half the thickness of the joint material.

An object of the invention is to provide an expansion joint having parts which are slidable one on the other and which are so attached or molded to the adjacent slabs of the roadway as to transfer load pressure from slab to slab, and maintain the slabs in vertical alinement, and effectively exclude foreign solid particles tending to destroy the flexibility of the joint.

Another object of the invention is to provide an improved expansion joint wherein the members are not only slidably interlocked one with the other but are also readily interlocked with the adjacent road slabs and wherein means is provided for preventing filling in of crevices tending to retard the free movement of the sliding members.

Another object is to provide a flexible yielding joint which will yield and act like a hinge in case of undue upward or downward movements causing both adjoining slabs to yield in unison when unusual pressures cause such movements.

A further object of the invention is to provide an improved method of constructing an expansion joint and placing the filler strip of plastic material in such position that a relatively small amount of the plastic material is required for sealing the joint at the upper surface of the roadway, and provide for its easy removal for refilling.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawing, wherein like symbols refer to like or corresponding parts throughout the several views:

Figure 1 is a perspective view of a section of roadway in cross section taken immediately adjacent an expansion joint constructed and installed according to the present invention, part of the roadway being broken away to show the anchors for one of the expansion joint elements.

Figure 2 is an enlarged sectional view taken transversely through the joint substantially on the line 2—2 of Figure 1.

Figure 3 is a similar view but showing the joint in expanded position as compared with the closed position of Figure 2.

Figure 4 is a fragmentary sectional view taken through one end of the joint substantially on the line 4—4 of Figure 3, and showing the end closure means to exclude solid material from the space between the joint elements.

Figure 5 is a like view showing a modified form of the end closure.

Figure 6 is a fragmentary sectional view taken through the roadway at the meeting inner ends of adjacent expansion joints.

Figure 7 is a fragmentary sectional view taken through the lower end of the expansion joint, showing a slight modification therein; and

Figure 8 is a sectional view through the roadway above the joint, showing the molding strip to form the filler material crevice during molding of the road.

Referring now to the drawing, the expansion joint comprises a pair of interfitting channel members having webs 10 and 11. The webs are provided respectively with flanges 12 and 13 and these flanges are disposed to slide upon one another, as shown in Figures 2 and 3. The smaller or inner channel member, having the web 10 and flanges 12, fits into the open side of the larger channel member having the web 11 and flanges 13 so that the flanges 13 provide guides for the inner member and upon which the latter may slide to and from the web 11 of the larger member. The larger channel member preferably has its web 11 and its flanges 13 at least twice as thick as the web 10 and flanges 12 of the smaller inner

channel member so that the outer channel member may withstand the strain imposed on it in the transfer of forces between the channel members.

The larger member 11 is provided upon its outer side, intermediate the upper and lower edges of the web 11, with a shear bar 14 adapted for embedding in the body portion or material of an adjacent road slab 15 which is molded against the outer side of the web 11 in placing the joint. Suitable anchors 16 are also carried by the web 11 and are adapted to be embedded in the material of the slab 15 so as to firmly hold the outer or larger channel member to the slab 15 for movement therewith in the expansion and contraction of the slab.

This larger or outer channel member is positioned in the joint preferably flush with the lower face of the slab 15 so that the outer member rests at its lower flange 13 upon the sub-base of the roadway.

The inner or smaller channel member is adapted to receive in its concave or open side of the material of a second adjacent slab 17 of the roadway and thus shearing tendencies of the inner member is offset by the thickness of the enclosed slab material lying between the flanges 12. An anchor 18 is attached to the web 10 and extends from the inner side thereof for embedding in the material of the slab 17 to securely hold the inner channel member to the slab 17 for independent movement therewith during the expansion and contraction of the slab.

The channel members are of such height, compared to the thickness of the slabs 15 and 17, as to provide a slot or space between the abutting portions of the slabs and above the joint to receive a filler 19 of a suitable plastic composition which will be relatively small in volume and which will readily maintain a closed or filler joint crevice at the upper surface of the roadway. The quantity of the material 19, depending upon the relatively small size of the slot or channel, is such that when the slabs expand and close the joint, as shown in Figure 2, the amount of the plastic material ejected upwardly from the crevice will be relatively small and negligible as compared with the amount of plastic filler used in joints of the present day type and consequently the road surface will be maintained relatively smooth and without humps of any appreciable size.

An elastic filler element 20, of sponge rubber or the like, may be countersunk in the lower face of the slab 17 with the upper surface of the filler member 20 lying in part against the lower side of the adjacent flange 12. The outer end of the filler member 20 abuts the end of the adjacent flange 13 of the outer member while the opposite end of the filler member 20 abuts a shoulder 21 provided in the molding of the material of the slab 17 over and about the member 20.

With this construction, as the relatively slidable and interfitting channel members contract under pressure of expansion of the slabs 15 and 17, the compressible element or member 20 is reduced in size, as shown in Figure 2, while as soon as the channel members spread apart or expand the compressible member 20 will follow such motion and exclude foreign substances from the path of the lower flange 13 so that the latter will have a relatively free path of movement in the expansion and contraction of the joint.

In the modification shown in Figure 7 the element 20 is omitted and the lower outer flange 13 is beveled as at 13a similar to the upper flange 13 so as to force downwardly any subgrade particles tending to close the space at the end of the lower flange 13 upon the expansion and contraction of the joint.

The upper flange 13 of the outer channel member is preferably provided with a bevel edge 22 which faces the plastic filler 19 so as to gradually raise the filler when the channel members are moved toward each other and to thus reduce to a minimum resistance or friction occasioned by this movement. The air space between the webs 10 and 11 of the channel members is negligible from the standpoint of resistance to the action of the joint and the overlapping flanges 12 and 13 effect a desired closure sufficient for excluding solid particles which would otherwise interfere with the free action of the joint.

As shown in Figure 4, the opposite ends of the channel members may be provided with a closure plate 23 which may have an anchor 24 at one end portion to engage in one of the slabs, such as the slab 15, while the other end of the closure plate is freely slidable in a recess in the opposite slab 17 and a compressible filler member 25 may be provided between the end of the plate 23 and the adjacent shoulder of the slab 17. A rubber sealing strip 23a may be placed against the inner side of the plate 23 for engagement against the ends of the channel webs 10 and 11. This closure plate 23 with its sealing strip 23a, at each end of the space between the webs 10 and 11, effectually closes the space against entrance of solid particles which otherwise might impede the closure movement of the channel members.

A slight modification in the construction of the end closure for the space between the channel members is shown in Figure 5 wherein the inner channel web 28 is shorter than the width of the road and the outer channel web 29 is slightly longer than the web 28 but of less width than that of the road. A compressible strip 30 of rubber or the like is embedded in the adjacent side portions of the slabs 15 and 17 and bears against a filler plate 31 which is preferably carried by the outer web 29 and slidably engages the adjacent end of the web 28. A compressible block 32 of rubber or the like is disposed in the slab 17 at the outer edge of the plate 31. Thus the webs 28 and 29 may move toward and from each other and the plate 31 serves as a guide over which the adjacent end of the web 28 may slide.

With reference particularly to Figure 6 there is shown the meeting ends of the expansion joints at the central portion of the roadway and wherein the upper flanges 13 of the outer channel member substantially abut and support an overlapping plate 33 forming the bottom of a groove 34 formed longitudinally in the surface portion of the roadway and in which is placed or poured a suitable filler material or strip 35. The material 35 may be of a softer or thinner consistency at the bottom of the groove 34, as shown, while the upper or surface portion of the material is of a harder character so as to withstand wear and offer the necessary resistance for maintaining the crevice closed at all times.

The plate 33 may be of steel or the like so as to hold the softer filling material from flowing down between the adjacent ends of the expansion joints. This type of filler may, of course, be used in the cross grooves or channels disposed above the expansion joint.

With reference now to Figure 8 the groove provided in the surface portion of the roadway

is shown before the molding strip **36** is removed. The molding strip **36** may be formed in one or more pieces and is shown in Figure 8 as comprising two parts, **36** and **36a**, so as to take care of the flaring or undercut formation of the groove immediately above the expansion joint, shown in Figures 2 and 3. The strips **36** and **36a** may be withdrawn from the joint and the desired filling material poured into the joint above the channel members. These molding strips are held in place by stakes or the like in any suitable manner until the concrete or other material used flows in about the interfitting channels and about the opposite sides of the molding strips.

This expansion joint thus not only provides a relatively small crevice or opening at the top of the joint for the plastic filler **19** but also effectively transfers load pressure from one slab to the other by virtue of the overlapping engagement of the flanges **12** and **13**. Further, these flanges effectively hold the slabs **15** and **17** in true vertical alinement and prevent distortion or movement of the slabs out of alinement during their relative movements, particularly where the outer channel is of twice the thickness of the inner channel.

The method of installing this joint in a roadway comprises the assembly of the channel members in interfitting relation and disposing them in upright position. The lower filler member **20**, when used, is placed in position beneath the lower flange **12** and against the end of the lower flange **13**, resting upon the surface of the sub-base of the road. A suitable mold strip **36** and **36a** is seated upon the upper end of the interfitting channel members and the upper surface material of the roadway is poured in place and is filled in against the outer side of the web **11** of the large channel member, about the anchors **16** and about the shear bar **14**. The pouring of the material causes the material to flow into the open side of the inner channel member and about the anchors **18** thereof. Stakes may be driven into the soil to hold the members in place until the concrete is poured around the joint members and may be used and removed as the concrete is poured around the members.

The material of the slab **17** also is shaped about the expansion member **20** to provide the shoulder **21** and thus form a recess or pocket in the slab for the expansion member. At the same time the lateral or side closure plates **23** are held in place by forms or the like against the opposite ends of the channel members so that when the material of the slabs **15** and **17** are poured in place they will provide recesses defined by the end portions of the closure plate **23** and its expansion member **25**.

The filler strip **36** is then removed from the relatively small and shallow slot or crevice at the top of the joint and the plastic filler material **19** is poured in. One advantage of this construction is that a commercial channel may be used for the inner member as well as for the outer member. The flanges or legs may be reduced as well as the webs of the channels. The desired slidable interfitting of the channels may thus be provided and it will be noted that the legs or flanges of both channel members extend in the same direction and that the smaller channel is nested within the open side of the larger channel.

It will be noted also that the flanges **13** of the outer channel are at all times abutting against the opposite upper and lower edges of the web **10** of the small channel so that there is a substantially direct transfer of load pressure from one channel to the other and the danger of flexing or bending the channels is reduced to a minimum. The arrangement is such that the crevice or groove at the top of the joint is made relatively narrow and shallow and may be filled with tar, asphalt or the like so as to effectively close the top of the joint and maintain a substantially smooth and uninterrupted surface level to the roadway.

To insure sealing the space between the channel members, the lower leg **13** of the outer channel member may have a coating or layer **37** of filler material on the inner or upper side thereof and this layer **37**, being yieldable, is capable of expansion and contraction or displacement sufficiently to offer practically no resistance to the relative movements of the channel members.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims.

What is claimed is:—

1. An expansion joint comprising a pair of interfitting channel members with the outer side of the inner member facing the inner side of the outer member and said members being relatively slidable, means for anchoring said members independently to adjacent road surface slabs, an expansible filler element disposed against the edge portion of the lower flange of the outer channel member, closure plates disposed across the opposite ends of said channel members, means for anchoring the closure plates each to one of the adjacent slabs, and expansible filler members arranged at the opposite ends of the closure plates to admit free sliding movement thereof.

2. A roadway or concrete structure, having an expansion joint, consisting of inner and outer channel structures having right angle flanges at top and bottom, one slidably within the other with flanges of each channel structure in same direction and a yielding filler substance placed against the edge of the top flange of the outer channel to yield in the path of the flanges of the outer channel when in movement.

3. In an expansion joint, a pair of interfitting channel members each having right angle flanges at top and bottom, both placed with flanges in the same direction, road slabs molded about the outer sides of said members for carrying the members therewith and said members adapted to slide one within the other upon the expansion and contraction of the road slabs, said road slabs extending higher than the members and having their adjacent end portions above the members spaced apart to provide a groove above the members and said groove having a bottom width substantially equal to the depth of the flanges of the channel members and being reduced in width at the surface portion of the roadway, and a flexible filler disposed in the groove for sealing the same above the channel members.

4. An expansion joint comprising inner and outer interfitting relatively slidable channel members having right angled top and bottom flanges and adapted to be embedded in the ends of adjacent road slabs, and closure members consisting of a plurality of interacting closure plates adapted to be embedded between the road slabs and disposed at opposite ends of the said channel mem-

bers for excluding foreign particles from the space between the channel members.

5. An expansion joint, comprising outer and inner channel members disposed transversely between the abutting ends of slabs in a roadway, each of said members being anchored to its adjacent slab and with the flanges of said members extending in the same direction and each of said members having a width less than the thickness of the slabs, the upper flanges of said members being disposed below the top surfaces of said slabs, said outer channel member being heavier than said inner channel member whereby when a vehicle crosses the joint from the slab anchor to the heavier outer channel member, the load will be transferred from said slab to the outer heavier channel member through the upper flange thereof to the inner channel member and to the adjoining slab and when the vehicle passes in the opposite direction the load may be transferred from said other adjacent slab through the inner channel member to the lower flange of said heavier outer channel member to said first slab.

6. An expansion joint, comprising a pair of slidably interfitting channel members having overlapping rightangular flanges extending in the same direction, said channel members disposed vertically in a roadway with the lower flange of the outer member seated directly on the sub-surface of the roadway and with the upper flange of the outer member spaced a short distance below the upper surface of the roadway for directly transmitting the load and shock on the joint to the sub-surface, means for anchoring the channel members to their respective adjacent portions of the roadway, a sealing substance disposed above the channels and between the adjacent portions of the roadway, and a sealing substance on the inner side of the lower flange of the outer member.

7. An expansion joint for roads, comprising a pair of road surface slabs, a pair of slidably interfitting channel members disposed between the ends of the slabs having overlapping top and bottom flanges extending in the same direction and with the bottom flange of the outer member seated on the sub-surface of the roadway to directly support both members thereon, said channel members being vertically disposed and terminating a short distance below the upper surface of the roadway with the inner member embracing the end of its adjacent road slab, means for anchoring the members to their respective ends of the slabs, a yieldable filler substance disposed above the members between the adjacent ends of the slabs, and a yieldable filler substance on the inner side of the lower flange of the outer member.

8. An expansion joint comprising inner and outer interfitting relatively slidable channel members having right angled top and bottom flanges and adapted to be embedded in the ends of adjacent road slabs, a closure plate at each end of said channel members, and anchoring means secured to said plate and embedded in one of said slabs to slidably hold said plate against the end of the channel member secured to the other slab for excluding foreign particles from the space between the channel members.

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