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EXPANSION JOINT AND ROD SUPPORTING ASSEMBLY

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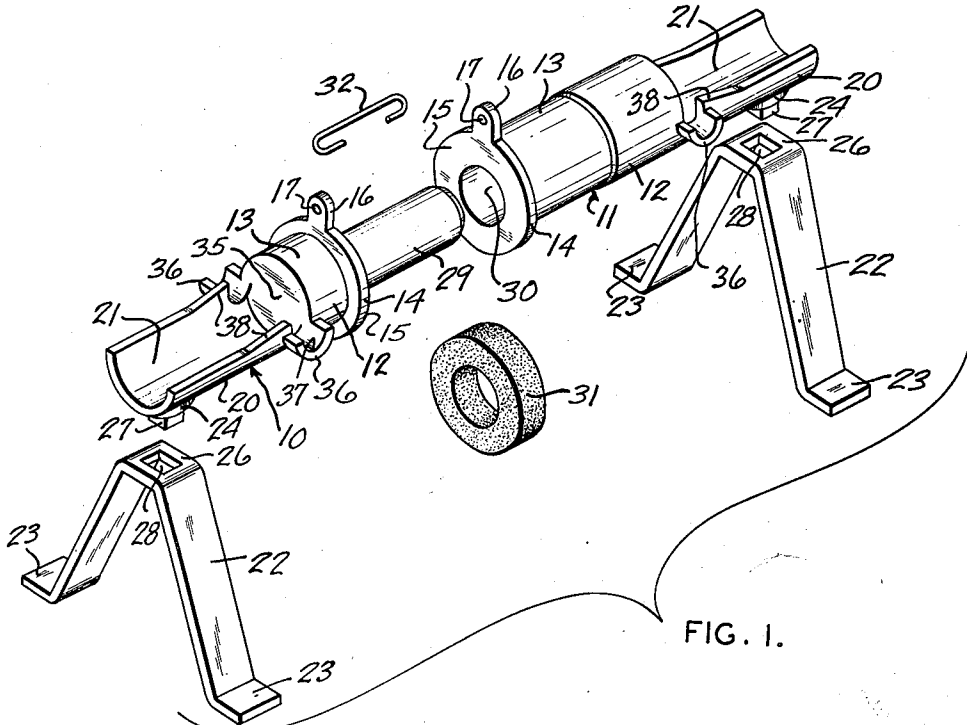


FIG. 1.

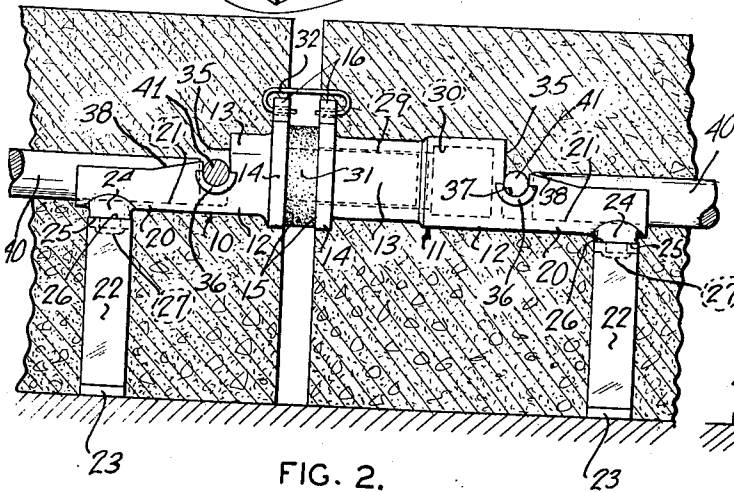


FIG. 2.

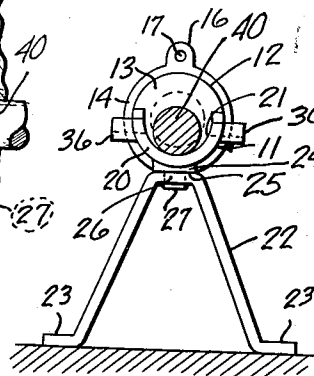


FIG. 3.

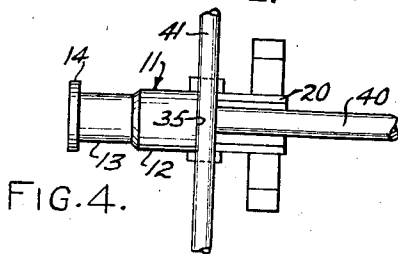


FIG. 4.

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EXPANSION JOINT AND ROD SUPPORTING
ASSEMBLY

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7 Claims. (Cl. 94—18)

This invention relates to expansion joint and rod-supporting assemblies, and more particularly to an improved assembly of companion metal units to be installed in adjacent slabs or sections of concrete or like masonry, as in the building of concrete pavements, wherein provision is made for expansion joints between adjacent sections or slabs. The invention is, however, adapted for use in concrete structures generally, as well as in masonry, bridges, flooring and many other kindred structures.

A major object of the invention is attained in an improved provision for joining adjacent concrete road slabs or sections, for example, across the expansion joints usually allowed between such sections, and such that a concentrated load imposed on the end of one of the sections or slabs is, in part, transmitted to the adjacent slab, and such that through the improved joint section to be described, the adjacent slabs are held in vertical alignment and as well retained against transverse displacement, all while allowing free linear expansion or contraction of the roadway due to changes in temperature.

Yet another and important object is attained in a joint structure of the type above referred to, and which embodies provisions for seating and supporting the end portions of the steel reinforcing rods or bars, particularly the longitudinal elements of reinforcing metal, by which is meant those extending in a direction lengthwise of a roadway for example, and transverse to the expansion joint.

A still further important object of the invention is attained in a dowel joint assembly which is so formed as to have a definite structural and functional relation to certain at least of the longitudinal reinforcing bars of the adjacent concrete sections, and which, in cooperation therewith, results in a continuous metal tie-bar arrangement extending over the length of the pavement, and yet providing for expansion and contraction between adjacent pavement sections.

An additional object of the invention is attained in a metal dowel bar assembly for use in and between adjacent slabs of concrete pavement or the like, the dowel-joint-forming members being such as materially to reduce the number of machining operations heretofore required, particularly in certain of the more elaborate types of dowel bar bearings.

Yet another object of the invention is attained in an improved device for the purpose noted, such that the companion units of each metal joint assembly are or may be spaced in predeter-

mined assembly prior to pouring the concrete or the like thereabout, whereby to effect a considerable saving of time in installation, and to assure the correct distance placement of the two units constituting the assembly, all in accordance with the optimum width of expansion joint desired between adjacent pavement sections.

A still further important object of the invention is attained in an improved arrangement of angular support on the body of each of the companion units forming the joint assembly, these supports being such as automatically to provide for the correct height or depth of placement of the joint elements within the concrete slab. These elements serve at the same time an important function as depending wings or projections, greatly enhancing the holding effect of the units in the concrete after setting thereof, and tending markedly to prevent misplacement or misalignment as well as disturbance of the joint elements before and after the concrete is poured and set; the present improvements serving further in substantial measure to prevent so-called high or low joints arising from vertical disparities in the adjacent sections of concrete roadway or the like.

An additional object is attained in a structure involving a cast metal body, and a formed or strip metal chair or support, such that the bodies are or may be uniformly cast, and optionally to the trade, supplied with or without the chair or support.

The foregoing and numerous other objects and advantages of the invention will appear as the description proceeds, particularly when considered in connection with the accompanying drawing, in which:

Fig. 1 is an isometric exploded elevation of the assembly; Fig. 2 is a side elevation of the assembly of Fig. 1 with the parts operatively related and shown as they would appear when embedded in the adjacent slabs or sections of a concrete roadway for example; Fig. 3 is an end elevation of the assembly of Figs. 1 and 2, showing in transverse section, one of the reinforcing bars or rods as seated on one unit of the assembly, and Fig. 4 is a top elevational view of one unit of the assembly, showing the manner of supporting certain of the reinforcing bars.

Referring now by characters of reference to the drawing, the assembly is comprised of a pair of substantially similar units, generally indicated at 10 and 11. These units are or may be similar in appearance, function and construction with the exception of the interfitting, dowel-joint-

forming portions thereof to be hereinafter described in more detail. In preferred form, each of the units includes an elongate body generally indicated at 12, and which is preferably of a somewhat cylindrical shape over a portion of its length, and which is formed by preference, of a one-piece casting, for example, of malleable iron or the like. Each of the units 10 and 11 is characterized, near its joint-forming end, by a barrel-like body portion, being the cylindrical part 13, terminating in an enlargement or annular projection 14, forming a flange. The flanges are provided with planar faces 15 which, as will appear when the two units are telescoped to the fullest extent, constitute abutting surfaces, each for engagement by the corresponding face of the companion unit.

Projecting preferably upwardly of each of the annular projections or flanges 14, is an ear 16, each of the ears being provided with an aperture 17, for a purpose hereinafter more specifically pointed out.

Extended rearwardly or toward the free ends of the units 10 and 11, the body portion 13 of each unit is continued into a portion of trough-like aspect, each such portion being indicated at 20, and serves to provide an upwardly opening channel or the like for the reception of the free end of one of the longitudinally disposed reinforcing bars or rods in the associated concrete slab or section. The trough or channel 21 is preferably of a width and depth such that it will partially surround the reinforcing bar seated therein. It results from this that, in assembly, when the joint parts are embedded in the concrete, that portion of the trough along the bar is filled with concrete, which upon setting, serves securely to retain and secure the end of the bar in the seat therefor constituted by the trough or channel 21.

It is a preference to provide for support of the joint assembly at a definite height above the grouting or subgrade on which the concrete proper is poured, and to this end there is provided on the outer or free end, i. e., opposite the flanged or joint-forming end of each of the units, a depending leg portion generally indicated at 22, this chair or arm preferably projecting in a plane at substantially a right angle to the axis of the body of the unit with which it is associated. Projecting horizontally from each side of the leg portion 22, is an extremity or foot 23, these feet having the function of increasing the bearing area of the leg, and tending to prevent any penetration of the grouting or subgrade by the free end of the leg, as the weight of the rod end and concrete is imposed thereon. It will appear that this arrangement results in a substantially A-shaped support or chair normal to the axis of the bodies of the units.

It is a preference to form each of the supports or chairs 22 of a rolled strip stock, in most cases a strip material of the order of sixteen gauge, has been found suitable. The chairs or legs when so constructed, may be die-formed in substantial quantity and at a low unit cost.

A preferred manner of securement of each of the chairs 22 to the body portion of the associated unit, consists in the provision of a boss 24 formed on the lower portion, near the outer end of the trough-like part 20 of the cast unit. This boss provides a bottom horizontal planar surface 25 which, in assembly, engages the upper horizontal portion 26 of the leg or chair. A

stud or lug 27 of square or other angulate section, is formed by casting on the lowermost central portion of the boss 24, and extends through an opening 28 which conforms in shape to, and is of a size just sufficient to pass the stud 27. The aperture 28 is preferably formed, at the time of forming up the strip stock of the leg 22, as by punching. Assembly of the legs to the bodies is effected by a first step of inserting the stud 27 in the opening 28 therefor, then upsetting the stud by pressure or impact so that it snugly engages the under surface of the flat portion 26 of the chair. Although it is obvious that the stud 27 and opening 28 may be of other than squared section, an angulate or non-circular section is preferred due to its function in preventing rotation of the leg or chair, once it is assembled to the body of the unit. By this provision its angularity is fixed with respect to the axis of the unit and is also definitely maintained with respect to an axis normal to that of the unit.

It will have appeared from this provision that the castings forming the units 10 and 11 are greatly simplified, and that casting problems of draft and the like are overcome in substantial measure by the use of the formed strip elements for the chairs or legs. It will also appear as commercially advantageous that when the joint elements proper, such as 10 and 11, are to be used in walls, bridges, masonry or other structures wherein the chair or leg portions are not necessary, these cast units may nevertheless be made standard, and whenever desired by the nature of the job, the legs 22 may be quickly affixed to the bodies of the units. It will have appeared that the snug engagement of the surfaces 25 on the bosses 24, with the horizontal portions 26 of the chairs, prevents any tendency to looseness or wobble effects, between the bodies 10 and 11 and the supports 22.

Referring now to the joint structure, the elements of which are distinguishable in the two companion units which collectively constitute the dowel structure or expansion joint, there is preferably formed integrally with the unit 10, as by casting, an axial dowel pin portion 29, which is preferably cylindrical in form. For reception of the dowel portion 29 of unit 10, unit 11 is provided at its outer or joint-forming end, with a pocket 30 which may be roughly formed by coring at the time of casting the element, and is preferably finished by drilling or machining. The pocket 30 is preferably of an internal diameter conforming closely to the external diameter of the dowel pin portion 29, and is of such depth as to accommodate the full length of the dowel pin portion whenever occasion therefor arises. It is a preference, although not absolutely indispensable, that the external surface of dowel 25 and the internal surface of the socket or pocket 30 therefor, be machined to a reasonably accurate fit, say to a clearance of .002". Since many of the dowel-joint-forming structures heretofore prevalently in use in concrete road construction required as many as six machining operations, it will appear as a distinct improvement that the present arrangement materially reduces the necessary minimum number of such operations.

In order to facilitate the installation of the joint assemblies as described, it is a preference to equip each joint structure, including the companion units such as 10 and 11, with a spacer between the flanges 14 thereof, the thickness of

such spacer corresponding or being proportionate to the width of expansion joint desired between adjacent sections or slabs of roadway, it being understood that this spacing will vary according to the temperature differential and other factors prevailing in the locality where the road is being constructed.

The spacing element referred to is by preference, formed of a material which corresponds in its physical characteristics to that used as a filler in the space between adjacent roadway sections, for example, a bitumastic composition such as pavement pitch or the like. An annulus or washer 31 of such material is inserted over the dowel 29 prior to initial assembly of the units 10 and 11, following which a tie-wire 32 is inserted with its ends through openings 17 of the lugs 16, and clamped over in a manner to hold the units in temporary assembly until after installation and setting of the concrete.

The manner of usage and advantages in installation will be in a large measure apparent from the foregoing description, but it will be noted for completeness that the two major units of each joint assembly, such as 10 and 11, may be assembled prior to shipment, through the use of the tie-wire or like 32, and in case an appreciable and known width of expansion joint is desired between the adjacent sections of concrete, the washer 31 is inserted between the units 10 and 11 prior to application of the tie wire. If desired, however, this operation may be performed on the job, and with the units so assembled, each of the assemblies is readily located by one man at the situs of the desired roadway expansion joint, preferably with the reinforcing bars or rods in place, at least in one of the sections, and with the appropriate longitudinal bars seated in the troughs or channels 21 of the companion units. To avoid niceties of placement of the bars and to obviate any cutting or fitting thereof, it is not necessary, but is desirable where possible, to locate the bar end in the trough 21 so that its end abuts the transverse end wall 35 of the trough. In any event, when the concrete is poured and tamped it will fill the space about the bar and in the laterally adjacent portions of the channel 21, so that the bar end is firmly anchored to the adjacent unit of the expansion joint.

As thus far described, the arrangement is particularly adapted for the reception of the longitudinal rods of the usual reinforcing assembly; in case however a wire-mesh type of reinforcement is used, the longitudinals thereof may occupy the channels 21, and provision is also made for the seating reception of the transverse wires, rods or bars of the mesh. To this end a boss or projection 36 is provided on each side of the body, and is curved out to form a channel or seat 37. Just above the rear edge of the boss and seat is a cam portion and holding lug, indicated at 38. This assists in introducing the transverse wires or rods into the seat 37 therefor, and serves to retain them against any tendency to displacement from the seat incident to tension on the reinforcing elements. A portion of one of the longitudinal reinforcing wires or bars is shown at 40 (Fig. 3), and a broken portion of one of the transverse wires or bars is indicated at 41.

It will have been noted that in the case of either contraction or expansion of the adjacent concrete sections, the units of the improved joint construction as described, will be telescoped by the movement of the pavement sections in either

direction. It will further have appeared that the load on one slab or section in the region of one of the joint structures, will be transmitted to the adjacent slab or section in such manner that the adjacent ends of the slabs will not be permitted to rise, either above the other. The improved joint will further prevent any relatively transverse movement of adjacent concrete sections, due to the preferred close slip fit between the two units of the pair of each assembly. It is observed that the tendency to shear is minimized by reason of the substantial resistance to such stresses afforded by the relatively large diameter of the dowel pin portion 29 and the rugged construction of the barrel body providing the socket for the reception of the dowel, in the companion unit.

A distinct advantage is noted in usage of the joint assembly of the present invention, due to the definite structural tie-in of the joint-forming elements with the reinforcing bars of the slab or section. It will be understood that, in most cases, the longitudinal reinforcing bars, being those extending in a direction parallel to the joint-forming units such as 10 and 11, are in cross-piled relation to other bars arranged transversely thereto. Due to the fact of the structural union between the longitudinal bars and the units of the joint in the channels 21, it will appear that, in effect, the joint-forming units result in a series of continuing structural metallic connections from each slab to the adjacent one, while still making the necessary provision for expansion and contraction movement between the adjacent sections. When a wheel load or the like is imposed on the slab in the region of the joint, this load is transmitted in part through the concrete per se, and in substantial part through the transverse and longitudinal reinforcing bars, thence directly to the joining units, thus resulting in a distinct dissipation of compressive and shearing stresses. Otherwise stated, the arrangement results in a division of the unit loading or pressures on any one of the expansion joint assemblies, since all thereof, by virtue of their structural union with or bond to the reinforcing bar system, definitely coact in sustaining the load and preventing breakage and shearing effects on the concrete or metal joint structures.

The two-part dowel-joint or anchoring assemblies heretofore shown and described, thus serve the dual purpose of tying together adjacent, separately poured slabs of the concrete, and of anchoring the reinforcing rods or other metal elements such as are used in road construction, besides affording full facility for free expansion and contraction of the adjacent slabs. This latter action is facilitated by initially lubricating the dowel projection 29 and the inner surface of recess 30 in the companion unit.

It will have appeared that the structure heretofore described serves fully to attain each of the several objectives heretofore expressly stated, as well as those implied from the more detailed description. Although the invention has been disclosed by making explicit reference to a single preferred embodiment of the invention, many changes may be made in the parts as well as in their combinations and arrangements without departing from the full intended scope of the invention as defined by the claims hereunto appended.

I claim as my invention:

1. A dowel joint and rod supporting assembly for use in and between adjacent sections of con-

crete pavement or the like, the assembly including a pair of interfitting, companion units, each including an elongate body, a supporting leg near one end of the body, means for connecting the opposite end of the body to the companion unit, said means comprising a dowel on one of the units and a dowel sleeve on the other unit to receive the dowel, and each body formed to provide a trough extension constituting a supporting and retaining seat for a concrete reinforcing rod, the trough extension being of a trend longitudinally of the unit and assembly.

2. A pavement dowel joint and bar supporting assembly including a pair of companion units, adapted to be embedded in the end zones of adjacent slabs of concrete or the like, each unit comprising an elongate, trough-like body for the reception of an end of a concrete reinforcing bar extending longitudinally of the unit and assembly, the body being further formed to provide a recessed seat of a trend transverse of the body and assembly, a dowel and a dowel sleeve adapted to interfit and formed respectively on the adjacent ends of the companion units, and a supporting leg carried by the end portion of each unit remote from the companion unit.

3. A dowel joint and bar support for use in joining adjacent sections of concrete pavement or the like, the joint assembly including a pair of interengaging companion units each including an elongate body, an annular flange projecting from the joint end of the body, and adapted to coast with the corresponding flange of the companion unit as an abutment, a supporting leg near the opposite end of the body, a dowel formed on one unit, and a dowel-receiving sleeve formed on the companion unit, the dowel and sleeve coacting for connecting the flange end of one body to that of the companion unit in interfitting relation thereto, and each body being formed to provide an elongate trough-like recess therein overlying the supporting leg, and constituting a retaining seat for an end of a concrete reinforcing bar, the retaining seat being of substantial length, and of a trend along the axis of the body and joint assembly.

4. An assembly of paired interfitting companion units constituting a dowel-type expansion joint and end support for adjacent reinforcing bars, for use in and between adjacent sections of concrete pavement, each unit of the assembly including an elongate body, a supporting leg near one end of the body, the body being formed to provide an elongate trough as a longitudinal, rearward extension of the body, the trough constituting a supporting and retaining seat for an end of a concrete reinforcing bar, each unit including an annular enlargement

near the end adjacent the companion unit and cooperating therewith to form an abutment, one of said units being provided with an integrally formed projecting dowel, and the other unit provided with a pocket in its joining end, adapted for the slidable reception of said dowel.

5. In an assembly of the type and for the purpose described, a pair of body elements, one of which is formed to provide an integral dowel member, and the other element a socket coacting with the dowel member to form a slip joint for expansion purposes between adjacent slabs of pavement or the like, each of said body elements being elongate in form and of substantially U-shape transverse section over a substantial portion of its length endwise beyond the joint-forming portions, whereby to provide an elongate, longitudinal trough for receiving the end of a concrete reinforcing bar, said trough having its sides notched at one end to provide a transverse bar receiving and positioning seat.

6. A dowel joint and rod supporting assembly for use in and between adjacent sections of concrete pavement or the like, the assembly including a pair of interfitting, companion units, one including an integral dowel and the other formed to provide a dowel socket, each unit including an elongate body, a supporting leg near the end of the body remote from its doweled end and each body being formed to provide an extension just beyond its doweled end, the extension shaped to provide an open-top channel which is of a trend transverse of the unit, and constituting a supporting and retaining seat for a concrete reinforcing rod.

7. In a device of the class described, a pair of coacting elongate, aligned units, one thereof formed with an axial extension providing a dowel pin and the other formed to provide a socket at one of its ends for receiving the pin, the pin and socket constituting an interfitting connection between the units, each unit being extended longitudinally of its end remote from its connecting elements, for supporting a reinforcing rod in a concrete slab, each unit including therefor in its last mentioned extension, an open-top channeled seat portion for receiving and positioning the rod, each unit further including a supporting leg below said channeled seat portion, each leg being constructed of formed strip metal, the seat and remainder of each unit being formed of cast metal, and each channeled rod-seating portion being formed to provide a projection on its under surface, deformed into permanent holding engagement with the strip metal leg.

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