May 16, 1939. B. C. WILCOX 2,158,953

LOAD TRANSFERRING AND ALIGNING DEVICE

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Fig. 1

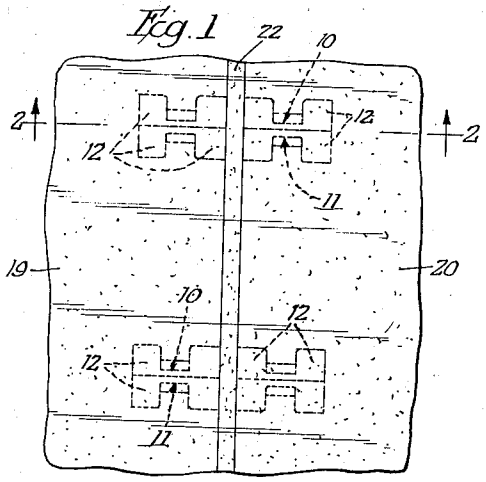


Fig. 3

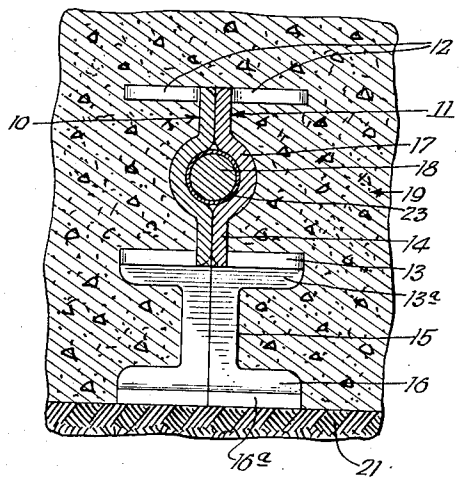


Fig. 2

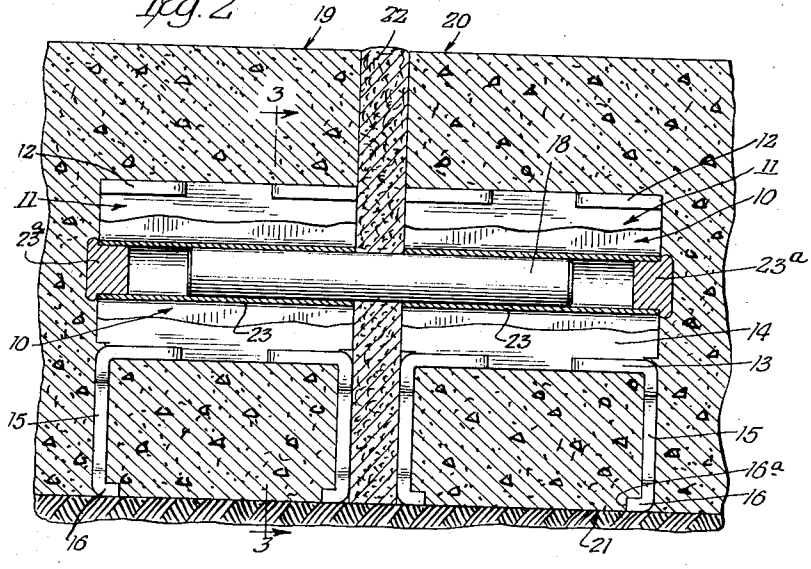
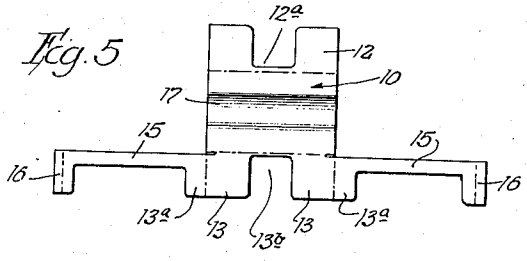


Fig. 5



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Fig. 4

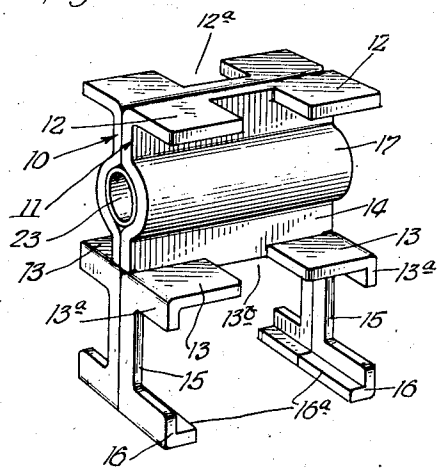


Fig. 8

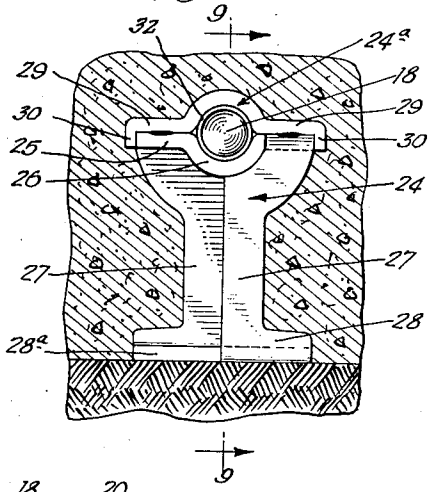


Fig. 9

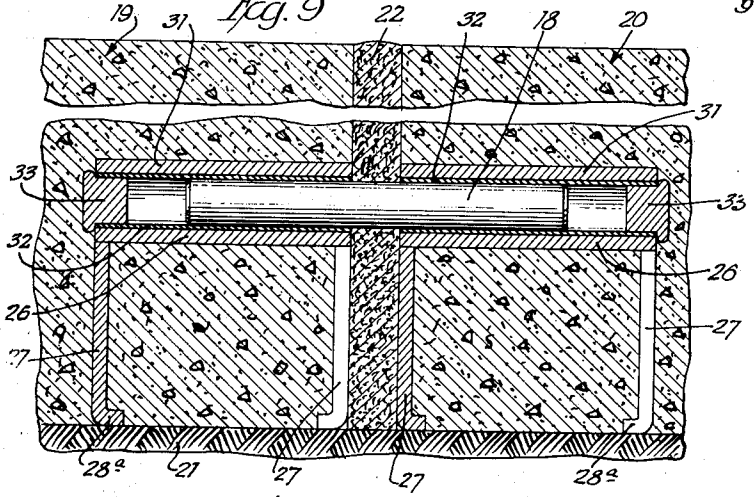


Fig. 6

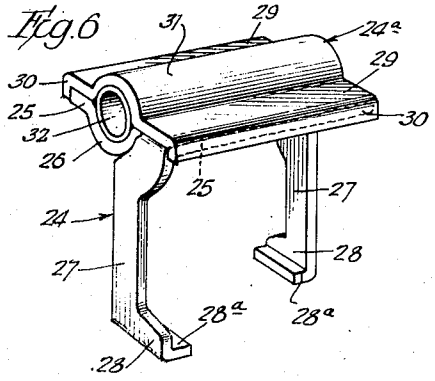
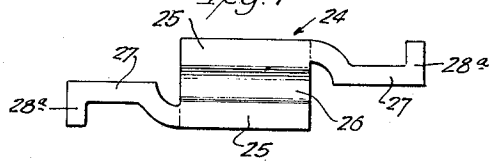


Fig. 7



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Patented May 16, 1939 2,158,953

UNITED STATES PATENT OFFICE

2,158,953

LOAD TRANSFERRING AND ALIGNING DEVICE

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Application November 26, 1937, Serial No. 176,447

8 Claims. (Cl. 94—18)

This invention relates to improvements in load transferring and aligning devices for use in contiguous ends of concrete pavement slabs or sections.

In concrete highway construction it is common practice to build pavements in slabs or sections separated by a joint or space to permit expansion of the slabs, the space usually being filled with mastic composition, generally asphaltic in character, to exclude water from the joint. Due possibly to several causes, the adjacent ends of the slabs frequently do not remain in their original relative horizontal alignment, with the result that an elevated edge or end of a slab is subjected to excessive impacts by passenger vehicles, heavy trucks and busses, which in time fracture the slab and thereby admit water which may wash away the subjacent support of the pavement, or freeze and thereby hasten the disintegration of the pavement, necessitating costly repairs or creating hazards to motorists. Heavy vehicles passing along a highway may cause a slight subsidence of the slabs as they are subjected to the imposed loads whereby the forward edges of adjacent slabs, being relatively slightly elevated, receive impacts which frequently are of sufficient severity to crack the concrete. For the purpose of retaining the adjacent ends of successive slabs of a pavement in horizontal alignment, load transferring and aligning devices have been employed. These devices usually comprise rods or dowels (either circular or rectangular in cross-section) which are placed in the pavement during laying thereof and span the joints between the slabs, which rods in some instances have their ends disposed in cast iron supporting members embedded in the concrete which hold the rods in position during the placing of the concrete and distribute vertical thrusts from the rods to the concrete. Such cast iron members, which permit slippage of the rods relatively to the concrete during expansion and contraction of the pavement, frequently fracture under the vertically imposed loads and stresses to which they are subjected and thereafter improperly support the rods or dowels against leverage or prying action imposed by forces tending to disrupt the concrete above the rods and supporting members. Since such supporting members are embedded in the concrete generally about midway between the upper and lower surfaces, upward thrusts applied to the same from an adjacent pavement section are distributed largely to the portion of the concrete above the supporting member and not to the lower portion of the pavement.

It is an object of the present invention to provide load transferring and supporting members which are not only of economical construction, but which, being formed of ductile or non-brittle material, are not likely to fracture in use, and which, due to their construction, provide adequate bearings for the rods or dowels and act both as compression and tension members for distributing vertical thrusts from the rods to the base of the concrete in resisting vertical disalignment of the pavement slabs with reference to adjacent slabs as the same are successively subjected to imposed loads or stresses.

Another object of the invention is to provide a fabricated device of the character mentioned comprising complementary parts which may be formed, if desired, in a punch press, and which will resist flexing and breakage under the stresses imposed thereon.

Other objects of the invention relate to various features of construction and arrangement of parts, which will be apparent from a consideration of the following specification and accompanying drawings wherein:

Fig. 1 is a broken top plan view of adjacent sections or slabs of a pavement showing the present improvements in position therein;

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

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a perspective view of a device embodying the present improvements comprising two complementary sections formed of sheet metal;

Fig. 5 is a plan view of a blank of which one of the said sections is formed;

Fig. 6 is a perspective view of a modified form of a supporting and aligning device, also formed of sheet metal;

Fig. 7 is a plan view of a blank out of which the lower portion of the device is formed;

Fig. 8 is a sectional view illustrating one of the devices embedded in concrete and taken on a plane coincident with a joint between adjacent slabs;

Fig. 9 is a sectional view taken on line 9—9 of Fig. 8.

The supporting and aligning device illustrated in Figs. 1 to 4 of the drawings comprises two identical sections indicated generally by the numerals 10 and 11, each of which sections may be formed of sheet metal from blanks illustrated in Fig. 5. As shown in the drawings, each of the

devices comprises a horizontal upper flange 12 and a lower horizontal flange 13, integral with an intermediate generally vertical web or flange 14. From the flange 13 extend legs 15 which terminate in laterally directed bases or feet 16. The flanges 13 in the form of the invention disclosed are provided with vertical flanges 13a for stiffening the structure while the bases or feet 16 are provided with horizontal extensions or flanges 16a which likewise stiffen the same and provide adequate area for supporting the devices during the pouring of the concrete. The vertical webs 11 are formed with semi-cylindrical portions 17, which portions, when two of the said sections have been assembled, form a cylindrical recess or bearing for an end of a rod or dowel which extends transversely of the joint between two adjacent pavement slabs.

As will be seen, the top flanges 12 and the lower flanges 13, in conjunction with the vertical webs 14, provide in effect and I-beam structure adapted to be supported a proper distance above the sub-base of the pavement by the legs 15 and the feet 16. The sections 10 and 11 are joined together by any approved means, such as by spot-welding, for example. For supporting a dowel or rod 18 which extends between two spaced slabs 19 and 20 of a concrete pavement, two of the supporting members of the type shown in Fig. 4 are employed, one being embedded in each slab. As shown in Fig. 2, for example, the devices rest upon the sub-base 21 of the pavement and are positioned one on each side of the space provided between said slabs for accommodating expansion thereof, which space usually is filled with a mastic composition, as indicated at 22, for excluding water from the joint. The dowels or rods 18 extend into the cylindrical bearing chambers provided in each of said supporting members. Since, in forming the sections 10 and 11 of sheet metal, it is not feasible to so shape the semi-cylindrical recess as to form a perfectly fitting cylindrical recess for the rods 18, sleeves 23 are provided which are of a diameter to provide a close fit with said rods. The sleeves, as will be seen, exclude the entrance of liquid concrete or grout from the dowels during the pouring and the setting of the concrete, the rear ends of the sleeves being closed preferably by plugs 23a, as shown in Fig. 2. This arrangement leaves the interior of the sleeves free of concrete whereby, during expansion and contraction of the pavement sections, the sleeves may move longitudinally of the rods.

As stated, the legs 15 space the I-beam-like section of the device at the proper height above the sub-base 21 so that as the concrete is poured it can flow or be tamped or worked closely around the rod-supporting members at each side of the pavement joint. If desired, the flanges 12 and 13 may be provided with slots 12a and 13b, respectively, to permit the fluid concrete to flow into intimate contact with all portions of the flanges to thereby preclude the formation of voids or cells in the concrete.

It will be understood that several supporting and aligning devices are used in each pavement joint, as indicated in Fig. 1, it being general practice to position them 12 to 15 inches apart transversely of the road bed, depending on traffic conditions.

It will be seen that as a vehicle passes along a highway from one section or slab of concrete to another, it will tend to depress the slabs successively and if one slab is movable vertically relative to the other, the forward edge of the latter may receive an impact from the vehicle which will soon chip and break the concrete. As shown in Fig. 2, a load imposed upon slab 19 adjacent the joint 22 will be in part transferred to the slab 22 due to the connection provided by the series of supporting devices referred to. The devices therefore tend to hold the upper surfaces of contiguous slabs in horizontal alignment and thus avoid the imposition of destructive impacts at the edges of the slabs as vehicles pass thereover. It will also be seen that should water find its way through a joint and wash away some of the sub-base material so as to remove partially the subjacent support for the pavement, the embedded devices will retain the slabs in alignment. Upward thrust or stresses exerted on one slab adjacent the joint due to freezing of water therebeneath, or from other causes, will in part be transferred to the adjacent slab by the aligning devices and thus tend to hold the slabs in horizontal alignment at the joints to avoid imposition of destructive impacts.

When a heavy vehicle passes from one slab to another in succession, as from slab 19 to slab 20 of Fig. 1, the weight thereof tends to depress the former below the level of the latter. This tendency is resisted by the aligning members. The downward thrust of a load is transmitted through the rods or dowels 18. This transmitted force from one pavement section to another, or from one aligning device to another of the pairs by means of the rods 18, results in a leverage or prying action upon the aligning members, tending to break them loose from the concrete. This result is not infrequent where the aligning devices are merely embedded within the pavement between the upper and lower surfaces thereof. With the present construction the legs act as tension members as well as compression members and distribute the disruptive stresses throughout the thickness of the pavement. For example, as a wheel of a vehicle reaches the edge of section 19, shown in Fig. 2, moving to the right, there is a tendency to depress that section, with the result that the rod 18 tends to swing at its right end in a counter-clockwise direction, thus exerting an upward thrust at the right-hand end of the aligning member carried by the slab 20, the fulcrum of this movement being at the forward end of the said aligning member. The leg most remote from the joint is thus subjected to tension, but due to the fact that the foot or flange 16a thereof is disposed beneath the bottom of the slab, the imposed stresses are distributed throughout the entire thickness of the pavement and not merely to the portion thereof above the dowels. Concurrently, the other leg of the device acts as a compression member in supporting the lower edge of the pavement against fracture while the edges of the aligning member in slab 19 similarly assist in reinforcing the concrete and distributing the applied forces.

Regardless of the directions of stresses imposed by the rods in transferring the loads or stresses, the aligning devices, due to their flange construction, are adequately supported in the concrete to resist displacement and breakage of the surrounding concrete. The material, being of non-brittle metal, adequately resists forces of compression of tension without breakage and thus retains the adjacent ends of the pavement sections in properly aligned position. The I-beam formation of the device is particularly effective in resisting deflection from vertical

forces exerted on the pavement, whether they be downwardly from imposed loads, or upwardly due to freezing of water beneath the road bed.

The form of the invention shown in Figs. 6 to 9, inclusive, is also constructed of sheet metal and comprises a lower section indicated generally by the numeral **24** formed from a blank shown in Fig. 7 and an upper section **24***a*. The section **24** comprises a horizontal portion having lateral flanges **25** and an intermediate semi-cylindrical portion **26**. From one end of each flange **25** depends a leg **27** preferably terminating in a supporting base or foot **28** having a flange **28***a* at the bottom thereof, which feet and legs space the device a proper distance above the sub-base of the pavement during the laying of the concrete. Section **24***a* comprises lateral flanges **29** which at their outer edges are turned downwardly to form flanges **30** which are adapted to fit over the longitudinal edges of the flanges **25** as the sections are assembled. After assembly the sections are held in proper position by welding, riveting, or by any other approved means. The section **24***a* has also a semi-cylindrical intermediate portion **31** complementary to section **26** and forming therewith a cylindrical recess for the reception of the end of a dowel or rod **18**, as in the above described modification of the invention. Preferably within the recess is located a sleeve **32** which closely fits the rod or dowel to prevent entrance of grout during the pouring of the concrete, the ends of the passage remote from the joint being closed by suitable plugs **33**. The form of the invention shown in Figs. 6 to 9 resists disintegration of the slabs by virtue of the stiffening effect provided by the flanges **25**, **29**, and **30**, which thus distribute the forces over greater areas of the concrete. The members **28** also provide not only means for spacing the devices properly during the laying of the concrete, but provide anchorage members which resist displacement whether the imposed stresses exerted thereon be compressive or tensile forces, and distribute imposed forces from the rods and aligning members to the lower surface of the concrete.

While I have shown and described certain embodiments of my invention for the purpose of illustration, I do not wish to be restricted specifically thereto as it will be apparent that various changes may be made therein without departing from the spirit of the invention.

I claim:

1. In a load transfer device, a pair of complementary members secured together and providing therebetween and intermediate the longitudinal edges of said members a recess for receiving and enclosing an end of a dowel, and legs at each end of said pair for initially supporting said members in a position between the upper and lower surfaces of a concrete slab during the pouring thereof and thereafter constituting means for distributing vertical thrusts from said members to areas of the slab beneath said members.

2. In a load transfer device, a pair of sheet metal members secured together and providing therebetween a recess for receiving an end of a dowel, said members having laterally directed stiffening and thrust distributing flanges, and legs for initially supporting said members in a position between the upper and lower surfaces of a concrete slab during the pouring thereof and constituting tension means for distributing vertical thrusts from said members to areas of the slab beneath said members.

3. In a load transfer device, a pair of sheet metal members secured together and providing therebetween a recess for an end of a dowel, said members having longitudinally directed flanges for stiffening the same against flexure from forces exerted vertically thereon by said dowel and for distributing said forces to areas of concrete laterally of said dowel, and legs for initially supporting said members in position for embedment within a concrete slab between the upper and lower surfaces thereof and constituting means for distributing to areas of the concrete beneath said members thrusts exerted on said members by said dowel.

4. A device of the class described comprising a pair of complementary members secured together and providing a recess for slidably receiving an end of a dowel, said members having laterally directed stiffening and load distributing flanges, legs for supporting said members for embedment within a concrete slab during the pouring thereof and constituting compression and tension means for distributing forces applied to said members by said dowel to portions of the concrete beneath said members.

5. A device for supporting an end of an aligning dowel comprising a pair of stamped members of complementary formation providing a dowel receiving recess, integral vertically arranged flanges for stiffening said members against flexure under stresses imposed by said dowel, and legs for supporting said members in position for embedment in a concrete slab intermediate the upper and lower surfaces thereof during the laying of the same and constituting means for distributing thrusts imposed on said members to portions of the slab therebeneath.

6. A device for supporting an end of an aligning dowel comprising a pair of flanged members secured together and providing an I-beam-like structure having the web thereof disposed in a vertical plane and having a longitudinal dowel receiving recess in said web, and legs at each end of said pair of members for supporting said structure for embedment in a concrete slab and constituting means for distributing to portions of the slab beneath said members vertical thrusts exerted on said members by said dowel.

7. A device for supporting an end of an aligning dowel comprising a pair of channel members secured together back-to-back and forming an I-beam-like structure the web of which is disposed in a vertical plane for resisting flexing of the structure and is provided with a longitudinal dowel receiving recess intermediate the upper and lower longitudinal edges thereof.

8. A device for supporting an end of an aligning dowel comprising a pair of stamped sheet metal members, one of said members being provided with a channel in the upper end thereof, and comprising a pair of integral supporting legs, said other member being formed to fit over said upper end of said first member and to be secured thereto and provided with a channel complementary to said first channel for forming a longitudinal dowel receiving recess.

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