Oct. 5, 1937. E. H. GEYER 2,095,061

JOINT FOR CONCRETE SLABS

Filed March 16, 1936

Fig. 1

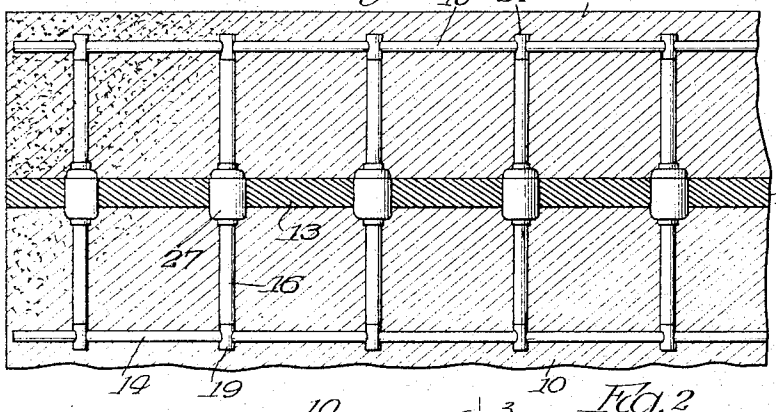


Fig. 3

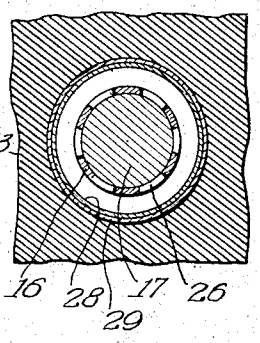


Fig. 2

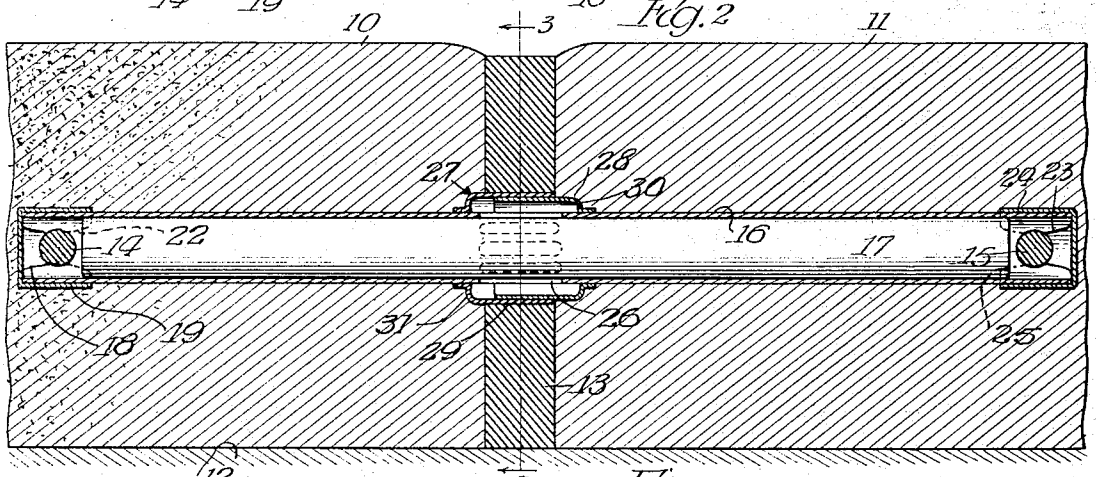


Fig. 6

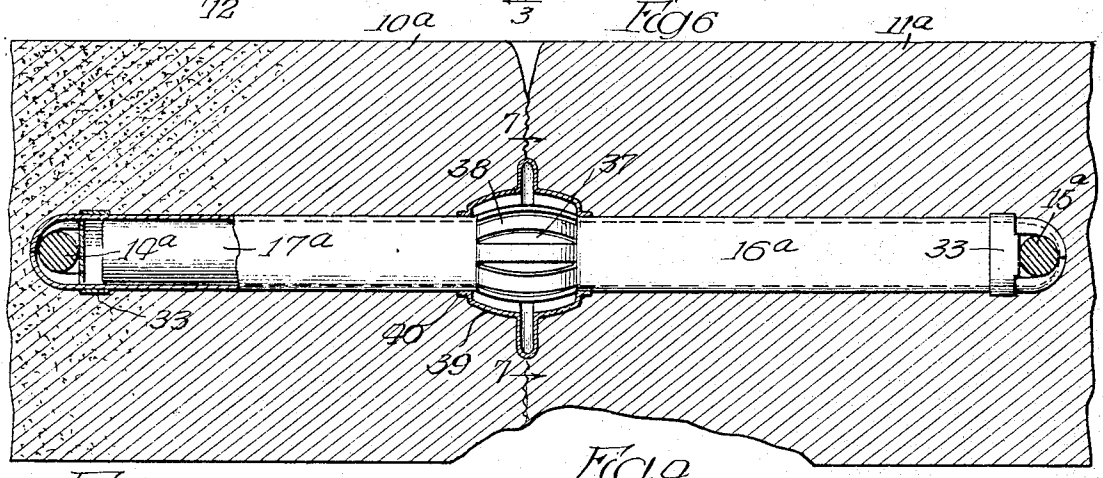


Fig. 7

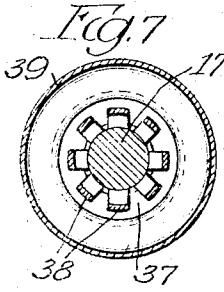


Fig. 8

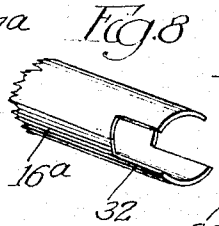


Fig. 4

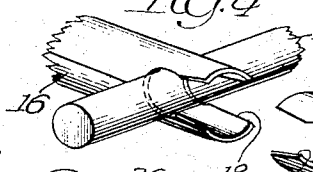
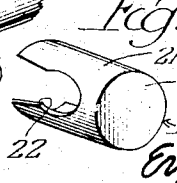


Fig. 5



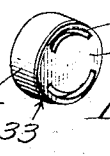


Fig. 9

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JOINT FOR CONCRETE SLABS

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Application March 16, 1936, Serial No. 69,026

11 Claims. (Cl. 94—18)

The present invention relates generally to joints for concrete. More particularly the invention relates to that type of joint which is adapted for use between a pair of adjoining or contiguous slabs in a roadway or like concrete construction, operates as a load-transfer unit and at the same time permits of expansion and contraction of the slabs and comprises (1) a pair of laterally spaced load distributing bars which are adapted for association respectively with the adjoining portions of the slabs and to extend transversely through the slabs; (2) a plurality of dowel rods which extend between and at right angles to the load distributing bars and extend through the meeting faces of the slabs; and (3) a set of sleeves which encase and are slidable relatively to the rods and are adapted to become bonded to the concrete.

One object of the invention is to provide a joint of this type which is an improvement upon and certain advantages over that which is illustrated in and forms the subject matter of my copending application for United States Letters Patent, filed November 1, 1935, Serial No. 47,734.

Another object of the invention is to provide a joint of the type under consideration in which the ends of the sleeves have notches for retaining the load distributing bars and also have caps which serve as closures for preventing the inflow of concrete during pouring of the slabs.

A further object of the invention is to provide a concrete joint of the aforementioned type and character which embodies simple and improved means for excluding concrete or filler from the slots which serve to weaken the central portions of the sleeves in order that the end portions are readily movable to and from one another in response to expansion and contraction of the slabs.

A still further object of the invention is to provide a concrete joint which is generally of new and improved construction, may be manufactured at a low and reasonable cost, and is so designed and constructed that it may be assembled quickly and readily and will not crack or break the concrete slabs with which it is used.

Other objects of the invention and the various advantages and characteristics of the present joint will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawing which accompanies and forms a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a horizontal sectional view of two adjoining slabs of concrete having therebetween a joint embodying the invention;

Figure 2 is an enlarged vertical longitudinal section through one of the sleeves of the joint;

Figure 3 is a vertical transverse section taken on the line 3—3 of Figure 2 and showing in detail the slot arrangement whereby the central portions of the sleeves are weakened so that the end parts of the sleeves are movable to and from one another and slidable with respect to the dowel rods in response to expansion or contraction of the slabs;

Figure 4 is a detail perspective view showing the manner in which the ends of the sleeves are notched in order to receive and retain the load distributing bars;

Figure 5 is a perspective of one of the caps which fit over the notched ends of the sleeves and form closures for preventing the inflow of concrete during pouring of the slabs;

Figure 6 is a vertical section of a joint embodying a modified form of the invention;

Figure 7 is a vertical transverse section on the line 7—7 of Figure 6;

Figure 8 is a detail perspective view showing the bar receiving notch formation at the ends of the sleeves of the joint of Figure 6; and

Figure 9 is a perspective of one of the caps which is used as an end closure for the sleeves of the Figure 6 joint.

The joint which is shown in Figures 1, 2, 3, 4 and 5 of the drawing constitutes the preferred embodiment of the invention and is shown in connection with a pair of adjoining roadway forming slabs 10 and 11. As shown in the drawing, the slabs 10 and 11 rest on a bed 12. They are spaced slightly apart and have a filler 13 therebetween. This filler is formed of any resilient material and extends from the bed 12 to the top portions of the slabs. The joint operates as a load transfer unit and at the same time permits the slabs 10 and 11 of the roadway to expand and contract as the result of changes in temperature or climatic conditions. It is of unitary design or construction and consists of a pair of laterally spaced, horizontally extending, load distributing bars 14 and 15, a set of sleeves 16 between the bars 14 and 15 and a plurality of dowel rods 17 in the sleeves. The load distributing bars 14 and 15 are associated respectively with the slabs 10 and 11 and extend transversely through the latter, as shown in Figures 1 and 2.

Preferably the distributing bars 14 and 15 are located midway between the top and bottom faces of the slabs and are positioned from the filler 13 a distance corresponding substantially to the thickness of the slabs.

The sleeves 16 extend between and at right angles to the load distributing bars 14 and 15 and project through the resilient filler 13. They are formed of any suitable type of metal and are of uniform diameter throughout. The outer faces of the sleeves are coated with zinc or any other material which when brought into contact with concrete bonds itself to the concrete as the result of the chemical action which takes place. Because of these coatings the end portions of the sleeves at one side of the filler 13 become bonded to the concrete of the slab 10 and the other end portions of the sleeves, that is the end portions at the other side of the filler 13 become bonded to the concrete of the slab 11. The load distributing bar 14 in the slab 10 fits within notches 18 in the contiguous end portions of the sleeves 16 and is held in place or connected relation with respect to the sleeves by means of caps 19. The notches 18 extend inwardly from the outer edges of the sleeve end portions that are in the slab 10 and have rounded inner ends which are shaped conformably and correspond in diameter to the bar 14. The outer ends of the notches are flared to permit of ready entry of the bar 14 and the central or intermediate portions of the notches are narrower than the flared outer ends and the rounded inner ends with the result that the bar 14 when in place in the inner ends of the notches is held in place. In connecting the bar 14 to the sleeve it is merely moved sidewise into the notches until it is snapped in place in the inner ends of the notches. The caps 19 serve as end closures for the sleeve end portions having the notches 18. They are in the form of metal stampings and embody circular end walls 20 and substantially cylindrical side walls 21. The side walls fit over the notched end portions of the sleeves, as shown in Figure 2, and have notches 22 for receiving the load distributing bar 14. The end walls 20 abut against the contiguous end edges of the sleeves and form closures whereby the inflow of concrete into the sleeves is prevented during pouring of the slab 10. The notches 22 correspond in shape to the notches 18 in the sleeves, as shown in Figure 5. The inner ends of the notches are shaped conformably and correspond in diameter to the bar 14 and form sockets in which the bar is disposed, (see Figure 2). The central portions of the notches 22 are narrower than the inner and outer ends with the result that entry of the bar into the notches is facilitated and the caps snap into position around the bar when they are driven or slid onto the contiguous end portions of the sleeves. The end portions of the sleeves in the slabs 11 have notches 23 for receiving the load distributing bar 15 and have caps 24 which serve as end closures and prevent the inflow of concrete during pouring of the slab 11. The notches 23 are similar in shape to the notches 18 and have rounded inner ends in which the load distributing bar 15 is disposed. The caps 24 are the same in design and construction as the caps 19 and have notches 25 in the side walls thereof through which the bar 15 extends. When the caps 19 and 24 are in place the ends of the sleeves are sealed and the load distributing bars 14 and 15 are secured fixedly in place. The load distributing bars and sleeves are preferably assembled at the place where the slabs 10 and 11 are formed. In assembling the joint the load distributing bar 14 is first snapped into the notches 18 and then the caps 19 are applied so as to hold the bar in place. Thereafter the bar 15 is snapped into the notches 23 and the caps 24 are applied. When the bars are in place the sleeves are held in parallel relation.

The dowel rods 17 fit snugly and slidably in the sleeves 16 and the ends thereof, as shown in Figure 2, terminate slightly inwards of the rod distributing bars 14 and 15. They constitute the load transfer members of the joint and are coated with graphite or any other suitable lubricant prior to insertion in the sleeves so that they are slidable relatively to the latter and thus permit the end portions of the sleeves to move to and from one another in response to contraction and expansion of the slabs 10 and 11. In order to permit the end portions of the sleeves at one side of the filler to move to and from the end portions of the sleeves at the other side of the filler the central portions of the sleeves are weakened by way of an annular series of longitudinally extending slots 26. By employing the slots the central portions of the sleeves are sufficiently weakened so that they either expand or buckle in response to movement of the end portions of the sleeves toward one another or rupture in the event that the end portions of the sleeves move away from one another as the result of marked contraction on the part of the slabs 10 and 11. By having the sleeves of one-piece design prior to installation, the dowel rods are all retained in parallel relation and as a result there is no misalignment which would tend to cause either the formation of funnel shaped sockets in the slabs or breakage of the concrete.

In order to exclude the filler 13 from entering the sleeves via the slots 26 and also to prevent concrete from entering the central portion of the sleeves during pouring of the slabs 10 and 11, shields 27 are provided. These shields are associated with the central portions of the sleeves 16 and each comprises a ring-shaped section 28 and a complemental ring-shaped section 29. The shield sections 27 are spaced from and extend around the slot weakened central portions of the sleeves 16, as shown in Figure 2, and have inturned end flanges 30 which surround and are welded or otherwise rigidly secured to the end portions of the sleeves which are disposed in and bonded to the slab 11. The complemental ring-shaped sections 29 surround and engage slidably the sections 28 and have inturned flanges 31 which are welded, soldered or otherwise fixedly secured to the end portions of the sleeves in the slab 10. By having the sections 28 and 29 of the shields connected respectively to the opposite end portions of the sleeves the shield sections move in telescopic relation in response to movement of the end portions of the sleeves to and from one another as a result of the expansion and contraction of the slabs. By reason of the telescopic fit between the sections of the shields the filler 13 is excluded from the slotted central portions of the sleeves and concrete cannot flow by way of the slots 26 into the interior of the sleeves during pouring of the slabs 10 and 11. The filler 13 may be of any suitable material such as poured or premoulded bitumen, cork or rubber which will permit of the desired expansion and contraction of the slabs. The shields 27 serve to exclude the filler in the event that it is poured between the slabs. It also excludes moisture and dirt from

the central portion of the sleeves after pouring of the filler. If a premoulded filler is used instead of a poured filler the sleeves with the shields thereon are inserted into the filler and supported thereby. Thereafter the load distributig bars 14 and 15 are inserted respectively into the notches 18 and 23 in the end portions of the sleeves and the caps 19 and 24 are applied. After connection of the load distributing bars to the sleeves, chairs, supports, brackets or like devices (not shown) are set under the sleeves or load distributing bars so as to hold them in place during pouring of the concrete in connection with the formation of the slabs 10 and 11. After the slabs have been poured the end portions of the sleeves in the slab 10 are free to move with the slab 10 and relatively to the end portions of the sleeves in the slab 11. During expansion and contraction of the slabs the shield sections 28 and 29 exclude moisture and dirt from inside of the sleeves and thus prevent the dowel rods from sticking to the sleeves. The joint of Figures 1 to 5 is in the nature of an expansion joint. When a preformed filler is used it is not essential to use the shields 27. The sleeves with or without the shields thereon are preferably fabricated at the factory and assembled with the load distributing bars 14 and 15 at the place of installation.

The joint which is shown in Figures 6, 7, 8 and 9 is a contraction joint and is shown in connection with a pair of roadway forming concrete slabs 10^a and 11^a. It consists of a pair of load distributing bars 14^a and 15^a, a plurality of sleeves 16^a, and a plurality of dowel rods 17^a, and it is similar to the joint of Figures 1 to 5 in that it serves as a load transfer unit. The bars 14^a and 15^a extend transversely through and are associated respectively with the slabs 10^a and 11^a and fit in notches 32 in the ends of the sleeves 16^a. The sleeve ends are closed against the inflow of concrete during pouring of the slabs 10^a and 11^a by means of caps 33. These caps are preferably in the form of metal stampings and comprise circular end walls 34 and annular or cylindrical skirts 35. The end walls 34 have diametrically opposite arcuate slots 36 through which extend the parts of the end portions of the sleeves on opposite sides of the notches 32. As shown in Figure 6 the end walls 34 of the caps are aligned with the inner ends of the notches 32 and the skirts 35 surround the adjacent parts of the sleeves. In assembling the joint the caps 33 are first mounted on the ends of the sleeves. Thereafter the load distributing parts 14^a and 15^a are inserted into the notches 32 and are secured fixedly in place against the end walls 34 or caps by deflecting or bending inwards by way of pliers or a hammer the outer extremities of the sleeves. When the caps 34 are in place the ends of the sleeves are effectively sealed. The dowel rods 17^a fit snugly in and are slidable lengthwise of the sleeves 16^a and are of such length that the ends thereof terminate slightly inwards of the end walls 34 of the caps 33. The central portions of the sleeves are slit longitudinally as at 37 to form strip-like connecting elements or bonds 38. These bonds are bulged outwardly, as shown in Figures 6 and 7, and permit the end portions of the sleeves to move to and from one another in response to expansion and contraction of the slabs. Sheet metal shields 39 surround the central portions of the sleeves. These shields have inwardly extending end flanges 40 which are welded or otherwise fixedly secured to the portions of the sleeves which are immediately adjacent to the bonds 38. The central portions of the shields are U-shaped in cross-section so as to permit the end parts to flex or move to and from one another. The U-shaped central portions of the shields are aligned with the crack which forms the separation point between the slabs 10^a and 11^a. By having the U-shaped central portions of the sleeves so positioned the shields although rigid with the sleeves are movable with the end portions of the sleeves. The shields serve to exclude concrete from entering the sleeves via the slits 37 during pouring of the slabs. They also exclude dirt and moisture from the sleeves.

The herein described joints are extremely efficient as far as fulfilling their intended purpose is concerned. They may be easily assembled and by reason of the fact that they consist of but a small number of parts may be fabricated at a low and reasonable cost.

The invention is not to be understood as restricted to the details set forth since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. In a joint for contiguous concrete slabs, the combination of a pair of laterally spaced load distributing bars adapted for embedment in and to extend transversely through the slabs respectively, a plurality of metallic one-piece sleeves between the bars adapted to have the end portions thereof bonded respectively to the slabs and having their extreme outer ends connected to the bars and the central portions thereof weakened to such an extent that they will readily expand or distend or rupture and hence, permit said end portions to move to and from one another in response to expansion and contraction of the slabs, dowel rods mounted slidably in the sleeves and extending across the central portions thereof, and individual, expansible and contractible annular shields around the central weakened portions of the sleeves.

2. In a joint for contiguous concrete slabs, the combination of a pair of laterally spaced load distributing bars adapted for embedment in and to extend transversely through the slabs respectively, a plurality of metallic one-piece sleeves between the bars adapted to have the end portions thereof bonded respectively to the slabs and having notches in their outer extremities through which the bars extend and also having weakened formations in the central portions thereof whereby the latter will readily expand or distend or rupture and hence permit said end portions to move to and from one another in response to expansion and contraction of the slabs, separately formed caps mounted on and arranged to close the ends of the sleeves, and dowel rods mounted slidably in the sleeves and extending across the central portions thereof.

3. In a joint for contiguous concrete slabs, the combination of a pair of laterally spaced load distributing bars adapted for embedment in and to extend transversely through the slabs respectively, a plurality of metallic one-piece sleeves between the bars adapted to have the end portions thereof bonded respectively to the slabs and having notches in their outer extremities through which the bars extend and also having weakened formations in the central portions thereof whereby the latter are free to expand or distend or rupture and hence permit said end

portions to move to and from one another in response to expansion and contraction of the slabs, separately formed caps mounted on and serving to close the ends of the sleeves and having continuous side walls with bar receiving notches therein in registry with the notches in the outer extremities of the sleeves, and dowel rods mounted slidably in the sleeves and extending across the central portions thereof.

4. In a joint for contiguous concrete slabs, the combination of a pair of laterally spaced load distributing bars adapted for embedment in and to extend transversely through the slabs respectively, a plurality of one-piece sleeves between the bars adapted to have the end portions thereof bonded respectively to the slabs and having their extreme outer ends connected to the bars and the central portions thereof weakened to such an extent that they will readily expand or distend or rupture and hence permit said end portions to move to and from one another in response to expansion and contraction of the slabs, dowel rods mounted slidably in the sleeves and extending across the central portions thereof, and individual shields extending around the central weakened portions of the sleeves and each consisting of a pair of complemental telescoping and ring-shaped sections.

5. In combination, a pair of adjoining concrete slabs with a substantially solid filler of elastic material therebetween, a pair of laterally spaced load distributing bars embedded in and extending transversely through the adjoining slabs respectively, a plurality of metallic one-piece sleeves extending between the bars and through the slabs and the filler and having their extreme outer ends connected to the bars and the central portions thereof weakened to such an extent that they will readily expand or distend or rupture and hence permit said end portions to move to and from one another in response to expansion and contraction of the slabs, and dowel rods mounted slidably in the sleeves and extending across the central portions thereof.

6. In combination, a pair of adjoining concrete slabs with a resilient filler therebetween, a pair of laterally spaced load distributing bars embedded in and extending transversely through the adjoining slabs respectively, a plurality of metallic one piece sleeves extending between the bars and through the slabs and the filler and having their extreme outer ends connected to the bars and the central portions thereof weakened to such an extent that they will readily expand or distend or rupture and hence permit said end portions to move to and from one another in response to expansion and contraction of the slabs, dowel rods mounted slidably in the sleeves and extending centrally across the central portions thereof, and individual annular shields embedded in the filler and extending around the weakened central portions of the sleeves.

7. In a contraction joint for contiguous concrete slabs, the combination of a pair of laterally spaced load distributing bars adapted for embedment in and to extend transversely through the slabs respectively, a plurality of metallic one-piece sleeves between the bars adapted to have the end portions thereof bonded respectively to the slabs and having their extreme outer ends connected to the bars and the central portions thereof slitted and bulged outwards so as to permit the end portions to move away from one another in response to contraction of the slabs, and dowel rods mounted slidably in the sleeves and extending across the central portions thereof.

8. In combination, a pair of adjoining concrete slabs, a series of laterally spaced substantially parallel one piece metallic sleeves extending between and through the slabs and having the end portions thereof bonded to the slabs respectively and having the portions thereof between the slabs weakened to such an extent that they will readily expand or distend or rupture and hence permit said end portions to move to and from one another in response to expansion and contraction of the slabs, dowel rods mounted slidably in the sleeves and extending across the weakened portions thereof, and individual expansible and contractible annular shields around said weakened portions of the sleeves.

9. In a joint for contiguous concrete slabs, the combination of a pair of laterally spaced load distributing bars adapted for embedment in and to extend transversely through the slabs respectively, a series of laterally spaced substantially parallel dowel rods extending between the bars and adapted to cross the space between said slabs, sleeve members slidably mounted on the ends of the dowel rods and having notches in their outer extremities through which the bars extend, and separately formed caps mounted on and serving to close said outer extremities of the sleeve members and embodying substantially continuous side walls with bar receiving notches therein in registry with the notches in the sleeve members.

10. In a joint for contiguous concrete slabs, the combination of a pair of laterally spaced load distributing bars adapted for embedment in and to extend transversely through the slabs respectively, a series of substantially equidistantly spaced parallel dowel rods extending between the bars and adapted to cross the space between said slabs, sleeve members slidably mounted on the ends of the dowel rods and having pairs of opposed notches with flared entrances in their outer extremities, through which the bars extend and into which the bars are adapted to be inserted by lateral movement thereof in connection with assembly of the joint, and separately formed caps mounted on and serving to close said outer extremities of the sleeve members and embodying substantially continuous side walls with pairs of opposed notches therein disposed in registry with the notches in the sleeve members and having flared entrances for facilitating mounting into their operative position with respect to said sleeve members and bars.

11. In a contraction joint for contiguous concrete slabs, the combination of a pair of laterally spaced load distributing bars adapted for embedment in and to extend transversely through the slabs respectively, a plurality of metallic one-piece sleeves between the bars adapted to have the end portions thereof bonded respectively to the slabs and having their extreme outer ends connected to the bars and the central portions thereof slitted and bulged outwards so as to permit the end portions to move away from one another in response to contraction of the slabs, dowel rods mounted slidably in the sleeves and extending across the central portions thereof, and individual shields extending around the central portions of the sleeves and serving to prevent concrete from flowing into the sleeves via the slits during formation of the slabs.

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