

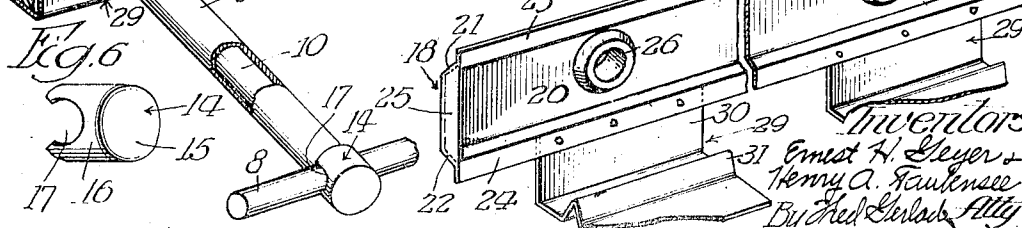
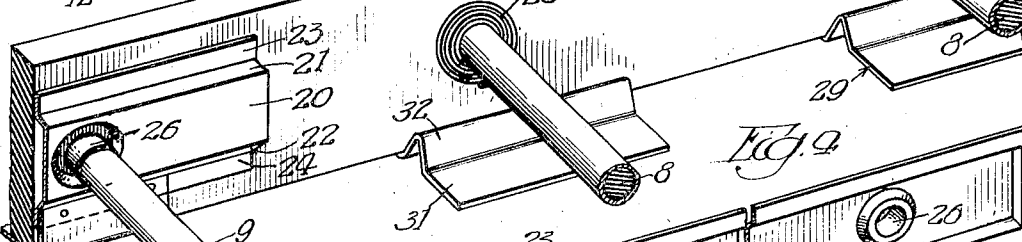
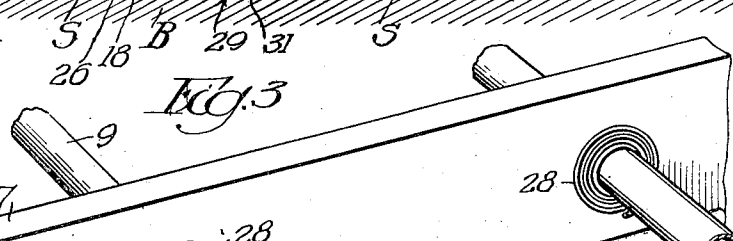
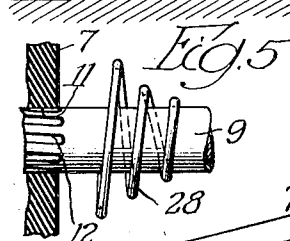
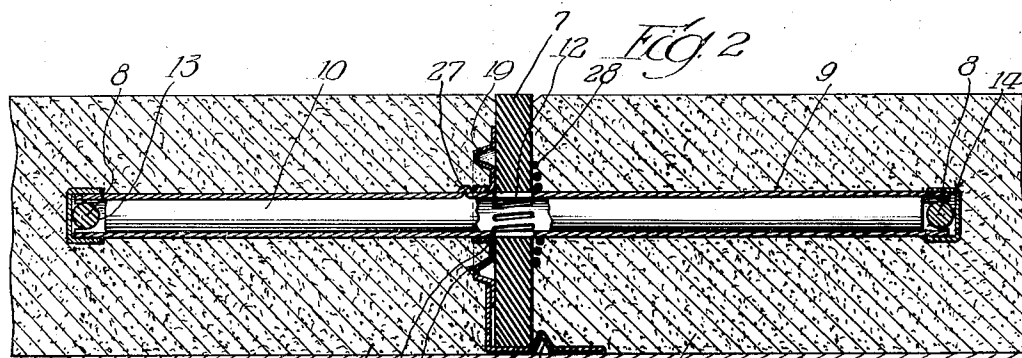
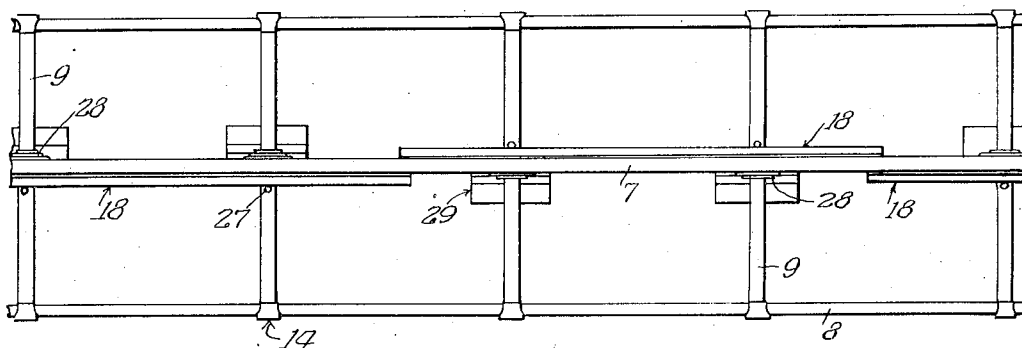
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JOINT FOR CONCRETE SLABS

2,186,104

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Fig. 1



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UNITED STATES PATENT OFFICE

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JOINT FOR CONCRETE SLABS

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10 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) an elastic filler strip which is adapted to fit between the slabs and serves to prevent dirt, water and like matter from passing between the slabs; (2) a plurality of one-piece cross-sleeves which extend between and at right angles to the load distributing bars and through the meeting faces of the slabs, are adapted to have the end portions thereof bonded respectively to the slabs, and have their extreme outer ends connected to the bars and the central portions thereof extending through holes in the elastic filler strip and also weakened so as to permit the end portions to move to and from one another in response to contraction and expansion of the slabs; and (3) dowel rods which are slidably mounted in the sleeves respectively and constitute the load transfer members of the joint.

One object of the invention is to provide a concrete joint of this type in which the cross-sleeves between the load distributing bars have on the central portions thereof volute elements of novel and improved design for stiffening and reinforcing the elastic filler strip against sagging or bending during pouring of the concrete in connection with the formation of the slabs.

Another object of the invention is to provide a concrete joint of the type and character under consideration in which the cross-sleeves have on the center portions thereof volute springs which are positioned in opposed relation with the stiffening elements and serve yieldingly to hold the filler strip in place against the elements.

A 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 an improvement upon previously designed joints of the same general character by reason of the fact that it is capable of being assembled at the place of installation with greater facility and in less time.

Other objects of the invention and the various advantages and characteristics of the present concrete 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 plan view of a joint embodying the invention;

Figure 2 is an enlarged transverse sectional view showing the joint in its operative position with respect to a pair of concrete slabs;

Figure 3 is a fragmentary perspective of the joint showing the manner in which the legs on the bottom or lower portions of the stiffening element for the filler strip operate in conjunction with the volute springs on the central portions of the cross-sleeve to hold the filler strip in place against and in firm engagement with the elements;

Figure 4 is a fragmentary perspective view of one of the elements for stiffening the elastic filler strip;

Figure 5 is a detail sectional view showing one of the volute springs before it is shifted or driven into its operative position wherein it serves to hold the adjacent portion of the elastic filler strip against the contiguous part of the opposite stiffening element; and

Figure 6 is a perspective of one of the caps for connecting the extremities of the cross-sleeves to the load distributing bars which are adapted to extend transversely through the slabs.

The joint which is shown in the drawing constitutes the preferred embodiment of the invention and is shown in connection with a pair of concrete roadway-forming slabs S. The latter, as shown in Figure 2, are spaced slightly apart and rest on a bed B. The joint operates as a load transfer unit and at the same time permits the slabs S of the roadway to expand or contract as the result of changes in temperature or climatic conditions. It is of unitary design or construction and comprises as the main or essential parts thereof a filler strip 7, a pair of laterally spaced horizontally extending load distributing bars 8, a plurality of cross-sleeves 9 between the two bars 8, and a set of dowel rods 10 in the sleeves.

The filler strip 7 is formed of felt, treated sponge rubber, or any other suitable elastic or compressible material. It is disposed in a vertical manner between the opposed faces of the concrete slabs S and serves to prevent dirt, water, and like matter from passing between the slabs. When the slabs expand as the result of an in-

crease in temperature, the filler strip 7 is compressed between the two slabs, and when the slabs contract as the result of a decrease or drop in temperature the strip, due to its elastic nature, expands and thus effectively fills at all times the gap, void, or space between the two slabs. The top and bottom surfaces of the filler strip are respectively substantially flush or coplanar with the top and bottom faces of the slabs.

The load distributing bars 8 are in the form of metallic rods and are associated with the slabs S respectively. They are disposed in parallel relation and extend transversely through the slabs, as shown in Figure 2. Preferably the bars are disposed midway between the bottom and top faces of the slabs and the ends of the bars terminate adjacent to the side faces of the slabs. The sleeves 9 extend between and at right angles to the load distributing bars 8 and project through holes 11 in the central portion of the elastic filler strip 7. They are disposed in a horizontal position and in parallel relation and are spaced laterally and equidistantly apart. Any suitable metallic tube stock is used to form the sleeves, and as shown in Figure 2 the sleeves are of uniform diameter throughout, that is, from end to end. The outer faces of the sleeves are coated with zinc or any other like 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 the coatings the end portions of the sleeves become bonded to the slabs. In order to permit the end portions of the sleeves at one side of the filler strip 7 to move to and from the end portions of the filler strip at the other side of the sleeve the central portions of the sleeves are weakened by way of annular series of slots 12. By employing these slots the sleeves are sufficiently weakened so that the central portions thereof either bend 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 S. The slots 12 are disposed midway between the ends of the cross-sleeves and are confined within the portions of the elastic filler strip which define the holes 11. The outer extremities of the cross-sleeves 9 have pairs of notches 13 therein. These notches are horizontally aligned and form seats for the load distributing bars 8. The inner ends of these notches are curved conformably to the bars and the outer portions of the notches are narrower than the bars so that the bars when snapped into, or driven into seated relation with, the notches are secured in connected relation with the sleeves. The outer ends of the sleeves are closed against the ingress of concrete during formation of the slabs S by means of caps 14. These caps are in the form of metal stampings and embody circular end walls 15 and cylindrical side walls 16. The side walls 16 fit over the notched ends of the cross-sleeves, as shown in Figures 2 and 3, and have horizontally aligned pairs of notches 17 which correspond in shape to the notches 13 in the end portions or extremities of the cross-sleeves and receive the load distributing bars 8. The notches 17 are so arranged that when the caps are in their operative position the end walls 15, as shown in Figure 2, substantially abut against the end edges of the cross-sleeves. In assembling the joint prior to pouring of the concrete in connection with the formation of the slabs S the cross-

sleeves 9 are first inserted through the holes 11 in the central portion of the elastic filler strip 7 and slid or adjusted relatively to the strip until the slots 12 are positioned within the holes 11. Thereafter the load distributing bars 8 are shifted laterally into seated relation with the notches 13 in the end portions of the cross-sleeves and the caps 15 are driven into place so as to secure the load distributing bars against lateral displacement with respect to the cross-sleeves and also to close the ends of the sleeves against the ingress of concrete. The dowel rods 10 fit snugly and slidably in the sleeves 9 and the ends thereof, as shown in Figure 2, terminate slightly inwards of the load distributing bars 8. 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 readily slidable relatively to the latter and thus permit the end portions of the sleeves to move to and from one another in response to expansion and contraction of the slabs.

In addition to the elastic filler strip 7, the load distributing bars 8, the cross-sleeves 9, and the dowel rods 10, the joint comprises a plurality of elements 18. These elements are in the form of plate metal stampings and serve, as hereinafter described, to stiffen or reinforce the elastic filler strip 7 so that the latter is held in an upstanding position and against collapse during pouring of the concrete in connection with the formation of the slabs S. Preferably there is one stiffening element 18 for two cross-sleeves and the elements, as shown in Figure 1, are arranged in alternate relation, that is, every other one adjacent to one side of the filler strip and the alternate elements adjacent to the other side of the strip. The central portions of the elements are deflected longitudinally so that the elements have longitudinal channels 19 and comprise side walls 20, inwardly extending top and bottom walls 21 and 22, and top and bottom flanges 23 and 24. The top and bottom walls serve to space the side walls from the flanges and together with said side walls define the channels 19. The flanges 23 and 24 are adapted to abut directly against the elastic filler strip 7 and operate to prevent transverse bending of the strip. The channels 19 are coextensive with the stiffening elements and are closed at the ends thereof by means of end walls 25. The latter are formed integrally with and extend inwardly from the end margins of the side walls 19 of the elements. The open sides of the channels 19 face the filler strip 7 with the result that portions of the filler strips are free to bulge or expand into the channels when the slabs S expand and place the strip under compression. The central portions of the side walls 19 of the stiffening elements are deflected inward and then outwardly to form collars 26 and annular depressions around the collars. The collars, as shown in Figure 3, fit around the central portions of the cross-sleeves 9 and serve to hold the stiffening elements against tilting relatively to the sleeves. There are two collars for each stiffening element inasmuch as there is one element for each pair of sleeves. The collars are the same in length as the channels 19 are in depth and their internal diameter is substantially the same as the external diameter of the cross-sleeves. The annular depressions around the collars permit concrete to flow around all portions of the sleeves with the exception of those parts or portions which are disposed within the filler

strip. The stiffening elements are of such length that when the cross-sleeves are spaced equidistantly apart, the ends of the elements lap one another (see Figure 1). Because of this lapping of the ends of the stiffening elements the elastic filler strip 7 is stiffened or reinforced throughout the entire length thereof. The reinforcing elements are preferably of such height that the top and bottom flanges 23 and 24 thereof fit respectively against the upper and lower portions of the filler strip and hence such portions are held against lateral sagging. The stiffening elements 18 are held against sliding movement away from the elastic filler strip 7 by means of protuberance-like stops 27. These stops are formed by striking or punching outwards the central portions of the cross-sleeves and are adapted to abut against the outer edges of the collars 26 of the stiffening elements. They are so spaced from the true centers or mid-parts of the cross-sleeves that the collars when in abutment therewith, as shown in Figure 2, serve centrally to position the filler strip on the sleeves.

In order yieldingly to hold the elastic filler strip 7 in abutting relation with the stiffening elements 18, volute springs 28 are provided. These springs are mounted on the central portions of the cross-sleeves 9 in spaced relation with the stiffening elements. The inner convolutions of the springs are slightly smaller in diameter than the cross-sleeves with the result that they grip the cross-sleeves frictionally. In assembling the joint, the sleeves with the stiffening elements 18 thereon are inserted through the holes 11 in the filler strip 7 and slid transversely of said strip until the latter is brought into abutting relation with the stiffening elements. Thereafter the volute springs 28 are mounted on the sleeves in opposed relation with the stiffening elements and by way of a hammer or any other suitable implement are driven toward the stiffening elements until the inner convolutions thereof substantially abut against the contiguous face portions of the filler strip 7. When the inner convolutions of the spring are so positioned the outer convolutions engage yieldingly the strip and serve to hold the strip in clamped relation with the stiffening elements. By reason of the fact that the inner convolutions of the springs are smaller in diameter than the cross-sleeves the springs remain in their driven position. The springs are of such outside diameter or size that a comparatively large part of the central portion of the filler strip is engaged by the springs and hence the strip is effectively held against the stiffening elements.

In order to support the aforementioned parts of the joint in their proper positions during pouring of the concrete in the formation of the slabs S the stiffening elements 18 are provided with legs 29. These legs are in the form of metal stampings and embody vertically extending parts 30 and horizontally extending parts 31. The vertically extending parts 30 are riveted or otherwise fixedly secured to the bottom flanges 24 of the stiffening elements and depend from such flanges, as shown in Figure 2. The horizontally extending parts 31 of the legs extend under the bottom edge or face of the elastic filler strip 7 and are designed to rest upon the bed B. They are substantially flat and are of such size that the legs form a firm support for the joint and prevent the latter from tilting during the concrete pouring operation. There are preferably two legs for each stiffening element. The central

portions of the horizontally extending parts 31 of the legs are deflected upwards to form inverted V-formations 32. These formations extend longitudinally of the filler strip 7. They are disposed beneath the volute springs 28 and coact with the latter to hold the strips 7 in clamped relation with the stiffening elements. By reason of the fact that the horizontally extending parts 31 of the legs on every other stiffening element extend in one direction and the horizontal parts of the legs on the alternate stiffening elements extend in the opposite direction the joint is efficiently and rigidly supported. The inverted V-formations 32 on the parts 31 of the legs are so spaced from the vertically extending parts of the legs that they hook around the lower portions of the filler strip 7 and hold such portion against lateral displacement with respect to said vertically extending parts of the legs.

It is contemplated that the joint be sent by the manufacturer to the place of installation in dismantled or knock-down form. In assembling the joint the stiffening elements 18 are positioned on the bed B so that they are positioned in substantial alignment and also in alternate relation, that is, one facing in one direction and the next facing in the opposite direction. Thereafter the elastic filler strip 7 is positioned so that the bottom edge thereof rests on the inner portions of the horizontally extending parts 31 of the legs 29 and the side faces thereof fit against the top and bottom flanges 23 and 24 of the stiffening elements. When the strip is so positioned the inverted V-formations 32 on the horizontally extending parts 31 of the legs are arranged in hooked relation with respect to the bottom portions of the strip 7 and hold such portions in clamped or fixed relation with the vertically extending parts 30 of the legs, as hereinbefore described. After positioning the filler strip in the aforementioned manner the cross-sleeves 9 are inserted through the collars 26 of the stiffening elements and the holes 11 in the filler strip and slid longitudinally so as to bring the slots 12 within the hole defining portions of the filler strip and the protuberance-like strips 27 into abutting relation with the outer edges of the collars 26 of the stiffening elements. After shifting the cross-sleeves in this manner the volute springs 28 are mounted on the sleeves 9 and driven inwardly until they are disposed in opposed relation with the stiffening elements and engage yieldingly the filler strip and hold the latter in clamped relation with said elements. As hereinbefore pointed out, the springs are preferably driven or slid on the sleeves until the inner convolutions thereof substantially abut against the filler strip in order to place the outer convolutions under spring pressure as far as the strip is concerned. After driving of the volute springs into place the load distributing bars 8 are connected to the end portions or extremities of the cross-sleeve by shifting them into seated relation with the notches 13 and then applying the caps 14 to the extremities of the sleeves. The joint, after assembly thereof, is properly positioned on the bed B and thereafter the concrete is poured on opposite sides thereof to form the slabs S. During pouring of the concrete the legs 29 hold the joint against tilting, as hereinbefore pointed out.

The herein described joint may be manufactured at a comparatively low cost because it consists of but a small number of parts. It may be assembled with facility and speed and is characterized by the fact that the elastic filler strip is

so stiffened or reinforced that it cannot sag or buckle during pouring of the concrete.

Whereas the joint has been described as comprising load distributing bars and also cross-sleeves with dowel rods therein, it is to be understood that the joint may be used without the load distributing bars and also that solid or one-piece cross-members may be substituted for the cross-sleeves and dowel rods. It is also to be understood that the invention is not to be 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 we claim as new and desire to secure by Letters Patent is:

1. A joint for contiguous concrete slabs, comprising in combination a compressible filler strip adapted to fit between the slabs and yield in response to expansion thereof, a plurality of laterally spaced cross-members adapted to have the end portions thereof embedded in the slabs respectively and having their central portions extending through holes in the strip, and strip engaging elements for stiffening the strip and holding it against lateral displacement during pouring of the concrete in connection with formation of the slabs, mounted and held on said central portions of the cross-members against movement away from the strip and arranged so that every other one engages one side face of the strip and the alternate ones engage the other side face of the strip and also so that the ends thereof are disposed in lapped relation.

2. A joint for contiguous concrete slabs, comprising in combination an elongated compressible filler strip adapted to fit between the slabs and to yield in response to expansion thereof, a plurality of laterally spaced cross-members adapted to have the end portions thereof embedded in the slabs respectively and having their central portions extending through the central portion of the strip, an elongated strip stiffening element fitting against one side of the strip and mounted on the central portions of certain of the cross-members against movement away from the strip, and a second elongated strip stiffening element mounted on the central portions of certain other cross-members so that it engages the other side face of the strip and is held against movement away from said strip, and arranged so that one end thereof is disposed in lapped relation with one end of the first mentioned stiffening element.

3. A joint for contiguous concrete slabs, comprising in combination a compressible filler strip adapted to fit between the slabs and yield in response to expansion thereof, a pair of laterally spaced cross-members adapted to have the end portions thereof embedded in the slabs respectively and having their central portions extending through the strip, an elongated stamped metal stiffening element for stiffening the strip and holding it in place during pouring of the concrete for the slabs and fitting against one of the side faces of the strip and having the central portion thereof deflected longitudinally from end to end to form a channel with an open inner side, for receiving and accommodating the contiguous portions of the strip when said strip is compressed as the result of slab expansion, and also having end parts for closing the ends of the channel and additional parts forming integral collars which are disposed within the channel and have annular outwardly opening grooves

therearound and forming bearings for the central portions of said cross-members.

4. A joint for contiguous concrete slabs, comprising in combination a compressible filler strip adapted to fit between the slabs and yield in response to expansion thereof, a plurality of laterally spaced cross-members adapted to have the end portions thereof embedded in the slabs respectively and having their central portions extending through holes in the strip, stiffening elements for the strip mounted on the central portions of the cross-members held against movement away from the strip, and resilient means mounted on said central portions of the cross-members in opposed relation with the elements for holding the strip in clamped relation with said elements.

5. A joint for contiguous concrete slabs, comprising in combination a compressible filler strip adapted to fit between the slabs and yield in response to expansion thereof, a plurality of laterally spaced cross-members adapted to have the end portions thereof embedded in the slabs respectively and having their central portions extending through holes in the strip, stiffening elements for the strip mounted on the central portions of the cross-members and held against movement away from the strip, and springs mounted on said central portions of the cross-members in opposed relation with the stiffening elements and arranged yieldingly to hold the strip in clamped relation with said elements.

6. A joint for contiguous concrete slabs, comprising in combination a compressible filler strip adapted to fit between the slabs and yield in response to expansion thereof, a plurality of laterally spaced cross-members adapted to have the end portions thereof embedded in the slabs respectively and having their central portions extending through holes in the strip, stiffening elements for the strip mounted on the central portions of the cross-members, and springs of the spiral variety extending around and frictionally gripping said central portions of the cross-members and arranged in opposed relation with the stiffening elements and so that they operate yieldingly to hold the strip in clamped relation with said elements.

7. A joint for contiguous concrete slabs, comprising in combination a filler strip adapted to fit between the slabs, a plurality of laterally spaced cross-members adapted to have the end portions thereof embedded in the slabs respectively and having their central portions extending through holes in the strip, elements on the central portions of the members for holding the filler strip against sidewise displacement in one direction relatively to the members, and springs mounted on said central portions of the members in opposed relation to said elements and serving yieldingly to opposed lateral displacement of the strip in the opposite direction.

8. A joint for contiguous concrete slabs, comprising in combination a filler strip adapted to fit between the slabs, a plurality of laterally spaced cross-members adapted to have the end portions thereof embedded in the slabs respectively and having their central portions extending through holes in the strip, elements on the central portions of the members for holding the filler strip against sidewise displacement in one direction relatively to the member, and volute springs mounted on said central portions of the members in opposed relation with the elements and arranged so that they engage the strip yieldingly and op-

pose lateral displacement in the opposite direction.

5 9. A joint for contiguous concrete slabs, comprising in combination a filler strip adapted to fit between the slabs, a plurality of laterally spaced cross-members adapted to have the end portions thereof embedded in the slabs respectively and having their central portions extending through holes in the strip, and means for stiffening the strip and holding it against lateral displacement with respect to said cross members including springs of the spiral variety mounted on said central portions of the members and engaging yieldingly said strip.

10. A joint for contiguous concrete slabs, comprising in combination a filler strip adapted to fit between the slabs, a plurality of laterally spaced cross-members adapted to have the end portions thereof embedded in the slabs respectively and having their central portions extending through holes in the strip, and means for stiffening the strip and holding it against lateral displacement with respect to said cross-members including volute springs mounted on and gripping frictionally said central portions of the members and arranged so that they engage yieldingly said strip.

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