Jan. 19, 1971 C. R. MAGADINI 3,555,753

CONCRETE SLAB JOINT CONSTRUCTION

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Fig. 1

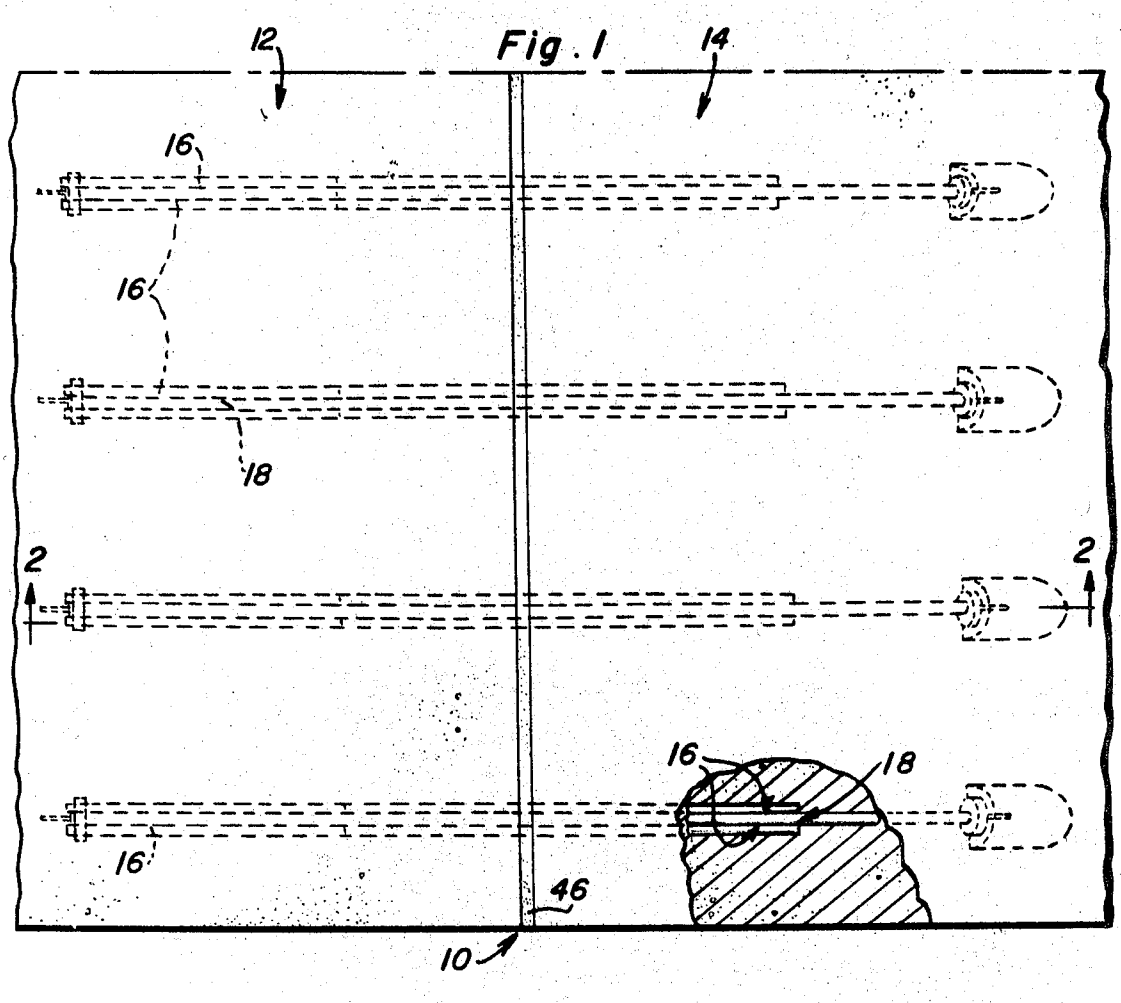


Fig. 2

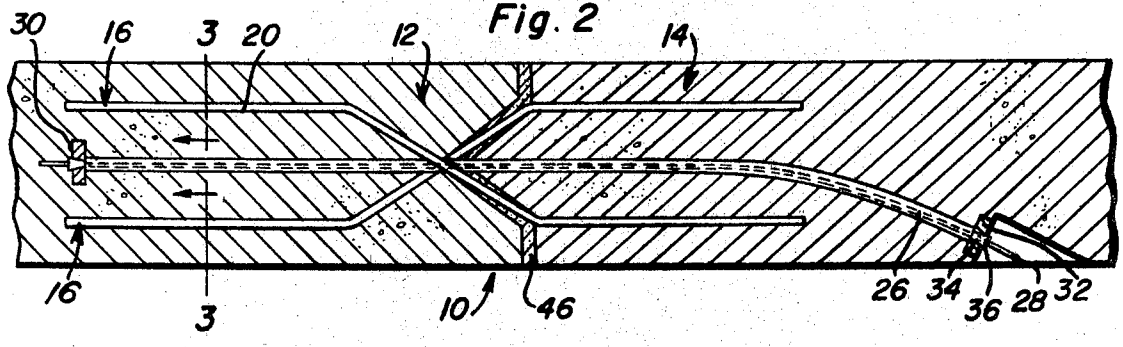
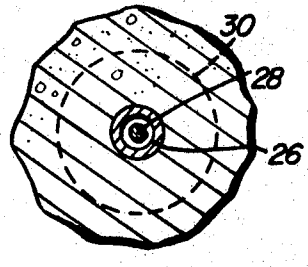


Fig. 3



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Fig. 4

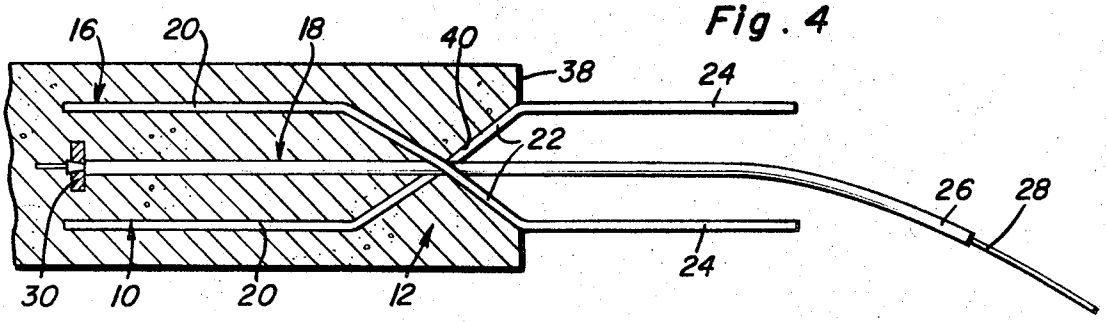


Fig. 5

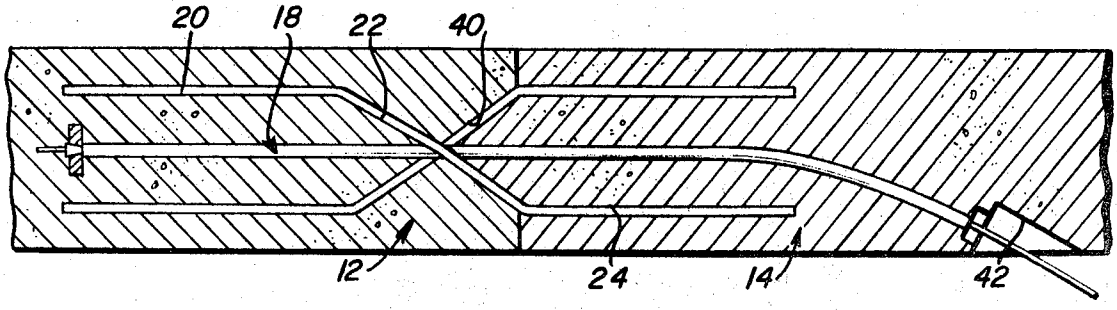


Fig. 6

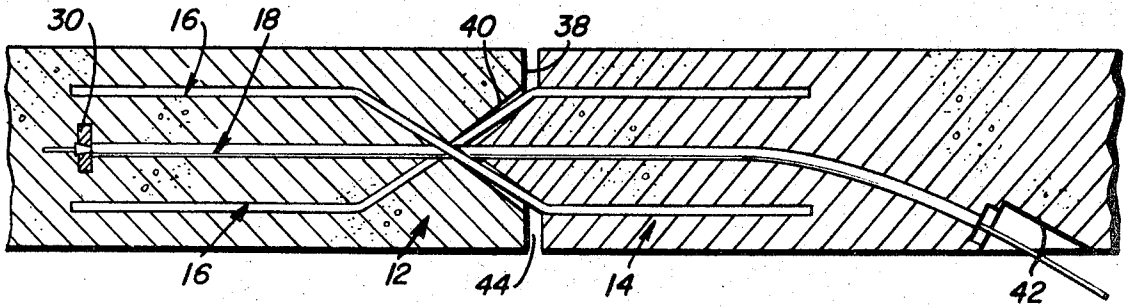


Fig. 7

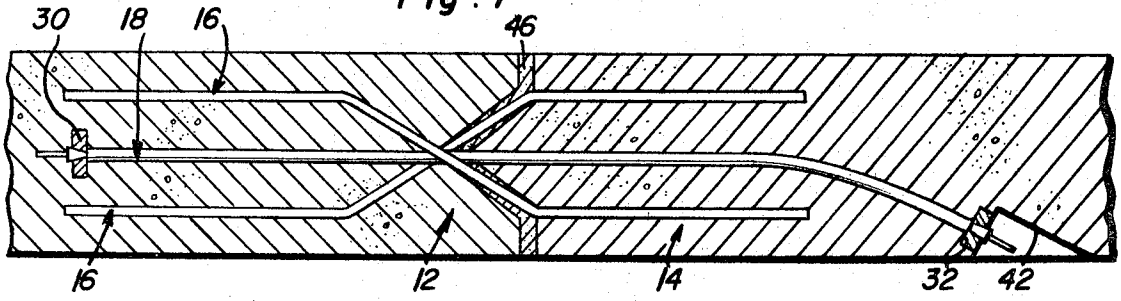
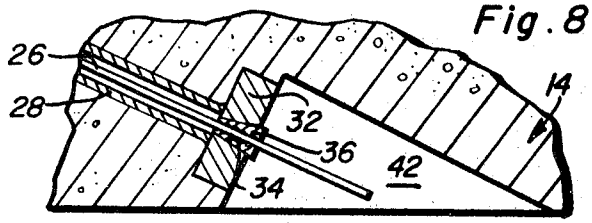


Fig. 8



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CONCRETE SLAB JOINT CONSTRUCTION

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U.S. Cl. 52—227 11 Claims

ABSTRACT OF THE DISCLOSURE

A construction for joints between concrete slabs that allows the adjacent slabs to shrink without cracking the slabs or destroying wall structures or other devices that might be rigidly mounted to such slabs. The joint is so designed that it is reinforced and self-supporting and allows other construction work to continue while the normal shrinkage is taking place.

In the construction of buildings concrete slabs of great longitudinal dimensions are a common occurrence. These elongated slabs are usually roof or floor slabs which are suspended or supported on columns and walls and, being the horizontal surfaces of building structures, are usually completely enclosed by and attached to exterior walls. Such being the case, problems arise since it is a peculiarity of concrete that as it cures and hardens it undergoes a volume reduction which manifests itself as linear shrinkage in all directions which causes a general contraction of the slab. Therefore, if walls, columns, elevator shafts, stair shafts, etc. are rigidly attached to the slabs they act to resist this contraction of the slab and the forces so generated gradually build up until either the resisting element cracks or the slab itself cracks. Heretofore, large open joints running completely across the slabs have been left to provide an area to compensate for the shrinkage and were filled with concrete once a reasonable amount of time has been allowed for the shrinkage to occur. This is highly undesirable, as the edges of the joint must be supported and the joint itself impedes further construction work which usually results in the joint being filled with concrete before the measured percentage of the total slab shrinkage has taken place.

The present invention relates to a joint construction for concrete slabs that allows the shrinkage to take place conveniently with the edges of the slabs interconnected to lend support to one another as well as doing away with the wide gap or joint normally associated with such construction. The joint provides for reinforcing rods to extend across the joint thereby tying the joints together to support them therebetween. The reinforcing bars are arranged such that they form a hinge point between the panels thereby further reducing stresses that may occur due to relative vertical movement between the slabs. Further, a sheathed cable is mounted in one slab and extends through the adjacent slab to be exposed therefrom and having excess length so that shrinkage, causing relative horizontal movement between the slabs, will be taken up by the movement of the cable within the sheath.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a top plan view, with a section broken away for clarity, of a concrete slab incorporating the subject joint.

FIG. 2 is a sectional view taken substantially along the line 2—2 of FIG. 1.

FIG. 3 is a sectional view taken substantially along the line 3—3 of FIG. 2.

FIGS. 4 through 7 are sectional views showing the steps in the construction of the subject joint.

FIG. 8 is an enlarged sectional view of the tensioning end of the sheathed cable.

Referring now to the drawings, the reference numeral **10** generally indicates the subject joint which is between a first concrete slab **12** and a second concrete slab **14**. The joint construction **10** includes a series of reinforcing rods **16** and a plurality of sheathed tensioning cables **18**.

The reinforcing rods **16** are bent into a predetermined shape which includes a first horizontal section **20** which is connected to an angular intermediate section **22** which in turn is connected to a second horizontal section **24** which is parallel to the first horizontal section **20**. The sheathed tensioning cables **18** comprise an elongated sheath **26** which has a cable **28** extending therethrough with the cable having an anchor plate **30** fixed to one end thereof and a second anchor plate **32** adjustably fixed to the other end thereof. The anchor plate **32** has a cone-shaped opening **34** through the center thereof which receives the cable **28** therethrough. A cone-shaped chuck **36** of a cross-section to cooperate with the cone-shaped opening **34** is received over the cable **28** to provide for tightening of the cable **28** by drawing the cable through the chuck **36** and then allowing the wedging action between the opening **34** and chuck **36** to tighten the chuck around the cable.

To utilize the joints in the construction of large slabs, the end **38** of a slab **12** is formed with a triangular notch **40** along its entire width. The angle which the intermediate angular section **22** of the reinforcing rods makes with the horizontal sections **20** and **24** thereof, is chosen so that when the concrete slab **12** is formed the angular section **22** will extend through the form and lie along the angled sides of the triangular notch **40** with the horizontal sections **24** extending perpendicular to the end of the slab **38**. Similarly, one half of the sheathed tensioning cable **18** is embedded in the concrete slab **12** and extends through a hole in the form for the slab so that the sheath will exit the slab at the apex of the triangular notch **40**. Thus, when the forms are removed the structure will be as shown in FIG. 4. As shown therein, a pair of reinforcing rods **16** have been placed so that the first horizontal sections **20** are parallel to one another and spaced there apart so that the angular sections **22** thereof, as mentioned above, exit the concrete slab and are juxtaposed with the sides of the triangular notch **40**, with the second horizontal sections **24** being perpendicular to the end **38** of the slab at the point where the triangular notch is cut into the end. The sheathed tensioning cable is shown as mounted in the center of the slab **12** with the anchor plate **30** embedded in the concrete and the sheath **26** and cable **28** exiting the slab at the apex of the triangular cutout **40**. At this point, the forms for the second concrete slab to be juxtaposed with the first slab **12** are put in place. The forms for the second slab **14** are constructed with a block out such that a cavity **42** will occur in the concrete slab. The horizontal sections **24** of the reinforcing rods are embedded in the slab **14** with the sheath **26** and cable **28** extending perpendicularly out of the base of the cavity **42** with the second anchor plate **32** mounted on the sheath and cable at the face thereof. Thus when the forms are removed from the second concrete slab **14** the structure will be as shown in FIG. 5, wherein the concrete slabs **12** and **14** are juxtaposed with the reinforcing rod assemblies **16** embedded therebetween providing support therefor, and the sheathed cable assembly **18** extends from the first slab **12** into the second slab **14** and out of the cavity **42** with the second anchor plate embedded as set forth above. With the slabs **12** and **14** as set up in FIG. 5 the formation of the joint is complete and the concrete may then be allowed to set or cure. As

the concrete in the slabs **12** and **14** cures the slabs will shrink and separate leaving a gap **44** as shown in FIG. 6. As the gap **44** gradually increases the angular intermediate sections **22** of the reinforcing rods will attempt to assume a straight line between the points where they enter the slabs **12** and **14**. Similarly, the cable **28** will be drawn into the sheath **26** as the slabs **12** and **14** separate. In this way the shrinkage of the slabs **12** and **14** can be accommodated without fracture or cracking of the slabs thus joined together. Also, since the slabs **12** and **14** are cast in abutting relation, the separation **44** will not be so great as to cause a hindrance in the rolling about of equipment or in completing other construction projects thereon. Further, since the gap **44** is so slight as compared to the extremely wide gaps normally left in such construction, the joint can be left open for a longer period of time thus assuring that the majority of the shrinkage due to curing of the slabs has occurred. When it has been determined that the acceptable amount of shrinkage has occurred in the slabs **12** and **14**, the gap **44** left between the slabs is filled with grouting **46** to seal up the gap thus left. When the grouting has set the cable **28** is withdrawn through the sheath to exert a tension load thereon and draw the slabs **12** and **14** together thereby placing the grouting **46** under pressure. When the proper load has been exerted on the cable **28** the cone-shaped locking chuck **36** is secured in place thereby maintaining the load on the cable and the grouting **46**. With the grouting thus poured in place and under tension provided by the cable **28** the joint is complete.

The structure as set forth hereinabove and the method for utilizing it in the joining of concrete slabs can readily be seen as a distinct advance over presently practiced methods in such joints. The drawings disclose the use of a pair of reinforcing rods **16** in conjunction with a sheathed tensioning cable **18** therebetween. However, as can be realized the number and placement of the reinforcing rods **16** and sheathed tension cables **18** is optional and would depend upon the predicted loads that the joint would have to bear. Also they could be spaced across the entire width of a joint, or concenrated in certain areas of higher loading. The joints are extremely functional and do not inhibit the progress of other work on the buildings wherein the joints are utilized. Further, while the structure and method set forth hereinabove has been shown applied to a solid concrete slab, it can be readily seen that the construction is adaptable to the waffle-type slabs or any of the other voided concrete slabs currently in use whether they be installed on grade or supported in the air. The construction can also be seen to be adaptable wherever two poured in place concrete slabs abut and shrinkage occurring will cause stress loads and resultant cracking therein.

What is claimed as new is as follows:

1. A joint construction for concrete slabs, comprising: a first concrete slab, a second concrete slab, and means interconnecting said slabs to provide support therebetween and to permit limited relative longitudinal movement therebetween, said first concrete slab having a V-shaped notch in one side thereof and said second slab having a cooperating V-shaped abutment to be received in said notch, said means including at least one reinforcing rod and at least one tension element, the reinforcing rod having a first horizontal portion, an intermediate section connected at one end to said first portion at an angle thereto, and a second horizontal portion connected to the other end of said intermediate portion in parallel relation to said first portion, the first horizontal portion of the rod being embedded in the first slab, the intermediate section of the rod being aligned with a leg of the notch with half of said section embedded in said first slab and the other half of said section lying on the surface of the leg of said notch between the cooperating notch and abutment, and the second horizontal portion of the rod embedded in said second slab.

2. The device of claim **1** wherein a plurality of rods are embedded with adjacent rods being rotated 180° from one another about an axis parallel to said first and second portions so that the intermediate sections align with opposite legs of the V-shaped notch and cooperating abutment.

3. The device of claim **1** wherein said tension element comprises a tensionable cable, an anchor attached to one end of said cable, said anchor and said one end of said cable being embedded in the first slab, and adjustable anchor means on the second end portion of said cable, said adjustable anchor means and said second end portion of the cable being embedded in said second slab.

4. The device of claim **3** wherein said cable emerges from said first slab at the apex of the notch and enters the second slab at the apex of the abutment thereon.

5. A joint construction for concrete slabs, comprising: a first concrete slab, a second concrete slab, and means interconnecting said slabs to provide support therebetween and to permit limited relative longitudinal movement therebetween, said first concrete slab having a V-shaped notch in one side thereof and said second slab having a cooperating V-shaped abutment to be received in said notch, said means including at least one reinforcing rod and at least one tension element, said tension element comprising a cable, a sheath surrounding said cable, an anchor attached to one end of said tension element, and anchor means adjustable along the other end of said tension element, said anchor and said one end of said tension element being embedded in the first slab and the other end of said tension element being embedded in said second slab, said tension element emerging from said first slab at the apex of the notch and entering the second slab at the apex of the abutment thereon.

6. The device of claim **5** wherein said other end of said tension element emerges from said second slab so that the cable may be withdrawn therefrom thereby tending to draw said slabs together, and said cable locked in the withdrawn position therefrom by the adjustable anchor means.

7. A joint construction for concrete slabs, comprising: a first concrete slab, a second concrete slab, and means interconnecting said slabs to provide support therebetween and to permit limited longitudinal movement therebetween, said first concrete slab having a notch in one side thereof and said second slab having a cooperating outwardly projecting abutment receivable in said notch, said means interconnecting said slabs including at least one reinforcing rod, said reinforcing rod having a first horizontal portion embedded in the first slab, an intermediate section connected at one end to said first rod portion at an angle thereto and extending along a surface of the notch from the inner end thereof to the outer end thereof between the notch and the abutment, and a second horizontal portion connected to the other end of the intermediate portion in laterally spaced generally parallel relationship to said first portion, said second horizontal portion being embedded in said second slab.

8. The device of claim **7** wherein the inner end of said notch is defined by a pair of angularly related faces, the intermediate section of said rod extending through the angle defined by said faces.

9. The device of claim **8** wherein a plurality of rods are embedded with adjacent rods being rotated approximately 180° from one another about an axis parallel to said first and second portions, whereby the intermediate sections of the rods extend angularly along opposed faces of the notch between the notch and the cooperating abutment.

10. A method for joining concrete slabs, comprising: forming a first concrete slab with a notch along one side thereof, embedding reinforcing rods in said first slab to emerge from said slab and lie along the sides of said notch, bending the portion of said rods beyond the notch to be perpendicular to said one side, embedding tension

elements in said first slab so that the free ends thereof emerge at the inner end of said notch, forming a second concrete slab with an abutment on one side thereof to engage said one side of said first slab and notch therein, embedding the perpendicular portions of said rods in the second slab, embedding said free ends of said tension elements in said second slab so that they enter thereinto at the outer end of said abutment and emerge therefrom from a surface of said second slab, and installing adjustable anchor means on the free ends of the tension elements to draw said elements therefrom and exert a tension in said elements to thereby draw said slabs together.

11. A method for joining concrete slabs, comprising: forming a first concrete slab with a V-shaped notch along one side thereof embedding reinforcing rods in said first slab to emerge from said slab and lie along the sides of said notch, bending the portion of said rods beyond the notch to be perpendicular to said one side, embedding tension elements in said first slab so that the free ends thereof emerge at the apex of said notch, forming a second concrete slab with a V-shaped abutment on one side thereof to engage said one side of said first slab and V-shaped notch therein, embedding the perpendicular portions of said rods in the second slab, embedding said free ends of

said tension elements in said second slab so that they enter thereinto at the apex of said abutment and emerge therefrom perpendicular to a surface of said second slab, and installing adjustable anchor means on the free ends of the tension element to draw said element therefrom and exert a tension in said elements to thereby draw said slabs together.

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