US006210070B1

(12) **United States Patent**
Shaw et al.

(10) **Patent No.: US 6,210,070 B1**
(45) **Date of Patent: Apr. 3, 2001**

(54) CONCRETE DOWEL SLIP TUBE WITH CLIP

(76) Inventors: **Ron D. Shaw**, 1401 Outrigger, Corona Del Mar, CA (US) 92625; **Lee A. Shaw**, 2672 Crestview Dr., Newport Beach, CA (US) 92663

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/291,528**

(22) Filed: **Apr. 14, 1999**

(51) **Int. Cl.**[7] **E01C 5/08**
(52) **U.S. Cl.** **404/70**; 404/65; 404/62
(58) **Field of Search** 14/73.1; 404/47, 404/60, 61, 62, 63, 64, 70, 134

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,045,562		11/1912	Kennedy .	
1,592,681		7/1926	Grothe .	
1,631,576	*	6/1927	Bawers	404/59
1,728,936		9/1929	Johnson .	
1,838,635		12/1931	Pilj .	
1,852,673		4/1932	Pilj .	
1,939,007		12/1933	Heltzel	25/118
2,095,060		10/1937	Geyer	94/18
2,129,568		9/1938	De Biasi	72/122
2,262,704		11/1941	Tompkins et al.	72/128
2,269,703	*	1/1942	Bagwill	404/62
2,275,272		3/1942	Scripture, Jr.	25/154
2,277,203		3/1942	Boult	94/24
2,296,453		9/1942	Saffert	25/155
2,319,526		5/1943	Wearn	72/128
2,331,949		10/1943	Whiteman	72/128
2,365,550		12/1944	Heltzel	94/18
2,373,284		4/1945	Autrey	72/128
2,508,443		5/1950	Carter	94/18
2,636,426		4/1953	Heltzel	94/51
2,746,365		5/1956	Darnielle	94/33
2,823,539		2/1958	Kersh et al.	72/128
3,066,448		12/1962	Pinter	50/80
3,279,335	*	10/1966	Garner	404/61
3,284,973		11/1966	Ames et al.	52/155
3,333,380		8/1967	Wolf	52/365
3,437,017	*	4/1969	Walz et al.	404/60
3,451,179		6/1969	Kendzia	52/370
3,896,599		7/1975	Werstein et al.	52/704
3,920,221		11/1975	Berry et al.	256/59
3,921,356		11/1975	Hughes	52/299
4,115,976		9/1978	Rohrer	52/741
4,146,599		3/1979	Lanzetta	264/35

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

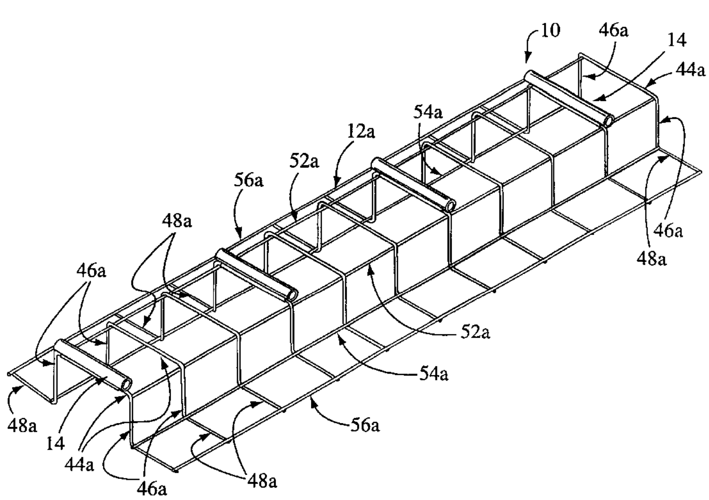
568457	10/1975	(CH) .
79813	8/1955	(DK) .
1094449	11/1953	(FR) .

Primary Examiner—Eileen D. Lillis
Assistant Examiner—Raymond W Addie
(74) *Attorney, Agent, or Firm*—Kit M. Stetina; Stetina Brunda Garred & Brucker

(57) **ABSTRACT**

A concrete dowel placement apparatus for use with continuous pour concrete slabs comprising at least one slip tube, a concrete support dowel insertable into a respective slip tube and a wire mesh supporting structure. The slip tube comprises an elongate tubular sheath with a closed end, and an open end for slidable insertion of the concrete support dowel. Additionally, attached to an exterior surface of the sheath is a clip which is engagable to the wire mesh support structure. Therefore, the slip tube is attachable to the wire mesh structure such that the dowel is positionable within a continuous pour concrete slab at a prescribed location. The slip tube provides lateral movement of the dowel within the slab to thereby prevent fracturing of the slab in areas near sawcuts. The support structure may be formed from different configurations to facilitate positioning of the slip tubes and respective concrete support dowels supported therein. A support foot is further provided to maintain the dowel in the prescribed position during pouring of the concrete slab.

15 Claims, 3 Drawing Sheets



U.S. PATENT DOCUMENTS

4,158,937		6/1979	Henry	52/365
4,261,496		4/1981	Mareydt et al.	224/315
4,329,080	*	5/1982	Elley	404/64
4,437,828		3/1984	Egger	425/458
4,496,504		1/1985	Steenson et al.	264/69
4,533,112		8/1985	Santos, Jr. et al.	249/3
4,578,916		4/1986	Witschi	52/396
4,614,070		9/1986	Idland	52/296
4,648,739		3/1987	Thomsen	404/2
4,748,788		6/1988	Shaw et al.	52/742
4,752,153		6/1988	Miller	404/59
4,800,702		1/1989	Wheeler	52/677
4,883,385		11/1989	Kaler	404/47
4,899,497		2/1990	Madl, Jr.	52/126.6
4,926,593		5/1990	Johnston	52/126.4
4,938,631		7/1990	Maechtle et al.	52/235
4,959,940		10/1990	Witschi	52/396
4,996,816	*	3/1991	Wiebe	404/134
5,005,331		4/1991	Shaw et al.	52/396
5,134,828		8/1992	Baur	52/704
5,216,862		6/1993	Shaw et al.	52/396
5,301,485		4/1994	Shaw et al.	52/678
5,678,952		10/1997	Shaw et al.	404/62
5,713,174	*	2/1998	Kramer	404/60

* cited by examiner

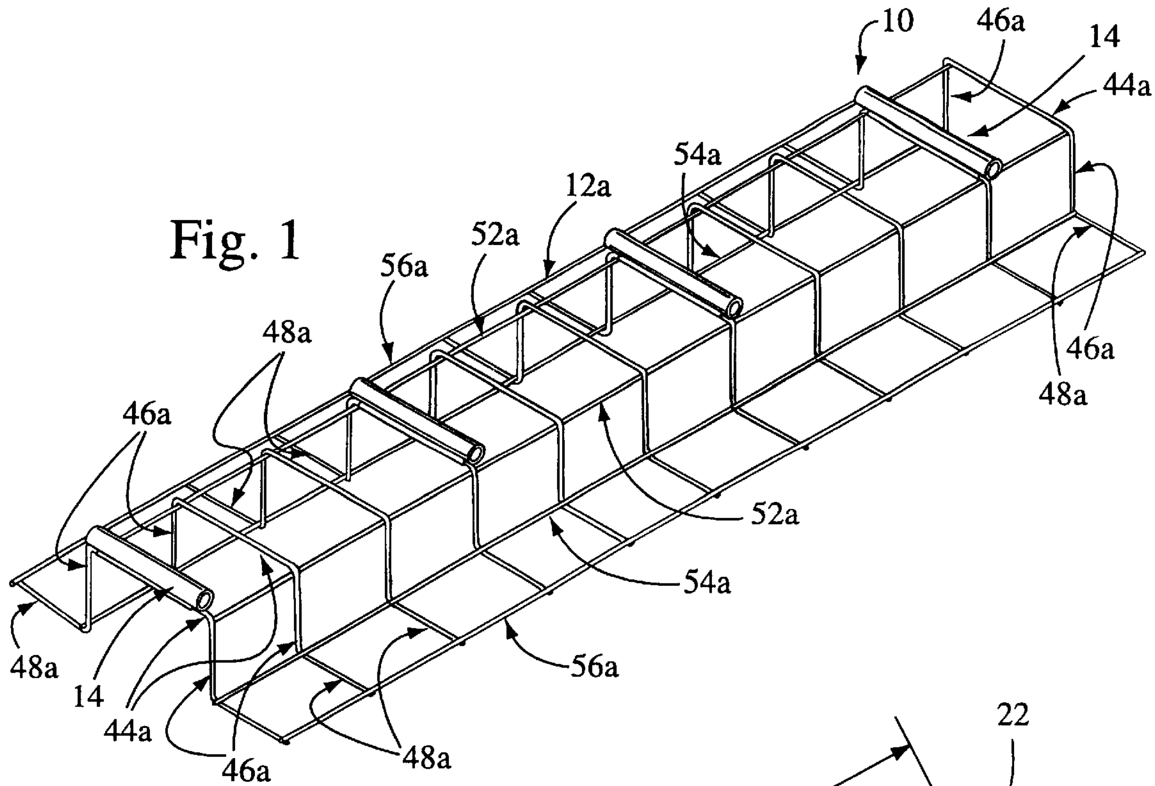

10
46a
14
44a
54a
12a
52a
56a
48a
46a
48a
52a
54a
56a
48a
14
44a
46a
48a
46a
48a

Fig. 1

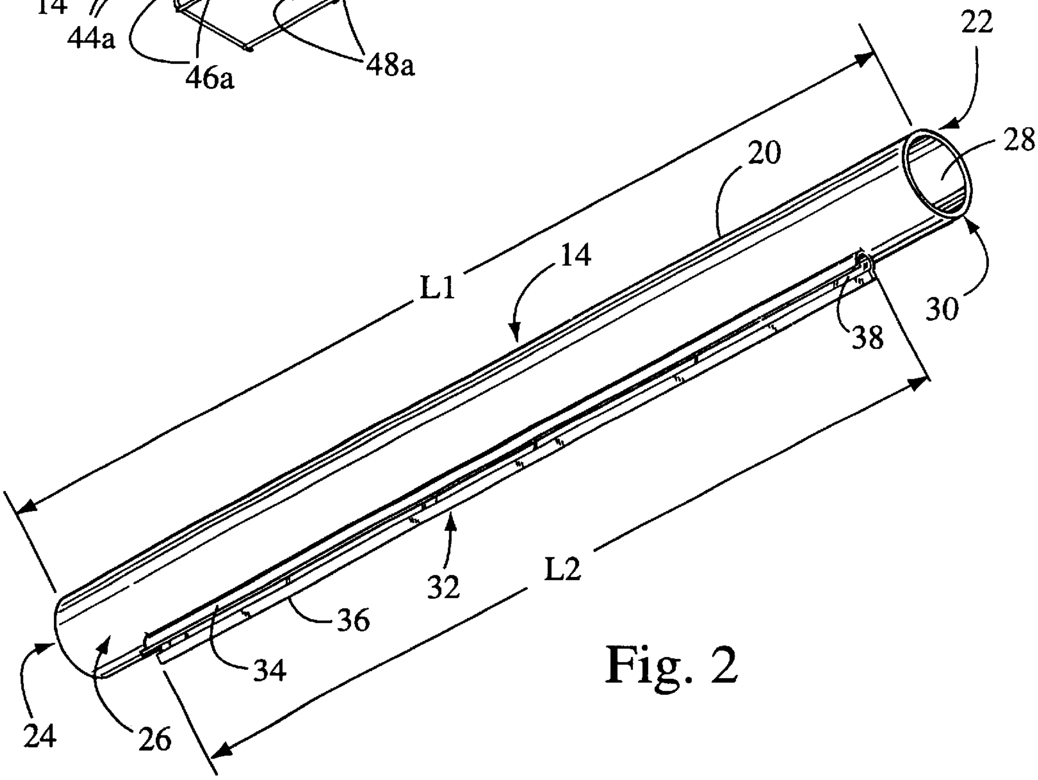

22
28
20
14
L1
30
38
32
L2
36
34
24
26

Fig. 2

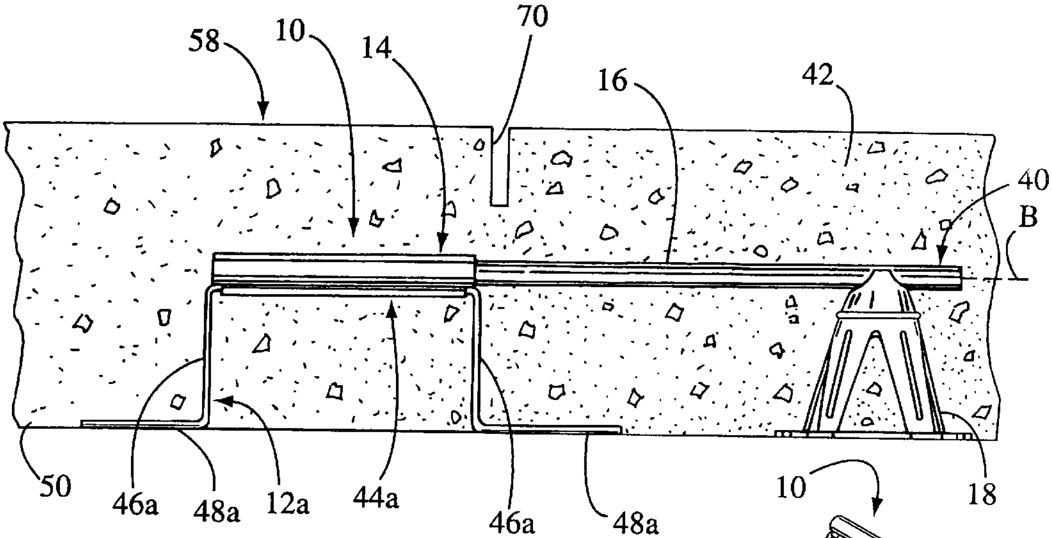

58
10
14
70
16
42
40
B
50
46a
48a
12a
44a
46a
48a
10
18

Fig. 3

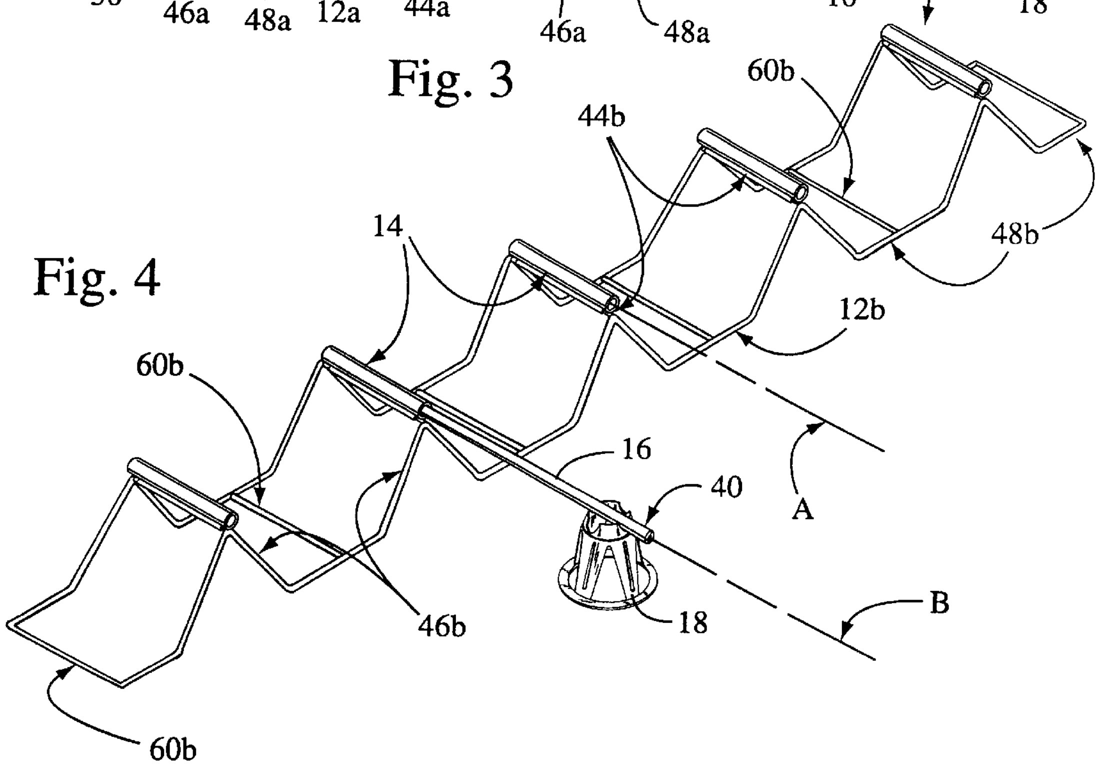

60b
44b
48b
14
12b
60b
16
40
A
46b
18
B
60b

Fig. 4

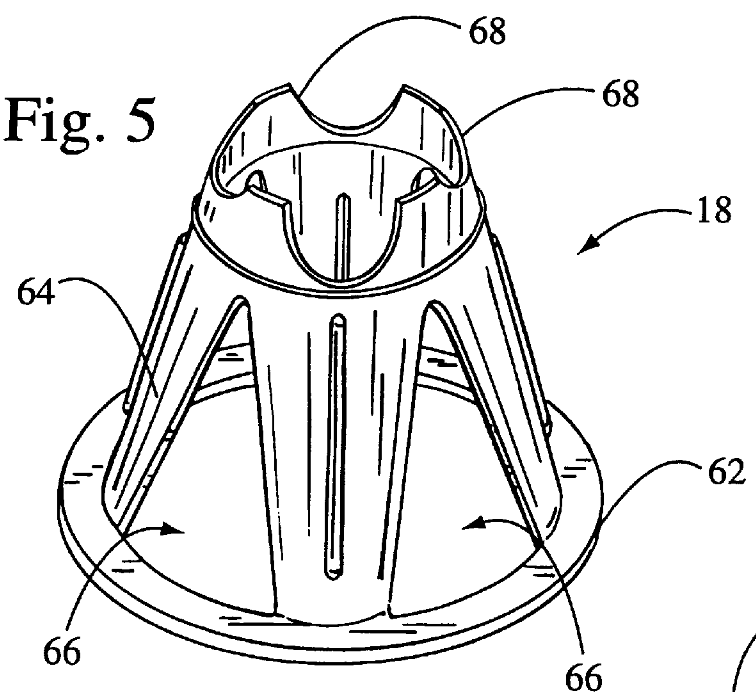


Fig. 5

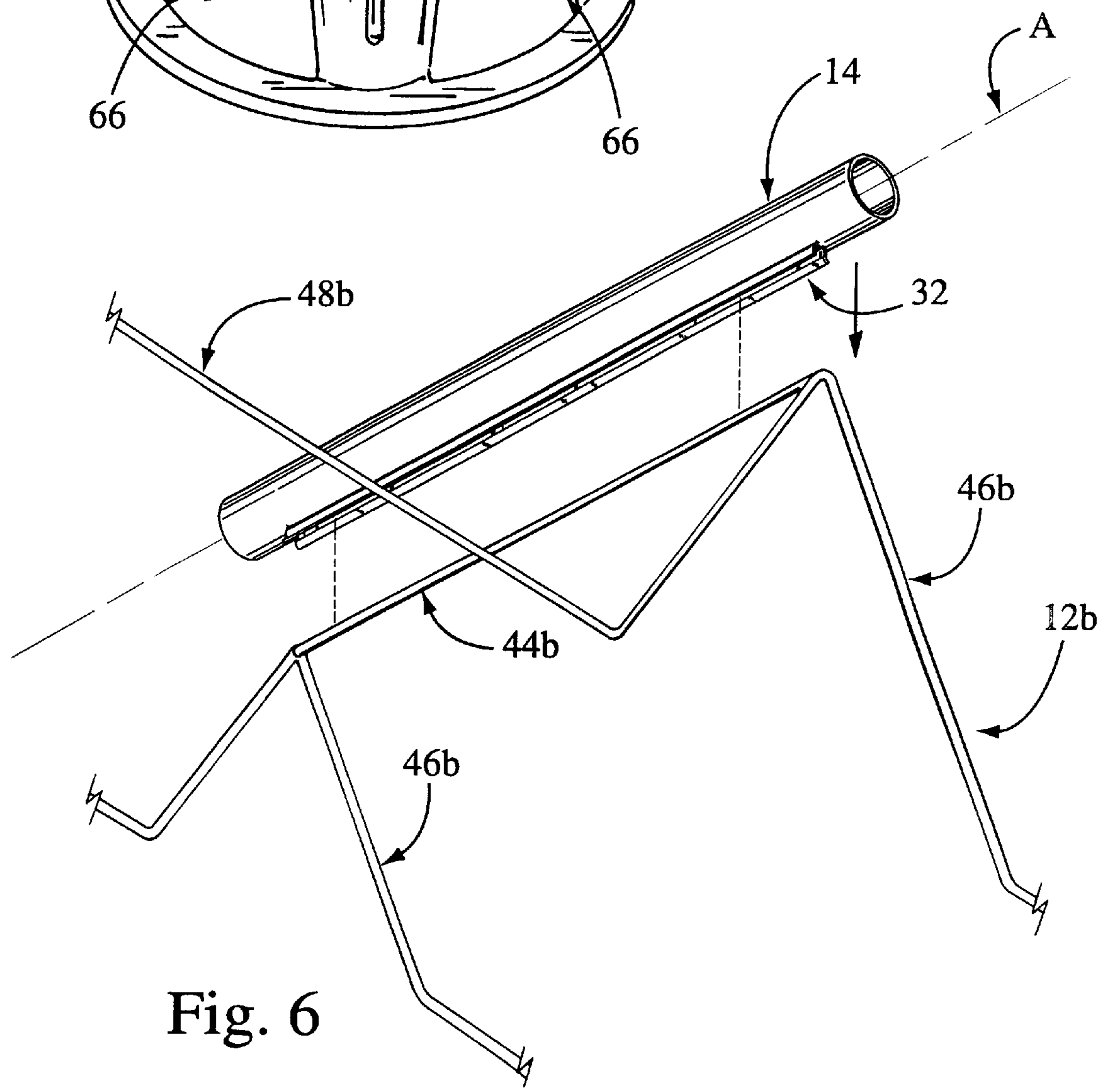


Fig. 6

CONCRETE DOWEL SLIP TUBE WITH CLIP

BACKGROUND OF THE INVENTION

The present invention generally relates to the art of concrete construction, and more particularly to a device for facilitating the placement of slip dowel rods within a concrete slab.

In the art of concrete construction, it is commonplace to form "cold joints" between two or more poured concrete slabs. Such cold joints frequently become uneven or buckled due to normal thermal expansion and contraction of the concrete and/or compaction of the underlying soil caused by inadequate substrate preparation prior to pouring of the concrete. As a means of preventing buckling or angular displacement of such cold joints, it is common practice to insert smooth steel dowel rods generally known as "slip dowels" within the edge portions of adjoining concrete slabs in such a manner that the concrete slabs may slide freely along one or more of the slip dowels, thereby permitting linear expansion and contraction of the slabs while at the same time maintaining the slabs in a common plane and thus preventing undesirable buckling or unevenness of the cold joint and in adjacent slabs.

In order to function effectively, slip dowels must be accurately positioned parallel within the adjoining concrete slabs. The non-parallel positioning of the dowels will prevent the desired slippage of the dowels and will defeat the purpose of the "slip dowel" application. Additionally, the individual dowels must be placed within one or both of the slabs in such a manner as to permit continual slippage or movement of the dowels within the cured concrete slab(s).

It is commonplace to form large concrete slabs using monolithic or continuous concrete pour methods. Such slabs are formed by continuously pouring large quantities of concrete without the use of forms or cold joints in order to reduce costs. Therefore, fracturing of the slab is prevented by including tooled joints or sawcuts in the slab where cold joints would otherwise be needed. Additionally, concrete reinforcement material such as wire mesh or segments of rebar are initially placed into the area in which the continuous pour is to be made, and in particular those areas where it is contemplated that sawcuts will be included in the resultant slab for purposes of preventing fracturing thereof. The wire mesh or other reinforcement material is preferably elevated above ground level by the placement thereof upon support blocks or "chairs".

In addition to having concrete reinforcement material disposed within those portions of the slab in which a sawcut is to be made, it is also desirable to incorporate slip dowels into such portions to allow the separate sections of the slab which are defined by the sawcuts to move relative to each other while preventing any buckling or angular displacement thereof. One prior art method of incorporating slip dowels into those areas of a continuous pour where sawcuts are contemplated involves manually "stabbing" the slip dowels into predetermined locations of the uncured concrete pour. This method, however, is deficient in that there is no way to insure that the slip dowels will be manually positioned within the uncured concrete in parallel relation to each other, or will be maintained in parallel alignment to the top surface of the concrete pour during curing. As previously explained, if the dowel rods are not in parallel alignment, the separate sections of slab as defined by the sawcuts will be prevented from moving relative to each other.

Another prior art method of incorporating slip dowels into a monolithic pour involves manually tieing the slip dowels

to the reinforcement material in parallel relation to each other prior to the concrete pour being made. Manual tieing, however, is extremely time consuming and presents significant difficulties in securing the slip dowels to the reinforcement material in true parallel relation to each other. Additionally, the tied slip dowels are susceptible to displacement or shifting when impacted by the concrete during the pour thus moving the same out of parallel alignment with each other.

The present invention addresses and overcomes the above-described deficiencies of prior art slip dowel placement in continuous concrete pours by providing a device that places slip dowels accurately during the pouring of such concrete slabs. In this respect, the present invention places slip dowels into a concrete slab through the use of slip tubes that are easily attached to a prefabricated support structure. Therefore, the present invention provides an accurate and easy system for slip dowel placement in a monolithic pour.

BRIEF SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a concrete dowel slip tube for attachment to a wire mesh support structure. The slip tube comprises an elongate, tubular dowel receiving sheath having a proximal end, a distal end, an exterior surface and a hollow interior compartment extending longitudinally therein. The hollow interior compartment that is sized and configured to receive a concrete support dowel. The interior compartment has a generally circular cross-sectional configuration with a diameter between about 0.5 inches and about 1.0 inches. The longitudinal length of the sheath is between about 6.0 inches and about 30.0 inches.

Attached longitudinally to the exterior surface of the sheath is a clip sized and configured to frictionally retain the wire mesh support structure. The clip has a first prong portion and a second prong portion that define an arcuately contoured recess that is engagable to the support structure. The clip extends longitudinally along at least one-half the length of the sheath or from about the distal end to about the proximal end.

There is additionally provided a concrete dowel placement apparatus comprising a wire mesh support structure placeable upon a support surface and the concrete dowel slip tube previously described. The support structure comprises a base portion and an elevated portion having a plurality of top segments which extend in spaced, generally parallel relation to each other for attachment of the clip of a respective slip tube. Each of the top segments is configured to be in generally co-planar relationship to each other. Typically each top segment is elevated to a height of between about 2.5 inches and about 24 inches and spaced between about 6.0 inches and 30.0 inches between one another.

In a first embodiment of the support structure the elevated portion comprises a plurality of side segments which extend generally perpendicularly relative to respective ones of the top segments. Additionally, the base portion includes a plurality of base segments which extend generally perpendicularly to respective ones of the side segments. In a second embodiment of the placement apparatus the elevated portion of the support structure comprises a plurality of V-shaped members attached to the base portion and arranged to define multiple opposed pairs. Each of the V-shaped members define an apex such that each of the top segments are attached to and extend between the apices of a respective pair of V-shaped members.

The placement apparatus may be in further combination with an elongate concrete support dowel. The concrete support dowel is slidably insertable into the concrete dowel slip tube such that an end of the support dowel extends therefrom. A support foot may be further included in the placement apparatus of the present invention. The support foot is sized and configured to receive and support the end of the dowel extending from the slip tube and coaxially maintain the dowel in such position. As such, the interior compartment of the sheath defines a first axis and the dowel defines a second axis that is coaxially alignable with the first axis when the dowel is inserted into the interior compartment. The support foot is formed to be of a height which maintains the coaxial alignment of the first and second axes when the dowel support foot is placed upon the support surface and interfaced to the end of the dowel protruding from the sheath.

The present invention further comprises a method of supporting a monolithic concrete pour through the use of a placement apparatus having a support structure, multiple slip tubes having open ends and multiple support dowels. The method comprises attaching the slip tubes to the support structure such that the slip tubes extend in generally parallel alignment with each other. Next, the support structure is placed at a prescribed location on a support surface and the support dowels are inserted into open ends of respective ones of the slip tubes such that at least a portion of each of the support dowels protrudes from a respective one of the slip tubes. The concrete is then poured around the slip tubes and the exposed portions of the support dowels to encapsulate the same and form a monolithic concrete slab. Finally, a sawcut is made in the concrete slab along an axis perpendicular to the axes of the slip tubes. The sawcut may be formed such that the axis of the cut is extended along and in spaced relation to the open ends of the slip tubes. The slip tubes may be attached subsequent to the placing of the support structure and a support foot may be attached to each support dowel after sliding the dowel within the slip tube.

BRIEF DESCRIPTION OF THE DRAWINGS

These, as well as other features of the present invention, will become more apparent upon reference to the drawings wherein:

FIG. **1** is a perspective view of a concrete dowel slip tube of the present invention as used in conjunction with a wire mesh support structure constructed in accordance with a first embodiment thereof;

FIG. **2** is a bottom perspective view of the concrete dowel slip tube shown in FIG. **1**;

FIG. **3** is a cross-sectional view of the concrete dowel slip tube and wire mesh support structure shown in FIG. **1** in an operative position within a monolithic concrete pour;

FIG. **4** is a perspective view of the present concrete dowel slip tube as used in conjunction with a support foot of the present invention and a wire mesh support structure constructed in accordance with a second embodiment thereof;

FIG. **5** is a top perspective view of the support foot shown in FIG. **4**; and

FIG. **6** is an exploded view illustrating the manner in which the concrete dowel slip tube is secured to the wire mesh support structure of the second embodiment as shown in FIG. **4**.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings wherein the showings are for purposes of illustrating preferred embodiments of the present invention only, and not for purposes of limiting the same, FIG. **1** perspectively illustrates a concrete dowel placement apparatus **10** for use with monolithic or continuous pour concrete construction techniques. The placement apparatus **10** comprises a wire mesh support structure ***12a*** constructed in accordance with a first embodiment of the present invention and at least one concrete dowel slip tube **14** attached thereto. As seen in FIG. **3**, the concrete dowel placement apparatus additionally comprises a concrete support dowel **16** and a dowel support foot **18**.

CONCRETE DOWEL SLIP TUBE AND SUPPORT DOWEL

The slip tube **14** constructed in accordance with the present invention is used for supporting the concrete support dowel **16** slidably insertable therein. As seen in FIG. **2**, the slip tube **14** is constructed from an elongate, tubular sheath **20** with an open proximal end **22** and a closed distal end **24**. The sheath **20** has a generally circular cross-sectional area with an exterior surface **26**, and an inner surface **28** which defines a hollow, longitudinally extending interior compartment **30** therewithin. Typically, the longitudinal length "L1" of the sheath **20** is between about 6.0 inches and about 30.0 inches. The interior compartment **30** is sized slightly larger than the outer diameter of the concrete support dowel **16**. The outer surface **26** of sheath **20** may further be provided with ribs or ridges (not shown) to facilitate frictional retention as will be further explained below.

Mounted on the exterior surface **26** of the sheath **20** is a clip **32** used to releasably attach the slip tube **14** to the wire mesh support structure **12***a*. The clip **32** can be integrally connected to sheath **20** (i.e., formed from the same plastic material) or attached to the exterior surface **26** thereof. The clip **32** comprises a first prong **34** and a second prong **36** that collectively define an arcuately contoured recess **38** which is sized and configured to receive a section of the wire mesh support structure **12***a*. The prongs **34** and **36** are fabricated from a flexible material such that receipt of the wire mesh support structure **12***a* into the recess **38** facilitates a slight outward flexation of prongs **34**, **36** and frictional retention thereof to support structure **12***a*. The clip **32** preferably has a length "L2" that is at least one-half the length "L1" of the sheath **20** in order to provide the necessary frictional retention to support the dowel **16**. The clip **32** retains the slip tube **14** in a position whereby the concrete support dowel **16** inserted therein is supported in a prescribed position as will be further explained below.

Referring now to FIG. **3**, the support dowel **16** is sized such that it is slidably insertable into the interior compartment **30** of the sheath **20**. The sheath **20** is typically fabricated from a plastic material such that the support dowel **16** may freely slide therewithin. The support dowel **16** extends outwardly from the open end **22** of sheath **20** such that an extended end **40** of dowel **16** is firmly adhered by a concrete slab **42** poured thereover. The dowel **16** may be fabricated from a section of rebar or other type of material with the necessary strength to prevent buckling or angular displacement of the concrete slab **42**, as will be further explained below. Additionally, the dowel **16** may be formed with ribs or ridges (not shown) on an exterior surface thereof to facilitate frictional retention within the concrete slab **42**.

PREFERRED EMBODIMENTS OF THE WIRE MESH SUPPORT STRUCTURE

As seen in FIG. **1**, a first embodiment of the wire mesh support structure **12***a* comprises a plurality of elevated portions **43***a* having top segments **44***a* and side segments **46***a*. Attached in generally perpendicular relationship to the elevated portions **43***a* are a plurality of base portions **48***a*. In order to form the first embodiment of the support structure **12***a*, two side segments **46***a*, **46***a* are attached perpendicularly to a respective end of the top segment **44***a* such that each side portion **46***a*, **46***a* projects downwardly toward a ground surface **50** and forms a generally U-shaped elevated portion **43***a*. Furthermore, in the first embodiment, two base portions **48***a*, **48***a* are attached generally perpendicularly to a respective end of each side segments **46***a*, **46***a* such that each base portion **48***a*, **48***a* is disposed in generally parallel relation to the ground surface **50**. Each base portion **48***a* provides a stable support foundation for each side segment **46***a* and top segment **44***a* attached thereto.

The first embodiment of the wire mesh support structure **12***a* additionally comprises two top stringers **52***a*, **52***a*, two side stringers **54***a*, **54***a* and two base stringers **56***a*, **56***a* as seen in FIG. **1**. Each top stringer **52***a* is attached to the elevated portion **43***a* such that each top segment **44***a* is substantially parallel to one another as is required for proper operation. Each side stringer **54***a* is attached to either elevated portion **43***a* or base portion **48***a*. Similarly, each base stringer **56***a* is attached to the outermost ends of each base portion **48***a*.

The first embodiment of the support structure **12***a* may be fabricated from concrete reinforcing wire. Each top segment **44***a*, side segment **46***a*, **46***a*, and bottom portion **48***a*, **48***a*, may be formed from a single section of concrete reinforcing wire by bending such material into the desired generally U-shaped configuration. Then the top **52***a*, side **54***a* and base **56***a* stringers may be welded at their respective locations in order to from the support structure **12***a*.

Referring now to FIGS. **4** and **6**, a second embodiment of a wire mesh support structure **12***b* can also support slip tubes **14** and is formed from a plurality of top segments **44***b*, generally V-shaped side segments **46***b* and base portions **48***b* inter-connected together. As seen in FIG. **4**, each end of the top segment **44***b* is connected to an apex of the V-shaped side segment **46***b* in order to elevate the top segment **44***b* and form elevated portion **43***b*. Each side segment **46***b* is then attached to the base portion **48***b*. Therefore, as seen in FIG. **4**, the plurality of base portions **48***b* are attached to the plurality of side segments **46***b* such that the side segments **46***b* are connected in a linear fashion side-by-side. A respective top segment **44***b* provides support to the apex of each V-shaped side segment **46***b* and spacers **60***b* attached to base portions **48***b* midway between two adjacent side segments **46***b*, **46***b*. The second embodiment of the support structure **12***b* can be formed by bending two, long segments of concrete reinforcing wire into two generally sawtooth configurations comprising base portions **48***b* and side segments **46***b*. Then both sawtooth configurations of reinforcement wire are attached, typically through a weld, to top segments **44***b* and spacers **60***b* to form support structure **12***b*.

Each support structure **12***a* and **12***b* is configured to maintain a plurality of concrete dowel slip tubes **14** in a substantially parallel relationship to one another and parallel to a top surface **58** of concrete slab **42**. Additionally, the support structure **12***a* and **12***b* maintains the slip tubes in substantially coplanar relationship. Therefore, each top segment **44***a* or **44***b* is attached to a respective side segment **46***a* or **46***b* such that each top portion is in parallel alignment with each other. Additionally, side segments **46***a* and **46***b* are sized such that each respective top segment **44***a* or **44***b* is elevated above the ground **50** in the same plane. Therefore, each side segment **44***a* or **44***b* has a length of between about 2.5 inches to about 24.0 inches. Each top segment **44***a* or **44***b* is sized to receive the clip **32** of slip tube **14**. As such, the length of the top segment **44***a* or **44***b* is between about 6.0 inches to about 30.0 inches and are spaced along the support structure between about 6.0 to about 30.0 inches.

CONCRETE DOWEL SUPPORT FOOT

The concrete dowel placement apparatus **10** additionally comprises the support foot **18** as shown in FIGS. **3**, **4** and **5**. The support foot **18** supports the extended end **40** of support dowel **16**. As seen in FIG. **5**, the support foot **18** comprises a generally annular base portion **62** that supports a frustum shaped wall **64**. The wall **64** is provided with a plurality of openings **66** for access to the interior of the support foot **18** during pouring of concrete. Referring to FIGS. **4** and **5**, the support foot **18** is sized and configured to receive the support dowel **16** in at least one of a plurality of dowel engagers **68** formed about a top of the base portion **62**. The dowel engagers **68** are sized with an interior diameter slightly smaller than the outside diameter of the support dowel **16** in order to frictionally engage the support dowel **16**. Therefore, an engager **68** can “snap” onto the extended end **40** of support dowel **16**.

PREFERRED PLACEMENT METHODOLOGY

Now having described the components of the concrete dowel placement apparatus **10**, the function and method of using each component will be explained. Reference to the first embodiment of the support structure **12***a* will be made herein, yet it will be recognized that the second embodiment of support structure **12***b* can be interchanged with the first embodiment in the following description of use. First, slip tubes **14** are attached to the top segments **44***a* of the support structure **12***a* via clip **32** as previously described. The slip tubes **14** are typically spaced about 6.0 to 30.0 inches between adjacent members. Therefore, the slip tubes **14** can be placed on top segments **44***a* in any spacing configuration that achieves the desired distance between themselves. As seen in FIG. **1**, the slip tubes **14** are attached to every fourth top segment **44***a*, however in FIG. **4**, the slip tubes **14** are attached to every top segment **44***b*.

Next, the support structure **12***a* is positioned in the location where a sawcut **70** will be made in the monolithic concrete slab **42** after pouring and curing thereof. As seen in FIG. **3**, the support structure **12***a* is placed upon the ground surface **50** that supports the concrete slab **42**. The base portions **48***a* are substantially flush with the surface **50** in order to prevent tripping of workmen during pouring of the concrete slab **42**. Next, The support structure **12***a* is positioned to place a central axis “A” of the slip tubes **14** perpendicular to where sawcut **70** will be made after pouring of the concrete. Additionally, the support structure **12***a* is positioned such that the central axis “A” of the slip tubes **14** is parallel to the top surface **58** of concrete slab **42** after pouring thereof. As will be recognized to those of ordinary skill in the art, it is also possible to position the support structure **12***a* on ground surface **50** before the slip tubes **14** are attached thereto. As such, once the support structure **12***a* is in proper position and location, the slip tubes **14** are attached to top segments **44***a* as needed.

Before the concrete slab **42** is poured, the concrete support dowels **16** are inserted within a respective slip tube **14**. As previously described above, the support structure **12***a* is configured to support the slip tubes **14** and support dowels **16** inserted therein in a substantially parallel and co-planar relationship to one another, and parallel to the top surface **58** of concrete slab **42**. The support dowels **16** are slidable within a respective slip tube **14** in order to provide lateral displacement of the concrete slab **42** as will be further explained below. The extended end **40** of dowel **16** projects outwardly from the slip tube **14** such that the support structure **12***a* may become imbalanced and tend to tip toward surface **50**. If this happens, then support foot **18** is attached to the extended end **40** of dowel **16** to provide additional support thereto. The support foot **18** has a height which coaxially aligns a central axis "B" of support dowel **16** with the central axis "A" of slip tube **14** when support dowel **16** is attached to a respective dowel engager **68** of foot **18**. The dowel **16** must be easily slidable within the slip tube **14** for proper operation. Therefore, the central axis "A" of slip tube **14** must be coaxially aligned with the central axis "B" of support dowel **16** in order to prevent binding of the dowel **16** within tube **14** which may be caused since the sheath **20** is slightly larger than the diameter of the support dowel **16**. Additionally, support foot **18** aligns axis "B" of support dowel **16** to axis "A" of slip tube **14** during pouring of the concrete because the weight of the concrete can cause the support dowel to bend and therefor bind on sheath **20**. The weight of the concrete being poured onto dowel **16** may further act as a lever arm to pop the clip **32** off of the top segment **44***a*. As such, the support foot **18** provides support to extended end **40** to maintain slip tube **14** in parallel alignment with top segment **44***a* and to prevent clip **32** from releasing.

After having placed the dowels **16** into respective slip tubes **14**, the concrete slab **42** is formed by pouring concrete around the support structure **12***a*. The concrete encapsulates the support structure **12***a,* the exposed portion of the support dowel **16** and the foot **18** (if used). Since the foot **18** is provided with openings **66** formed therein, the concrete is able to fully surround and encapsulate foot **18**. Therefore, foot **18** (if used) can remain in place after the concrete has cured. Typically, the height of the support structure **12***a* is chosen to position the support dowels **16** midway between the top surface **58** of concrete slab **42** and the supporting ground surface **50**.

After the concrete slab **42** has cured, the sawcut **70** is formed on the top surface **58** of concrete slab **42** by sawing the slab **42** with standard concrete construction techniques. The sawcut **70** is located perpendicular to the central axis "A" of the slip tubes **14**. Additionally, the sawcut **70** must be located at the junction where the support dowel **16** enters the slip tube **14** (i.e., near the open end **22** of sheath **20**). Since the dowel **16** is longitudinally slidable within the slip tube **14**, the concrete slab **42** may be laterally displaced about sawcut **70**. The portion of the support dowel **16** extending within the slip tube **14** is allowed to move freely in a longitudinal direction, whereas the portion of the dowel **16** extending into the concrete slab **42** is frictionally retained therein. The closed end **24** of sheath **20** prevents the seepage of concrete thereinto such that the portion of dowel **16** within the slip tube **14** is freely slidable in a generally horizontal direction. Therefore, the sawcut **70** is placed at the junction between the dowel **16** and slip tube **14** since this is the location whereby the dowel **16** is freely slidable horizontally. However, the dowel **16** is not movable in a vertical direction within slab **42** because it is encapsulated by concrete or retained within slip tube **14**. Therefore, the dowel **16** can prevent buckling or angular displacement of concrete slab **34** in the area whereby dowel **16** is positioned.

The present invention accurately positions concrete support dowels **16** during the pouring of the monolithic concrete slab **42**. As such, the positioning and configuration of the slip tubes **14** can be easily and quickly changed by varying the size of slip tube **14** and corresponding concrete support dowel **16**, as well as the size of the slip tube support structure. Since it is preferable to fabricate both the first and second embodiments of the slip tube supporting structure (i.e., support structure **12***a* or **12***b*) from concrete reinforcing wire, the structures can be modified very quickly. For example, the length of the structures can be decreased by trimming the structures at a desired location. As such, the present invention provides an adaptable system for quickly and easily placing concrete support dowels **16** before pouring a concrete slab **42**.

Additional modifications and improvements of the present invention may also be apparent to those of ordinary skill in the art such as varying the configuration of the slip tube support structure **12***a* or **12***b* as well as other configurations for the clip **32** of slip tube **14**. Thus, the particular combination of parts described and illustrated herein is intended to represent only certain embodiments of the present invention, and is not intended to serve as limitations of alternative devices within the spirit and scope of the invention.

What is claimed is:

1. A concrete dowel slip tube assembly for use with a wire mesh support structure in maintaining planar constancy of a cured concrete slab, the assembly comprising:

a) an independent elongate tubular sheath member having a length dimension and comprising a continuous wall having a constant thickness throughout and forming a tubular hollow interior compartment having a constant cross-sectional dimension substantially throughout, said tubular sheath member having a closed distal end and an open proximal end opening into said compartment, and further with said wall having a clip attached thereto and extending longitudinally along the sheath member, said clip sized to extend along at least one-half of said length dimension and configured to frictionally retain said wire mesh support structure; and

b) an independent dowel member slidingly engageable within the hollow interior compartment, said dowel having a length dimension and a constant cross-sectional dimension wherein said length dimension and said cross sectional dimensions are less than said length and the cross sectional dimension of the hollow interior compartment, with said dowel having an external configuration complimentarily substantially identical to the hollow interior compartment of the sheath member.

2. A concrete dowel slip tube assembly as claimed in claim **1** wherein the clip extends longitudinally on the sheath member from about the distal end of the sheath member to the proximal end of the sheath member.

3. A concrete dowel slip tube assembly as claimed in claim **2** wherein the clip comprises first and second opposing prongs which define an arcuately contoured recess therebetween engageable to the wire mesh support structure.

4. A concrete dowel slip tube assembly as claimed in claim **1** wherein the clip comprises first and second opposing prongs which define an arcuately contoured recess therebetween engageable to the wire mesh support structure.

5. A concrete dowel slip tube assembly as claimed in claim **1** wherein the sheath member has a length of between about six inches and 30 inches.

6. A concrete dowel slip tube assembly as claimed in claim **1** wherein the interior compartment has a generally circular cross-sectional configuration and is of a diameter from about 0.5 inch to about 1.0 inch.

7. A concrete dowel placement apparatus comprising:

a) a wire mesh support structure placeable upon a support surface; and

b) a concrete dowel slip tube assembly comprising:

i) an independent elongate tubular sheath member having a length dimension and comprising a continuous wall having a constant thickness throughout and forming a tubular hollow interior compartment having a constant cross-sectional dimension substantially throughout, said tubular sheath member having a closed distal end and an open proximal end opening into said compartment, and further with said wall having a clip attached thereto and extending longitudinally along the sheath member, said clip sized to extend along at least one-half of said length dimension and configured to frictionally retain said wire mesh support structure; and

ii) an independent dowel member slidingly engageable within the hollow interior compartment, said dowel having a length dimension and a constant cross-sectional dimension wherein said length dimension and said cross sectional dimension are less than said length dimension and said cross sectional dimension of the hollow interior compartment, with said dowel having an external configuration complimentarily substantially identical to the hollow interior compartment of the sheath member.

8. The placement apparatus of claim 7 wherein the wire mesh support structure comprises:

a base portion for placement upon the support surface; and

an elevated portion including a plurality of top segments which extend in spaced, generally parallel relation to each other;

the placement apparatus including a plurality of sheath members whose clips are attachable to respective ones of the top segments.

9. The placement apparatus of claim 8 wherein the top segments are generally co-planar.

10. The placement apparatus of claim 9 wherein each of the top segments is elevated to a height of between about 2.5 inches and about 24.0 inches above the support surface when the base portion is placed thereupon.

11. The placement apparatus of claim 9 wherein the top segments are spaced from each other at intervals of between about 6.0 inches and about 30.0 inches.

12. The placement apparatus of claim 8 wherein the elevated portions of the wire mesh support structure comprises:

a plurality of V-shaped members attached to the base portion and arranged to define multiple opposed pairs, each of the V-shaped members defining an apex;

each of the top segments being attached to and extending between the apices of a respective pair of the V-shaped members.

13. The placement apparatus of claim 8 wherein:

the elevated portion includes a plurality of side segments which extend generally perpendicularly relative to respective ones of the top segments; and

the base portion includes a plurality of base segments which extend generally perpendicularly relative to respective ones of the side segments.

14. The placement apparatus of claim 7 further comprising a dowel support foot sized and configured to receive and support an end of the dowel member when extending from the interior compartment of the sheath member.

15. The placement apparatus of claim 14 wherein:

the interior compartment of the sheath member defines a first axis;

the dowel member defines a second axis that is coaxially alignable with the first axis when the dowel member is inserted into the interior compartment; and

the dowel support foot is formed to be of a height which maintains the coaxial alignment of the first and second axes when the dowel member is inserted into the interior compartment and the dowel support foot is placed upon the support surface and interfaced to the end of the dowel member protruding from the sheath member.

* * * * *