United States Patent

[11] 3,590,538

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[54] **PLUG CONSTRUCTION FOR USE WITH ANCHOR INSERTS SET IN CONCRETE**
16 Claims, 4 Drawing Figs.

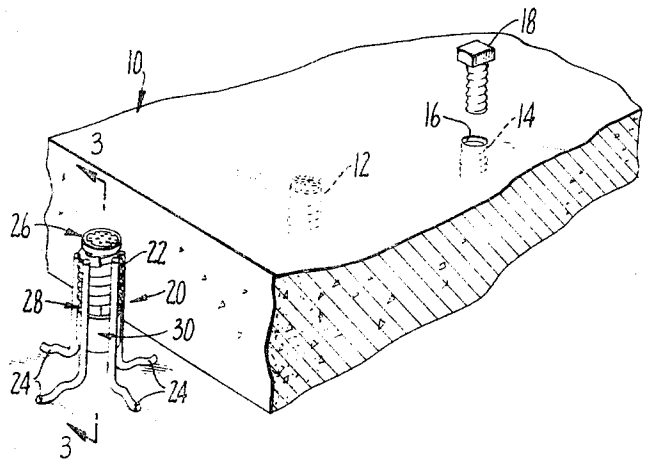
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[51] Int. Cl. **E04c 5/12,** E04g 21/12
[50] Field of Search 52/127, 125, 577, 699, 701, 705, 707, 708, 404, 302, 727, 310, 704, 98, 309, 221, 99, 100, 173; 249/63, 184, 186; 215/38, 48, 55

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1,143,429	6/1915	Mumford	52/705
1,365,718	1/1921	Ogden	52/705 X
2,497,928	2/1950	Cafiero	52/105 X
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2,880,608	4/1959	Boll et al.	52/699
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ABSTRACT: A pair of plugs designed for insertion into the opposite ends of a helical coil-type concrete anchor to prevent the intrusion of concrete into the anchor during pouring and provide for exposure of the anchor after the concrete has set. The plug for use in the end of the anchor to be exposed is of shell-like construction and carries an absorbent compressible material on its external end. The plug for use in the internal end of the anchor is made up of a body member threadably engageable in the anchor and a cuplike element designed to provide a void into which the body member may be displaced.



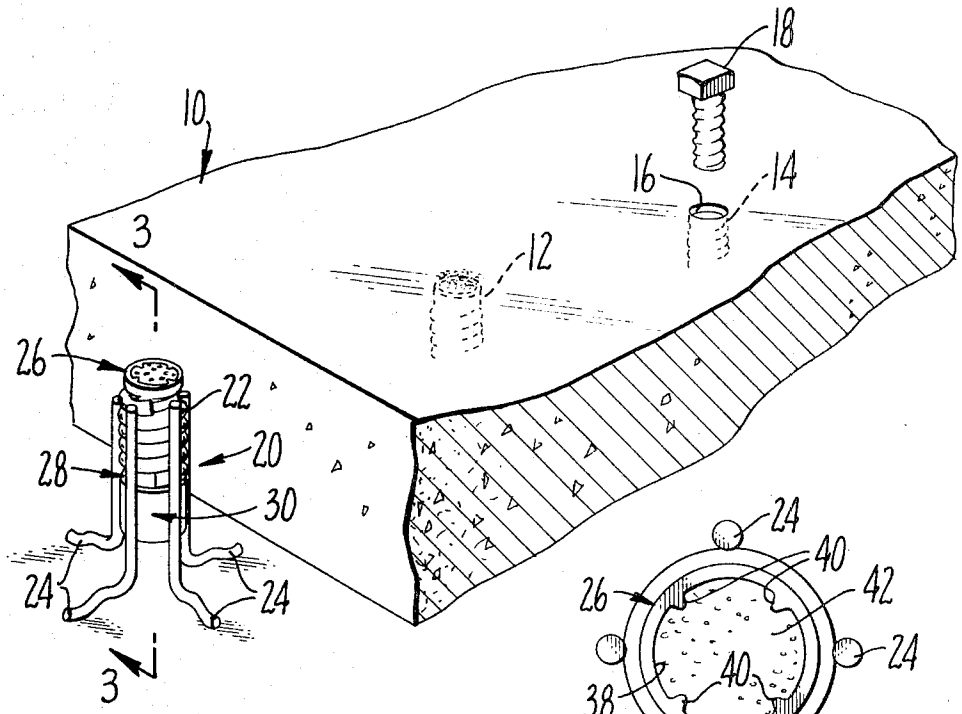


FIG. 1.

FIG. 4.

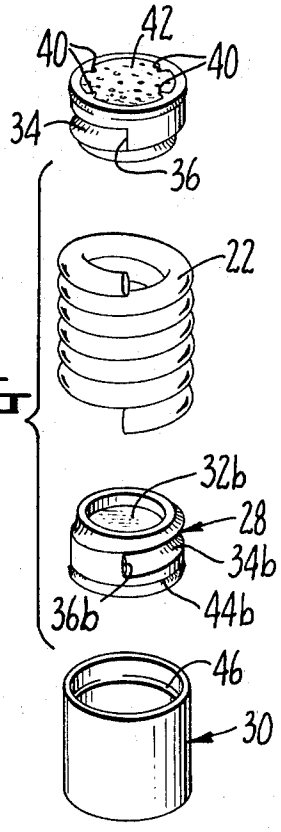


FIG. 2.

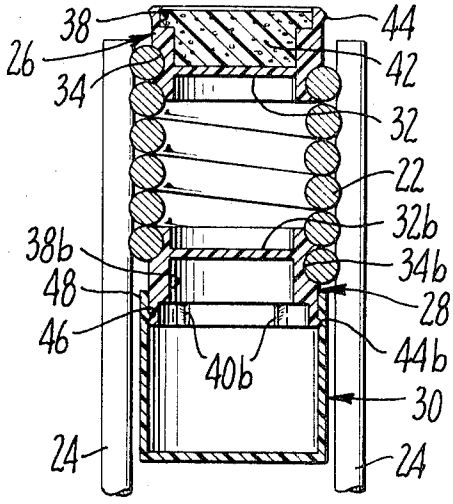


FIG. 3.

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PLUG CONSTRUCTION FOR USE WITH ANCHOR INSERTS SET IN CONCRETE

BACKGROUND OF THE INVENTION

The present invention relates to hardware for use in poured concrete construction and, more particularly, is concerned with a device for providing a void in a poured concrete structure into which a bolt or like object may be fastened.

In the prior art, anchors to provide threaded cavities in poured concrete structures are well known. These typically take the form of tightly wound helical coils which are placed prior to the pouring of the concrete and form an integral part of the ultimate structure.

In use, the helical coil type of insert requires some type of plug to prevent the intrusion of concrete thereinto during pouring. Many alternatives have been provided for this purpose. The simplest of these employ corks, as suggested by U.S. Pat. No. 1,365,718. Others employ sponge rubber inserts, as suggested by U.S. Pat. No. 2,880,608, while still others simply employ a bolt which is threaded into the insert prior to pouring. All of these techniques require removal of the plugging device prior to insertion of a bolt or like device into the anchor. Some anchoring devices also suggest the employment of a plugging medium which disintegrates upon the threading of a bolt into the anchor and, thus, need not be removed.

Prior art devices of the foregoing type possess various shortcomings. For example, those which employ simple corklike elements are subject to inadvertent displacement during handling, while those which rely on full boltlike cores are difficult to remove. Certain of these devices also have the disadvantage that they do not provide a void of sufficient volume in association with the anchor with which they are employed. All of these devices have the disadvantage that they make it difficult to locate and expose the anchor after a pour has set. This results because the devices are typically covered over with concrete and provide no visible evidence of their location or means to facilitate the removal of concrete therefrom. Certain of the devices also have the disadvantage that they occupy such a large volume as to impair the secure fixation of the anchor to the concrete structure.

SUMMARY

The present invention is concerned with an improved plug construction for use in combination with an anchoring insert of the type comprising an open-ended helical coil designed to be set in place within a body of concrete to provide for the threading of a bolt or the like into the body. In the preferred embodiment, the construction is made up of two plugs. One of the plugs comprises a body proportioned for snug receipt in the open end of the insert, which body has a recess therein disposed so as to be externally exposed upon receipt of the body within the insert and, a volume of compressible material received within and substantially filling the recess. The other of the plugs comprises a body proportioned for snug receipt within one end of the insert and a cup secured to and disposed to one end of said body to provide a void into which the body may be displaced. Ideally, the first of these plugs is employed in the end of the anchoring insert to be disposed immediately adjacent the surface of a concrete pour while the second is employed in the end of the insert to be disposed internally of the pour.

A principal object of the present invention is to provide a plug construction which avoids the aforenoted shortcomings of the prior art.

Another and more specific object of the invention is to provide a plug construction having a water-absorbent element disposed to leech moisture from concrete poured thereover so as to provide a weakened and discolored area in the concrete.

Still another object of the invention is to provide such a construction which is adapted to be positively interlocked with an anchor insert.

Yet another object of the invention is to provide such a construction which does not adversely interfere with the bonding of concrete to the insert.

A further object of the invention is to provide a plug construction which forms a complete void to the bottom of an insert employed therewith.

Another object of the invention is to provide a plug construction which facilitates the compression and breaking away of concrete which has hardened thereover.

These and other objects will become more apparent when viewed in light of the following detailed description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view illustrating an anchor insert having the plug construction of the present invention applied thereto and a concrete slab having inserts placed therein through the use of the plug construction.

FIG. 2 is an exploded perspective view of an anchor insert and the elements of the inventive plug construction, illustrating the manner in which the elements are assembled to the insert.

FIG. 3 is a sectional view of the assembled insert and plug construction illustrated in FIG. 1, taken on the plane designated by line 3–3.

FIG. 4 is a top plan view of the plug construction and associated anchor insert illustrated in FIG. 3.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

The concrete slab in FIG. 1 is designated by the numeral 10 and is shown as having a pair of anchor inserts 12 and 14 embedded therein. The insert 12 is illustrated as being covered by the surface of the slab, while the insert 14 is shown as being exposed through an opening 16 in the surface. A lag bolt 18 is shown in line with the opening 16 to illustrate the manner in which a bolt may be threaded into the anchor 14.

The anchor insert to the side of the slab illustrated in FIG. 1 is designated in its entirety by the numeral 20. It should be understood that this insert and the inserts 12 and 14 correspond identically in construction. The insert 20 is shown to one side of the slab to illustrate the manner in which an insert would be prepared and placed prior to the pouring of concrete. When the pour is complete, this insert would assume a condition corresponding to that shown for the insert 12.

The anchor inserts are of conventional construction and, as may be seen from the illustration of the insert 20, each comprises a tightly wound helical coil 22 having legs 24 welded thereto. The coil 22 is open ended and proportioned to threadably receive a lag bolt or the like, such as the bolt 18 shown in FIG. 1. The legs 24 terminate in laterally extending feet which provide for positioning of the insert in an upright condition prior to pouring.

The plug construction of the invention, as can be best seen from FIG. 2, comprises upper and lower cap elements 26 and 28, respectively, and a cup element 30. As seen in FIG. 2, these elements are shown cooperating with the coil 22 of the insert. In FIG. 2, the legs which are normally fastened to the coil have been omitted for the sake of illustration.

The cap element 26 comprises a shell-like body of generally cylindrical configuration having a membrane 32 extending thereacross. The body is proportioned for threadable receipt in the coil 22 and formed with an external helical thread 34 for this purpose. The upper boundary defining edge of the thread 34 defines a shoulder disposed for mating engagement with the uppermost convolution of the coil 22. A steplike surface 36 extends across the thread 34 for abutment with the distal end of the coil upon threading of the cap element 26 through one full convolution of the coil. The latter characteristic limits the degree to which the cap element 26 may be threaded into coil 22 and also aids in sealing of the cap element to the coil.

The upper end of the cap element 26 provides an extension disposed to extend above a coil in which the element is

received, as can be seen from FIG. 3. This extension is of a cylindrical cross section having an external diameter greater than the internal diameter of the coil and less than the external diameter of the coil. The latter characteristic permits concrete to flow over and set in place over the distal edges of the coil. The upper end of the extension is open and, together with the membrane 32, defines a recess 38. Wrench engageable lugs 40 are formed interiorly of the cavity for engagement by a wrench to facilitate turning of the element 26 into and out of threaded engagement with the helical coil of an insert.

The cap element 26 is completed by a volume of water-absorbent open-celled material 42 disposed and secured within the recess 38. In the preferred embodiment illustrated, this volume of material substantially fills the recess. Ideally, the material is a relatively soft open-celled composition, such as polyurethane, polyether or polyester. A very suitable material has been found to be that known as "Flexible Urethane" and marketed by the Upjohn Division of the C.P.R. Company under the specifications ASTM 1962 or ASTM-D-1564-62T. This material has a density of about 2 pounds per cubic foot.

The volume of soft absorbent material 42 functions to absorb water from concrete poured thereover and provide a compressible volume into which hardened concrete may be compressed in order to break it away. The advantages derived from these functions will become apparent from the following description.

The cap element 28 is of a shell-like construction identical to that of the element 26. It differs from the element 26 only in that the recess therein is not filled with an absorbent open-celled material, such as the volume of material 42. The parts of the cap element 28 are designated by numerals corresponding to those used to designate the parts of the element 26, followed by the subscript "*b*." These elements may be seen in FIGS. 2 and 3, as follows: membrane 32*b*; helical thread 34*b*; steplike surface 36*b*; and lugs 40*b*. It should be understood that the fabrication of the elements 26 and 28 with identical shell-like bodies has the advantage that the bodies may be interchanged and that tooling required for their production is minimized.

The shell-like bodies of the elements 26 and 28 are also identical in that they are each formed with an annular rib extending therearound. These ribs are designated, respectively, by the numerals 44 and 44*b*. The rib 44*b* is designed to cooperate with annular groove 46 formed internally of the cup element 30 to releasably secure the cup element to the cap element 28, as shown in FIG. 3.

The cup element 30 is provided with a thickened lip portion 48 in which the groove 46 is formed. This portion provides an area of reduced internal diameter at the edge of the element. The internal diameter of the cup element beneath this lip portion has a diameter greater than the diameter of the rib 44*b*. As a result of this overall arrangement, forcing of the cap element 28 to a point wherein the rib 44*b* passes beyond the groove 46 functions to release the cap element for relatively free movement into the interior of the cup element 30.

It is here noted that the cap elements 26 and 28 and the cup element 30 may be formed of any number of different materials. The primary requisite is that the material be substantially impermeable to intrusion by wet concrete. Ideally, the material should be as inexpensive as possible both from the standpoint of raw material and fabrication. A degree of resiliency is also desirable to facilitate threading of the cap elements into place and snapping of the cup element over the rib 44 on the cap element 28. High density nonporous polystyrene has been found a very satisfactory material for all of these reasons. It is also anticipated, however, that other materials, such as nonporous polyethalene, would prove equally as satisfactory.

In use, an anchor insert is first prepared by assembling the cap and cup elements into the condition illustrated in FIG. 1. This is accomplished by threading the cap element 26 into the upper end of the insert and the cap element 28 into the lower end of the insert and then snapping the cup element 30 over the element 28. Once the insert is so prepared, it is placed at the desired position in the concrete form so that the upper surface of the cap element 26 is disposed at or slightly below the ultimate finish level of the concrete. With the elements so placed, concrete is poured to the desired level, finished and permitted to set.

Most generally, the ultimate finish level is slightly above the upper surface of the cap element 26 and, accordingly, the element is covered with a thin layer of concrete. The volume of material 42 functions to leech the moisture from this layer to weaken and discolor it. As a result, after the concrete has cured, the anchor insert may be visually spotted and the thin layer of concrete thereover may be readily broken away. Once the layer is thus broken away, the cap element 26 is threaded out of place and discarded.

With the element 26 removed, the insert is in condition to receive a lag bolt or similarly threaded article. The bolt may pass freely into the coil of the insert and, upon abutment with the element 28, functions to unscrew this element and force it into the cup 30. Thus, the bolt may pass completely through the coil and into the void provided by the cup. It is noted that the cup is embedded in the concrete and that the internal void provided thereby permits the element 28 to be readily displaced thereinto.

While the present invention has been described primarily in use and environments wherein concrete is poured to a finished level covering the anchor insert and the cap elements, it should be understood that the invention has utility in any environment wherein it is desired to exclude concrete from the interior of an insert during pouring.

I claim:

1. An improved plug for use in combination with an anchoring insert of the type comprising a helical coil having at least one open end, said plug comprising:

a. a body proportioned for snug receipt within the open end of the insert and having a recess therein disposed so as to be externally exposed upon receipt of said body within the insert;

b. a volume of compressible material received within and substantially filling said recess; and,

c. protruding means on said body adapted to extend at least partially between and assume gripping engagement with the convolutional surfaces of the coil to prevent axial displacement of the plug from a coil within which the body is received during normal placement of the anchoring insert.

2. An improved plug according to claim 1 wherein the recess is generally cup shaped and a barrier is provided within the body to isolate the cup from the interior of an insert within which the body is received.

3. An improved plug according to claim 1 wherein the compressible material is open celled and water absorbent.

4. An improved plug according to claim 1 wherein the plug is provided with an extension disposed to extend generally axially from the insert upon receipt of the body therein, said extension having a cross section at least as great as the internal cross section of the coil and less than the external cross section of the coil.

5. An improved plug for use in combination with an anchoring insert of the type comprising a helical coil having at least one open end, said plug comprising:

a. an externally threaded body proportioned for threadable receipt within the open end of the insert and having a cuplike recess disposed so as to be externally exposed upon receipt of said body within the insert; and,

b. a volume of compressible material received within and substantially filling said recess.

6. An improved plug according to claim 5 further comprising an abutment disposed on the body for abutting engagement with the terminal end of the helical coil at the open end thereof to limit the extent to which the body may be threaded into the insert.

7. An improved plug according to claim 6 further comprising a helical shoulder on the body proportioned for engage-

ment with the outermost helix of the insert upon receipt of the body in the insert and wherein said abutment comprises an abrupt steplike surface on said shoulder.

8. An improved plug according to claim 5 further comprising wrench engageable means on the body to facilitate the turning thereof within the insert.

9. An improved plug for use in combination with an anchoring insert of the type comprising an open-ended helical coil designed to be set in place within a body of concrete to provide for the threading of a bolt or the like into the body, said plug comprising:

a. a body proportioned for snug receipt within one end of the insert; and,

b. a cup secured to and disposed at one end of said body to provide a void at the end of the insert in which the body is received into which the body may be displaced.

10. An improved plug according to claim 9 wherein:

a. the plug is provided with an extension disposed to extend generally axially from the insert upon receipt of the plug therein;

b. the cup is secured to and over said extension.

11. An improved plug according to claim 10 wherein the cup is secured to and over the extension by mutually engaged detent means disposed, respectively, internally of the cup and externally of the extension, said means being disengageable responsive to the displacement of the extension into the cup.

12. An improved plug according to claim 9 wherein the extension and cup each have an external cross section greater than the internal cross section of the insert and less than the external cross section of the insert.

13. An improved plug for use in combination with an anchoring insert of the type comprising an open-ended helical coil designed to be set in a body of concrete to provide for the threading of a bolt or the like into the body, said plug comprising:

a. an externally threaded body proportioned for threadable receipt within one end of the insert; and,

b. a cup secured to and disposed to one end of said body to provide a void to the end of the insert in which the body is received into which the body may be displaced.

14. An improved plug according to claim 13 further comprising an abutment disposed on the body for abutting engagement with the terminal end of the helical coil at the end thereof in which the body is received to limit the extent to which the body may be threaded into the insert.

15. An improved plug according to claim 14 further comprising a helical shoulder on the body proportioned for engagement with the outermost helix of the insert upon receipt of the body in the insert and wherein said abutment comprises an abrupt steplike surface on said shoulder.

16. An improved plug according to claim 13 further comprising wrench engageable means on the body to facilitate the turning thereof within the insert.