March 4, 1969 P. D. COURTOIS ET AL 3,431,012

ANCHOR INSERT AND PICKUP UNIT FOR A CONCRETE SLAB

Filed Oct. 23, 1967 Sheet 1 of 3

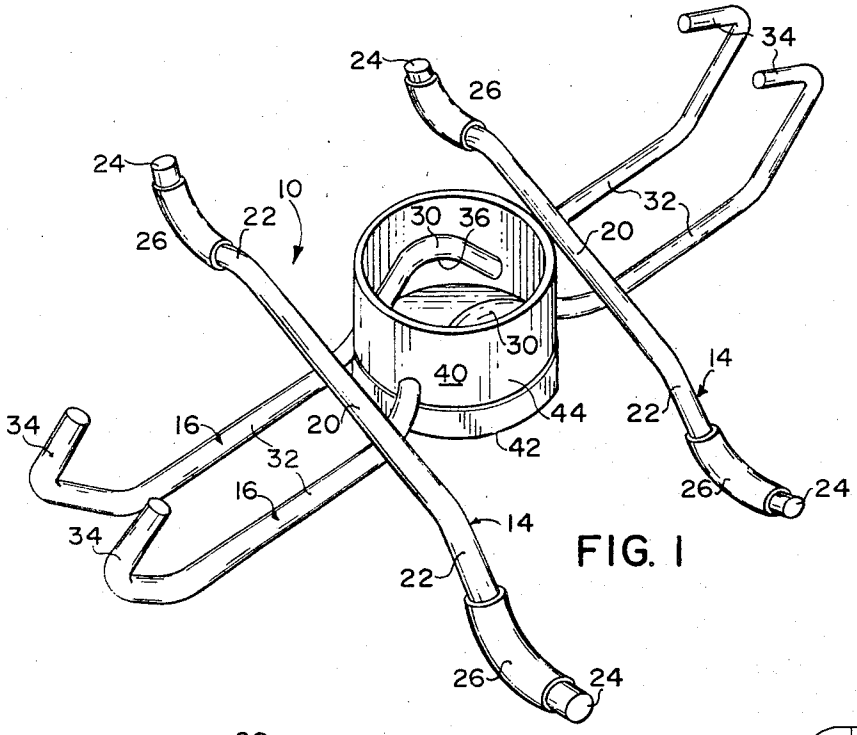

FIG. 1

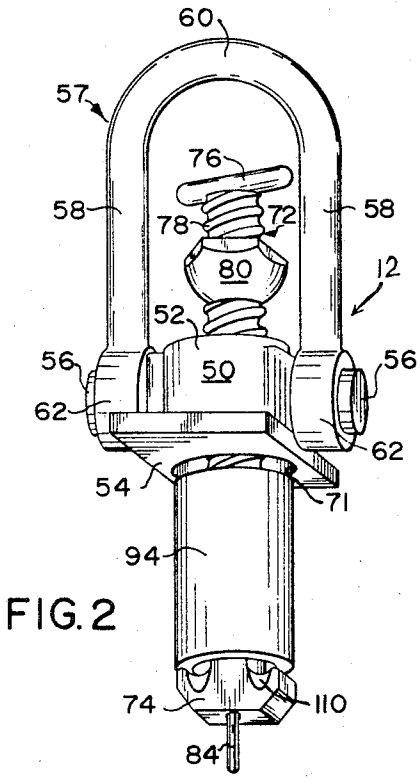

FIG. 2

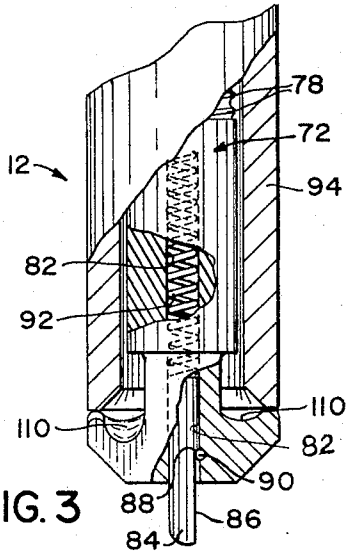

FIG. 3

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FIG. 5

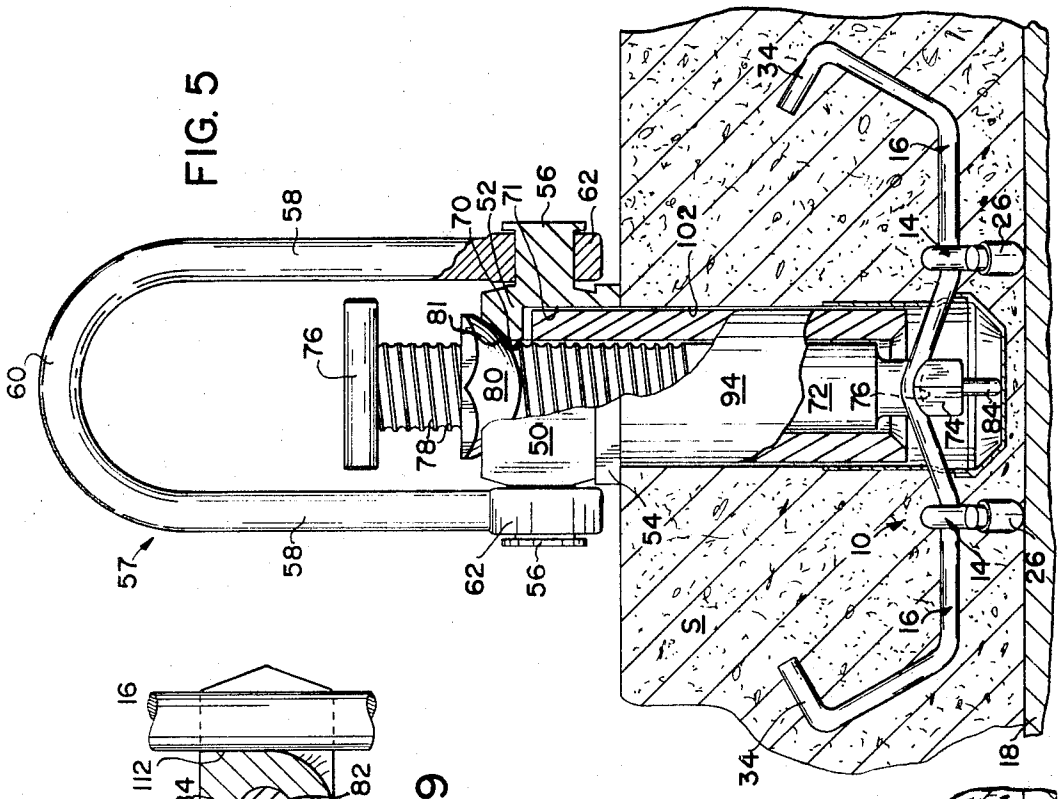

FIG. 9

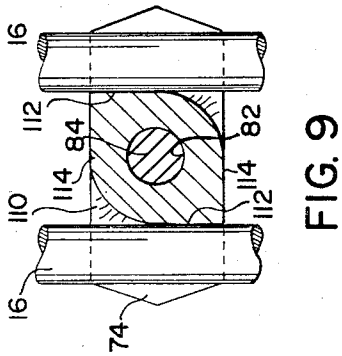

FIG. 4

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ANCHOR INSERT AND PICKUP UNIT FOR A CONCRETE SLAB

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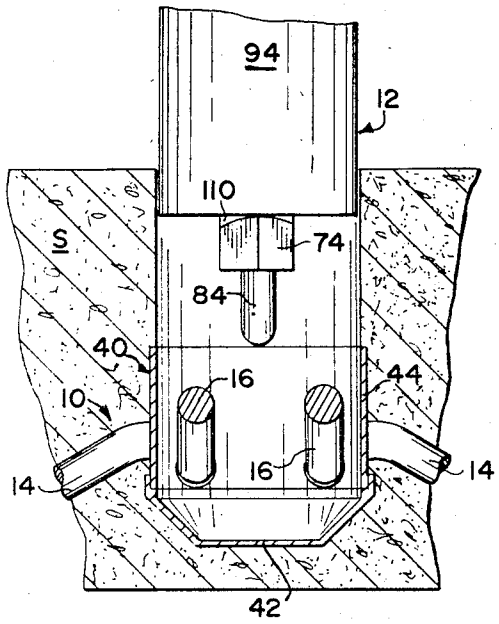


FIG. 6

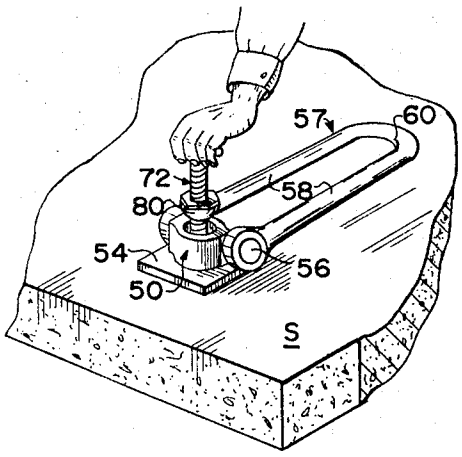
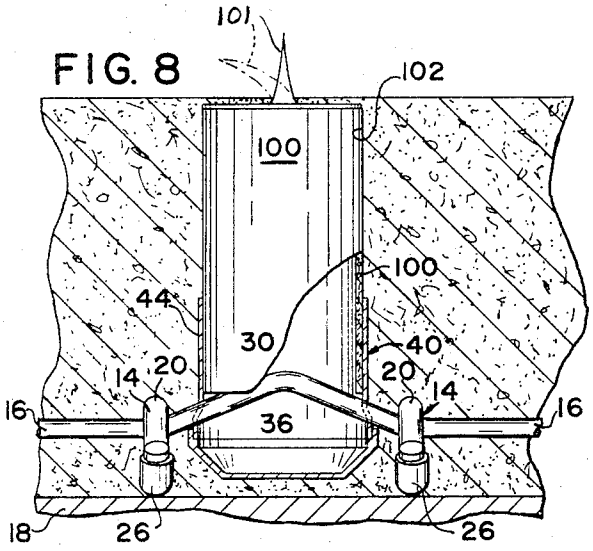


FIG. 7

FIG. 8



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ANCHOR INSERT AND PICKUP UNIT FOR A CONCRETE SLAB

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Filed Oct. 23, 1967, Ser. No. 677,400
U.S. Cl. 294—86 8 Claims
Int. Cl. E04b 1/60; B66c 1/10

ABSTRACT OF THE DISCLOSURE

An improved anchor insert adapted to be positioned on the foundation surface of a concrete slab form so that when concrete is poured into the form the insert becomes embedded therein, and an improved separate pickup unit including a torque stem which, when introduced through a hole in the concrete leading to the embedded insert and then twisted through an angle of 90°, becomes interlocked with the insert. A bail on the pickup unit enables the latter to be hoisted for slab-elevating purposes.

The present invention involves a novel and improved anchor insert and pick-up unit and is designed for use primarily in connection with the relocating of a preformed concrete wall slab by such a hoisting and tilting operation as to shift the slab from the original horizontal position in which it was formed to the final vertical position which it will assume when it constitutes one wall of a concrete building installation. Specifically, the invention is concerned with an anchor insert and pickup unit of the general type which is illustrated and described in our copending U.S. patent application Ser. No. 500,491, filed on Oct. 19, 1965 and entitled "Anchor Insert and Cable Pickup Therefor," and also of the particular type which forms the subject matter of our copending U.S. patent application Ser. No. 569,360, filed on Aug. 1, 1966 and entitled "Anchor Insert and Releasable Pickup Unit Therefor." The present anchor insert and pickup unit is an improvement upon and eliminates the disadvantages of the anchor inserts and pickup units of said applications.

Briefly, a combination anchor insert and pickup unit of the general type with which the present invention is concerned is comprised of two parts, namely, an anchor insert and a cooperating releasable pickup unit. The anchor insert is adapted to be embedded in one corner portion of the wall slab during formation of the latter and serves, in combination with similar anchor inserts in the other corner portions of the slab and after hardening of the poured concrete, as a medium whereby the slab may be detachably connected to a crane or similar hoisting mechanism to the end that the slab may be first raised while in a horizontal position and then tilted into a vertical position adjacent to a concrete floor slab in order to form a principal component of a building or other concrete structure. The cooperating pickup unit consists of a tubular, vertically elongated casting within which there is slidably disposed a locking stem having a T-head at its lower end. The T-head is receivable in the anchor insert and, by imparting a twisting or turning motion to the stem, the T-head may be caused to move into releasable interlocking relationship with respect to the anchor insert. After such interlocking of the T-head with the anchor insert, a nut which is threadedly received on the upper end of the stem may be tightened against the upper end of the casting in order to prevent release of the interlocked parts until such time as the nut is subsequently loosened. Means are provided on the casting

whereby the same may be attached to the associated overhead crane or other hoisting mechanism in order to raise the two interlocked parts, and consequently the slab, during actual hoisting and tilt-up operations.

The novelty of the present invention resides in the improvements which have been effected in both the anchor insert and in the cooperating releasable pickup unit as related to the anchor insert of our aforementioned patent application Ser. No. 500,491 and the pickup unit of our aforementioned patent application Ser. No. 569,360. Insofar as the anchor insert is concerned, a novel form of molded thermoplastic cage member replaces the former two-piece separately formed cage member for creating within the concrete slab the hollow void which is necessary to establish a path of entry for movement of the T-head into the confines of the anchor insert for locking purposes. Insofar as the pickup unit is concerned, a substantially complete redesigning of this unit eliminates the various disadvantages of the pickup unit of said copending patent application Ser. No. 569,360. Included in the redesigning is a novel form of securing nut and seat therefor which obviates the condition of binding of the parts when the slab with which the assembly is associated is lifted, the nut and its seat being self-aligning so that proper seating of the nut will always be attained and the locking stem will at no time be subjected to lateral stresses tending to dislodge the nut from its seat, the only stresses which are applied to the stem being truly longitudinal ones.

Numerous other improvements distinguish the present anchor insert and pickup unit from their respective predecessors and among these is the provision of a novel spring biasing means for effecting a detent action between the T-head of the pickup unit and its locking seat on the anchor insert, such biasing means being in the form of a spring which is entirely concealed within the T-head of the locking stem and is, therefore, shielded from contamination by foreign particles or objects which, otherwise, might become lodged between adjacent spring convolutions and thereby foul the operation of the biasing means.

The provision of an anchor insert and pickup unit such as outlined above and possessing the stated advantages constitutes the principal object of the present invention. Other objects and the various advantages and characteristics of the invention, not at this time enumerated, will readily suggest themselves as the nature of the invention is better understood 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 the claims at the conclusion hereof.

In the accompanying three sheets of drawings forming a part of this specification, one illustrative embodiment of the invention is shown.

In these drawings:

FIG. 1 is a top perspective view of the anchor insert component or part of the improved anchor insert and pickup unit constituting the present invention;

FIG. 2 is a bottom perspective view of the improved counterpart bail-equipped pickup unit which is designed for cooperation with the anchor insert of FIG. 1;

FIG. 3 is a fragmentary side elevational view on an enlarged scale showing specifically the T-head construction that is employed in connection with the pickup unit of FIG. 2;

FIG. 4 is a sectional view taken substantially centrally and vertically through the assembled improved anchor insert and pickup unit, and showing the anchor insert operatively embedded and installed in a concrete wall slab;

FIG. 5 is a vertical sectional view taken on the line 5—5 of FIG. 4, certain parts being left in elevation in order more clearly to reveal the nature of the invention;

FIG. 6 is a fragmentary exploded side elevational view illustrating the anchor insert and pickup unit in the positions which they assume immediately prior to effecting the interlock between such parts;

FIG. 7 is a perspective view of the pickup unit illustrating the manner in which it is manipulated when operatively applied to its counterpart anchor insert;

FIG. 8 is a vertical sectional view similar to FIG. 5 but showing the anchor insert in its embedded position within the poured concrete of the slab and prior to applaction thereto of the pickup unit; and

FIG. 9 is a horizontal section on the line 9—9 of FIG. 4.

Referring now to the drawings in detail and in particular to FIG. 1, the anchor insert **10** which is illustrated in this view is substantially identical to the anchor insert of our aforementioned copending patent application Ser. No. 500,491 but differs therefrom only with respect to the use of a certain molded plastic cage member in place of a formerly used two-piece interfitting metallic cage member as will be described presently. Functionally, but not structurally, the two cage members are identical. The anchor insert **10** is designed for embedment in a tilt-up type concrete wall slab S (see FIGS. 4, 5 and 7) and is adapted, in combination with similar inserts, to form a medium whereby said slag may be detachably connected to an overhead crane or other hoisting mechanism (not shown) in order that the slab may be raised bodily and subsequently tilted into a vertical position adjacent to a concrete floor slab in connection with the construction of a building or other concrete installation. Toward this end, the anchor insert **10** is designed for releasable cooperation with the novel pickup unit **12** which is illustrated in detail in FIGS. 2 to 7 of the drawings.

The anchor insert **10** involves in its general organization two crossed pairs of generally parallel rod sections **14** and **16**, the pairs being arranged in tic-tac-toe fashion and welded together at their regions of crossing. The rod sections of each pair are fairly widely spaced apart and constitute a support for the anchor insert as a whole in order that the insert may rest upon the foundation or upper surface of a slab form **18** (previously formed concrete floor slab) as best seen in FIGS. 4 and 5. The rod sections **16** are spaced apart more closely than the rod sections **14** of the anchor insert **10** and all of the rod sections constitute embedment rods which become widely distributed in the concrete wall slab S after a concrete pouring operation over the slab form **18**. The medial regions **20** of the rod sections **14** are linearly straight and extend horizontally while the end regions thereof are inclined downwardly as at **22** and then upwardly as at **24** to provide a pair of V-shaped foot portions which are covered at their apices with elastomeric sleeves **26**. The latter are provided for the purpose of covering or shielding said metal foot portions which otherwise would become exposed at the bottom surface of the concrete wall slab S and hence likely to leave rust marks on such surface due to corrosion of these metal foot portions.

The rod sections **16** of the anchor insert **10** are provided with inverted wide-angle V-shaped medial regions **30** which merge with linearly straight horizontal intermediate portions **32**. These intermediate portions merge with upwardly directed reentrant hook-like portions **34**. The apices of the inverted V-shaped medial regions **30** provide, in effect, downwardly facing thrust shoulders **36** which are designed for interlocking cooperation with counterpart shoulders on the associated pickup unit **12** in a manner that will be set forth in detail presently.

As best illustrated in FIGS. 1, 6 and 8, the medial regions of the rod sections **16** serve to support thereon a cup-shaped cage **40** which is formed of a suitable thermoplastic moldable material and is molded in situ directly on the rod sections **16** of the anchor insert **10**. The purpose of this cage is to create a void in the poured concrete in which the insert **10** is embedded, the void leading from the upper surface of the slab S downwardly into the central regions of the anchor insert so as to provide a path for entry of certain portions of the pickup unit when the latter is applied to the embedded anchor insert **10**. The cage **40** is provided with a dished bottom wall **42** (see FIG. 6) and a cylindrical side wall **44** through which project the V-shaped medial regions **30** of the two rod sections **16**. Various ways or means of applying the cup-shaped cage **40** to the medial regions of the rod sections **16** may be employed and one convenient way is initially to form the bottom wall section **42** as a separate unit at the factory, position the same within a suitable injection mold in the approximate position which it will assume in the completed anchor insert **10**, and then complete the molding operation wherein the cylindrical side wall **44** is formed about the medial regions of the two rod sections **16**. In this manner, the cup-shaped cage emerges from the mold as a one-piece member or element and no voids are left in the vicinity of the points of entry of the rod sections **16** into the member so that when concrete pouring operations are resorted to the wet concrete is excluded from entering the cup-shaped cage **40**.

The pickup unit **12** of the present invention is shown in its free state in FIGS. 2 and 3, and is shown in cooperation with its counterpart anchor insert **10** in FIGS. 4 and 5. It embodies a generally tubular, normally vertically extending forging or casting **50** including a main tubular body portion **52** from the lower rim of which there extends a flat rectangular seating flange **24**. Two diametrically opposite trunnions **56** overhang the longitudinal side edges of the seating flange **54**, are formed integrally with and project outwards in opposite directions from the body portion **52**, and serve pivotally to support a U-shaped lifting bail **57** having parallel arms **58** which are connected together at their proximal ends by a semi-circular bight portion **60**, the arms being provided at their distal or outer ends with eyelets **62** which encompass the trunnions **56** and serve pivotally to connect the bail **57** to the body portion of the casting **50**. The bight portion **60** of the bail is designed for cooperation with a suitable lifting hook, a fragment of which is illustrated at **64** in FIG. 4 of the drawings, the hook being associated with an overhead crane or other hoisting mechanism by means of which the pickup unit may be raised after it has been operatively applied to and interlocked with the associated anchor unit **10** in the hardened concrete slab S for slab-hoisting purposes as will be set forth in greater detail subsequently.

The casting **50** of the pickup unit **12** is formed with a central vertical bore **70** and an enlarged counterbore **71**. The pickup unit **12** comprises, in addition to the casting **50**, a normally vertically extending, elongated torque stem **72** which projects loosely through said bore and counterbore. The lower end of the torque stem **72** is formed with an integral T-head **74** which cooperates for locking purposes with the V-shaped medial regions **30** of the parallel rod sections **16** of the anchor insert **10** as will be described presently. The upper end of the torque stem **72** is provided with a transversely extending, fixedly mounted operating handle **76** by means of which the stem with its T-head **74** may be turned in either direction. The upper and central regions of the stem **72** are formed with a comparatively coarse external or male screw thread **78** (commonly known as a contour thread) while the remaining lower portion or region of the stem is truly cylindrical. A locking nut **80** is threadedly received on the male or contour screw thread **78** on the stem **72** and is captured thereon by means of the handle **76** which prevents its removal. The nut **80** has a frusto-spherical bottom surface

and cooperates with a frusto-spherical seat **81** which is formed at the upper rim or end of the bore **70**.

As best shown in FIG. 3, the lower portion of the torque stem **72** is hollow, which is to say that it is formed with a relatively deep, axially disposed socket **82** within which there is slidably disposed a generally cylindrical, normally vertical plunger **84**. The latter has at its lower end region a flat vertical surface **86** which defines at its upper end a shoulder **88**. Such shoulder cooperates with a horizontal pin **90** to form means whereby the plunger **84** is captured within the socket **82** against dislodgment. The pin **90** is mounted in a transverse hole in the lower end of the torque stem **72** and is held in place by way of a drive fit. A helical compression spring **92** is disposed within the upper portion of the socket **82** and yieldingly urges the plunger **84** to the projected position in which it is illustrated in FIGS. 2 and 3. A sleeve-like cylindrical pilot bushing **94** loosely surrounds the torque stem **72** and is interposed between the casting **50** and the T-thread **74**. The upper end of the bushing **94** is loosely received within the counterbore **71** as clearly shown in FIG. 5, the extent of projection of the bushing into the counterbore being dependent upon the extent of threaded engagement between the torque stem **72** and the frusto-spherical nut **80**. The lower end of the bushing rests on the T-head **74** when the pickup unit **12** is not in connected relation with the anchor insert **10**. It is contemplated that the bushing **94** will be made in varying lengths in order to accommodate varying thicknesses of concrete slabs, the bushing functioning as a guide sleeve to effect proper introduction of the pickup unit **12** into the concrete-embedded anchor insert **10** during application of the former to the latter.

In the operation of the herein described anchor insert and pickup unit, in order to form a concrete slab such as the wall slab S, the slab form is erected in the usual manner, and at each location within the form where an anchor point is to be effected in the finished slab an anchor insert **10** with its plastic cage **40** molded in position thereon is positioned on the form foundation **18** with the four elastomeric sleeves **26** resting upon the upper surface of such foundation. An inverted, cup-shaped, concrete-excluding shield **100** which is formed of a suitable resilient plastic material is positioned in the upper rim region of the cage **40** of each insert so that it projects vertically upwardly to the level of the upper surface of the slab to be formed and this shield precludes the entrance of poured concrete into the interior of the cage **40**. The shield is provided with an upstanding flexible locating prong or finger **101** on the top wall thereof which projects above the level of the upper surface of the slab to be formed. The concrete is then poured into the form to the desired height or thickness and then subjected to the usual screeding operation to level the upper surface of the slab. During the screeding operation, the flexible prongs or fingers **101** yield to passage of the screed board thereover as indicated in dotted lines and, after each prong is released, it returns to its erect condition. The prongs serve as locating elements which enable the sleeves **100** to be detected and removed from the hardened concrete for subsequent reuse in a succeeding installation. Removal of the sleeves **100** leaves cylindrical passages or holes **102** in the concrete and in vertical register with the cup-shaped cages **40**. The anchor inserts **10** are then ready for interlocking cooperation with the corresponding counterpart pickup units **12** for hoisting purposes, such cooperation being effected by lowering the units **12** endwise downwardly through the cylindrical holes **102** and manipulating the torque stems **72** in a manner that will be described in detail.

Lowering of each pickup unit **10** as described above is accomplished by the operator who utilizes the bail **57** as a handle to align the pilot sleeve or bushing **94** with the selected hole **102** in the concrete slab S, the T-head **74** being oriented as shown in FIG. 6 so that it will pass freely between the two inverted V-shaped medial regions **30** of the rod sections **16** of the anchor insert **10** and extend into the upper end of the open-ended cage **40**. The lower end of the free floating pilot bushing **94** will enter the upper rim of the cage **40** as the pickup unit **12** is progressively lowered while the lower end of the biasing plunger **84** will engage the foundation surface **18**. Thereafter, as shown in FIG. 7, the operator will apply downward pressure to the torque stem **72** in order to force the same downwardly against the yielding action of the spring-biased plunger **84** and cause the T-head **74** to become lowered below the level of the V-shaped medial regions **30** of said rod sections **16**, thus compressing the spring **92**. As soon as the T-head has thus cleared these medial regions **30**, the operator will turn or twist the stem **72** in a clockwise direction so as to bring the axis of the T-head into transverse relationship with respect to the vertical planes of the rod sections **16**, at which time the T-head will underlie the medial regions **30** of the rod sections **16** so that, upon release of the stem **72**, the spring-biased plunger **84** will raise the torque stem **72** to the position wherein it is illustrated in FIGS. 4 and 5 with the upper faces of the T-head on each side of the stem **72** bearing upwardly against the medial regions **30** of the rod sections **16**.

In order to maintain such interlocking relationship between the T-head **74** and the rod sections **16**, recesses **110** are formed in the end portions of the upper side of the T-head, the extreme apices of the V-shaped medial portions **30** of the rods **16** seating within these recesses after manual pressure on the stem **72** has been discontinued. The recesses **110** establish lift shoulders which are designed for engagement with the downwardly facing thrust shoulders that are established by the apices of the V-shaped medial regions **30**. It is to be noted at this point that, as illustrated in FIG. 9, the cross sectional shape of the torque stem **72** immediately above the T-head **74** is non-circular, the lower region of the stem being provided with two oppositely disposed flats **112** which, when the T-head **74** is disposed below the level of the medial regions **30** of the rod sections **16**, are adapted to engage the sides of said medial regions and limit the extent of clockwise turning movement of which the torque stem **72** is capable. Similarly, two oppositely disposed flats **114** on the lower region of the torque stem limit the extent of counterclockwise turning movement of which the stem is capable. The flats **114** are positioned at right angles to the flats **112** and form with the latter two diametrically opposite square corners, the other two corners being rounded or convexly curved as shown in FIG. 9. The four flats **112** and **114** coact to restrict the angular turning movement of the torque stem **72** to approximately 90° when the T-head is below the level of the medial regions **30** of the rod sections **16** so that the operator may not inadvertently overrun the proper locking position of the T-head and also so that he may not overrun the release position of the T-head when disconnecting the pick-up unit **12** from the embedded anchor insert **10**.

At such time as the interlocking relationship between the T-head **74** and the rod sections **16** has been established, the operator will then screw the frusto-spherical nut **80** downwardly on the stem **72** in order to draw the latter upwardly under tension and positively lock the T-head in position against dislodgment. The nut, in addition to serving as a locking element, further serves as a reaction member to assimilate the upward thrust of the casting **50** when the latter is lifted upwardly by the bail **57** under the influence of the aforementioned overhead crane or other hoisting mechanism. At such time as the crane hook **64** has been attached to the bail **58** and hoisting operations have commenced, the stem **72** and the nut **80** will assimilate the entire downward pulling force of the anchor insert **10** and the mass of hardened concrete wall slab S which is served by the particular involved embedded anchor.

After the slab S has been hoisted to the vertical posi-

tion which it assumes in the wall installation, release of the interlocking connection between the pick-up unit **12** and the anchor insert **10** may be effected by backing off of the nut **80** to such an extent that downward pressure upon the torque stem will permit lowering of the same against the yielding action of the plunger **84** so as to force the T-head out of engagement with the medial regions of the two rod sections **16**. The torque stem **72** may then be rotated 90° by the operator in a counterclockwise direction so as to cause the flats **114** to engage the sides of the medial regions **30** of said rod sections **16**, at which time the T-head will assume an angular position of register with a narrow space existing between these two rod sections, whereupon the entire lower region of the pickup unit **12** may be withdrawn upwardly and axially from the anchor insert **10** and also the hole **102** through which it was initially introduced. Removal of the pick-up unit **12** from the anchor insert **10** exposes the hole **102** which may then be filled with a suitable patching cement or be otherwise plugged. The removed pick-up unit is thus available for reuse in a subsequent slab pickup operation in connection with a different wall installation.

It is to be noted that by reason of the frusto-spherical nut **80** and its cooperating frusto-spherical seat **81**, slight discrepancies in pulling alignment of the hoisting chain or cable that is associated with the overhead crane and the axis of the torque stem **72** will be accommodated without danger of unequal pressure being exerted upon the upper face of the concrete wall slab S during hoisting operations. As shown in FIG. 5, an appreciable clearance is provided between the threaded torque stem **72** and the surrounding bore **70** in the casting **50**. Thus, in an instance where the anchor insert **10** does not seat squarely on a horizontal foundation surface, there may be as light tilting of the torque stem after it has become interlocked with the insert. By utilizing a frusto-spherical nut and cooperating frusto-spherical seat, such misalignment of the torque stem **72** may be accommodated and equal pressure of the seating flange **54** on the upper face of the concrete wall slab S will be attained. Otherwise, where unequal pressure is applied to a corner region of a freshly hardened slab, there is danger of fracturing of the concrete.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit or scope of the invention. Therefore, only insofar as the invention is particularly pointed out in the accompanying claims is the same to be limited.

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

1. In combination, an anchor insert adapted for embedment in a concrete slab and a cooperating pickup unit therefor, said anchor insert comprising a concrete-excluding cage across and through which there extends a pair of parallel rods defining downwardly facing spaced apart thrust shoulders, said cage presenting an open upper rim, said pickup unit comprising a tubular body having a flat underneath surface adapted to be positioned on the upper surface of the slab and also having formed therethrough a central vertical bore designed for vertical register with said open upper rim of the cage when the tubular body is in position on the slab, a vertical threaded torque stem projecting completely and loosely through said bore and provided with a T-head at its lower end, said T-head defining a pair of upwardly facing lift shoulders disposed on opposite sides of the stem and designed for interlocking engagement with said downwardly facing thrust shoulders when the stem is projected through said open rim to an extent sufficient to project the T-head below the level of and between said parallel rods and then turned through an angle of approximately 90°, the upper rim of said bore being flared to provide a frusto-spherical seat, a frusto-spherical nut threadedly received on the upper region of said stem, designed for mating engagement with said seat, and adapted when tightened to draw the stem upwardly to thus pull the lift shoulders hard against said thrust shoulders, and a bail pivoted to said tubular body and forming means whereby the pickup unit may be attached to an overhead hoisting mechanism.

2. The combination set forth in claim **1** and wherein said cage is in the form of a relatively deep cup-shaped shell of molded plastic material and has a cylindrical side wall which establishes said open upper rim, said parallel rods projecting through said side wall in chordal fashion and having the cage side wall bonded thereto at the points of entry of the rods where the latter project through said side wall.

3. The combination set forth in claim **1** and including, additionally, a cylindrical pilot bushing loosely surrounding said torque stem, interposed between the tubular body and the T-head, and adapted for projection through a preformed hole in the slab in register with the open upper rim of the cage.

4. The combination set forth in claim **3** and wherein said bore in the tubular body has associated with it an enlarged counterbore which opens downwardly and is adapted to receive the upper end of the pilot bushing when the frusto-spherical nut is tightened against its cooperating frusto-spherical seat.

5. The combination set forth in claim **1** and wherein the lower region of the torque stem is formed with a vertically disposed elongated axial socket which faces downwardly and projects completely through the T-head, and the pick-up unit embodies, additionally, a biasing plunger slidable in said socket and projecting downwardly below the lower end of the T-head, spring means yieldably biasing said plunger to its projected position, and interengaging means on the plunger and torque stem for preventing withdrawal of the plunger from said socket.

6. The combination set forth in claim **5** and wherein the interengaging means comprises a shoulder on the plunger and a cross pin projecting across said socket and engageable with the shoulder on the plunger.

7. The combination set forth in claim **1** and including, additionally, means effective when said torque stem is projected between said parallel rods for limiting the extent of turning movement of which the stem is capable to a maximum 90°.

8. The combination set forth in claim **7**, wherein said means for limiting the extent of turning movement of the stem comprises a pair of shoulders on the torque stem, one of which is engageable with one of said parallel rods to limit turning of the stem in one direction, and the other of which is engageable with the other parallel rod to limit turning of the stem in the opposite direction.

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U.S. Cl. X.R.

52—125, 706; 294—92