DUAL ANCHORING INSERT FOR A TILT-UP CONCRETE SLAB OR THE LIKE

Inventor
Harry G. Ballou

By [Signature]
Att'y.
DUAL ANCHORING INSERT FOR A TILT-UP CONCRETE SLAB OR THE LIKE

Harry G. Ballou, San Leandro, Calif., assignor to Superior Concrete Accessories, Inc., Franklin Park, III., a corporation of Delaware
Filed Mar. 5, 1963, Ser. No. 262,918

1 Claim.

(CL. 52—705)

The present invention relates generally to wire-formed inserts for concrete slabs and has particular reference to an anchoring insert which is designed for use in connection with a concrete wall slab of the tilt-up variety wherein the insert, which is formed for the most part of wire and rod stock, is adapted to be embedded in one corner portion of a wall slab during formation of the latter and serves, in combination with similar inserts formed at other portions of the slab and after hardening of the 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 next to a concrete floor slab in connection with the erection of a building. An insert embodying the present invention is not, however, limited to such particular use and may find use wherever an anchor point is required in a concrete slab or other structure undergoing formation. Irrespective of the particular use to which the invention may be put, the essential features thereof are at all times preserved.

As exemplified by United States Patent No. 2,794,336, granted to me on June 4, 1957 and entitled "Lag Screw Anchoring Insert for a Concrete Slab," an insert of the general character with which the present invention is concerned includes, as its principal components, a nut-like, wire-formed helix to which there is welded a wire-supporting structure by means of which the helix may be supported from a foundation surface so that it assumes an elevated position above such foundation surface, the entire assembly assuming the general form of a chair. When the concrete is poured, the chair-like insert becomes embedded in the concrete and the helix assumes a position wherein it extends at right angles to the upper face of the poured slab and its upper end is substantially flush with said upper face of the slab to the end that it may receive therein the shank portion of a lag screw or other screw-type attaching device. This form of insert exposes the helix through the upper face of the concrete slab so that the stresses involved, upon lifting of the slab, are vertical. The anchoring insert of the present invention differs from the anchoring insert of the aforementioned patent in that it is adapted to be positioned in the wall slab form with the axis of the helix extending horizontally so that, after the concrete is poured and has become hardened, the outer end of the helix is exposed through an edge of the slab for lag screw receiving purposes.

When lifting stresses are applied to an anchor insert through an edge of the wall slab, the moment of force which is applied to the helix by the lag screw is translated into torque, thus tending to tilt the helix from its position of parallelism with the horizontal upper face of the wall slab in which the anchor insert is embedded, the involved forces are very great, and, therefore, it is necessary to provide reaction means to counteract this tendency of the helix to tilt in the concrete especially when the latter is green or only partially hardened. This is particularly true because the wall slab tilt-up operation is usually performed before the concrete has become fully hardened and seasoned. To distribute these tilting forces throughout a greater area of the slab, outrigger extension in the form of wire loops have been welded to the helix so that they extend in a plane which is coincident with the axis of the helix. While these loops are helpful in relieving the helix from some of the tilting forces which are applied thereto, they exert their influence in the upper regions of the slab only.

When a wire-formed anchor insert of the character under consideration is employed in connection with a tilt-up type wall slab and exposed through one side edge of the slab, it is necessary that the wire helix assume its horizontal position within the horizontal slab at a region near the upper face of the slab so that a more efficient handling of the slab by the hoisting mechanism may be effected. With conventional anchoring inserts designed for this purpose, the inserts find no support in the lower regions of the slab and, therefore, when the weight of the slab is supported on the helices of the inserts during lifting operations, the danger exists that the relatively thin upper strata of the slab will break away from the remainder of the slab under the influence of the upward thrust which is exerted by the helices and their outrigger extensions when the helices are used for lifting purposes. The present invention obviates this danger of slab cleavage or breakage by providing an outrigger support which, in addition to reinforcing the helix against angular tilting within the slab, as heretofore described, lends support to the helix from the lower regions of the horizontally disposed wall slab so that upward pull on the helix in connection with a lifting operation will have a reaction thrust both near the surface of the slab and down deep in the slab near the latter's lower horizontal face. The provision of such an anchoring insert constitutes one of the principal objects of the present invention.

In carrying out this object, the invention contemplates the provision of an anchoring insert wherein two helices are provided, and that the two helices are connected together in spaced relationship by means of a combined tie and anchor rod, the rod being so termed because it serves the dual function of supporting the two helices, each from the other, and of forming a deep anchor for the two helices within the lower region of the horizontal concrete slab.

It is another object of the invention to provide an anchoring insert of the dual helix type and wherein the combined tie and anchor rod that forms a part thereof constitutes the sole connecting means between the two helices, thus creating an insert which is of unitary construction by reason of the fact that it constitutes a rigid assembly of parts and, in addition, is capable of being fabricated at the factory for shipment to the field for use in its manufactured form.

Another object of the invention is to provide a dual anchoring concrete wall slab insert which is an improvement upon, and has certain inherent advantages over, the insert which is disclosed in, and forms the subject matter of, my copending United States Patent application Serial No. 192,772, filed on May 7, 1962, now Patent No. 3,181,276 and entitled "Dual Anchoring Insert for a Concrete Slab."

With these and other objects in view, which will become more readily apparent as the following description ensues, the invention consists in the novel construction, combination and arrangement of parts shown in the accompanying two sheets of drawings forming a part of this specification.

In these drawings:

FIG. 1 is a perspective view of a dual anchoring insert constructed according to the principles of the present invention;

FIG. 2 is a fragmentary top plan view illustrating one of the two helices of the improved anchoring insert, together with the adjacent portion of the combined tie and anchor rod that is associated therewith;
FIG. 3 is a front elevational view of the structure that is shown in FIG. 4; FIG. 4 is a side elevational view of the structure that is shown in FIG. 2.

FIG. 5 is a fragmentary vertical sectional view taken through a tilt-up type concrete wall slab 12 in the vicinity of certain embedded anchoring inserts showing the slab and inserts mounted within a slab form and also showing in dotted lines the slab after it has been connected to a harness on an overhead hoisting mechanism and then raised as a preliminary to tilting; and

FIG. 6 is a fragmentary top plan view of a slab form showing a number of the improved anchoring inserts operatively installed therein prior to a concrete-pouring operation.

Referring now to the drawings in detail, the anchoring insert which is disclosed therein constitutes a preferred form or embodiment of the invention and is designated by the reference numeral 10. This insert, is adapted, with similar inserts (see FIGS. 5 and 6), to be embedded in a tilt-up type concrete wall slab, such, for example, as the slab 12 (see FIG. 5), and to form with such similar inserts a medium whereby the slab may be detachably connected to a crane or other overhead hoisting mechanism to the end that it may be raised and then tilted into a vertical position next to a concrete floor slab in connection with the construction of a building or other concrete structure.

Insofar as the actual handling of the slab 12 is concerned, various methods of raising the slab and then tilting it are currently in use. For a better understanding of the present invention, reference may be had to aforementioned patent No. 2,794,336 for one exemplary method of handling the wall slab. Briefly, and as described in this patent, the wall slab 12 is formed by pouring wet concrete over the surface of a previously formed floor slab 14. A layer or film 15 of nonadhesive material is applied to the top surface of the concrete floor slab 14 so that the concrete of the wall slab 12 when hardened, may readily be lifted from the slab floor for placement or positioning purposes. The floor slab 14 rests on a fill or foundation 16 at the site where the building or other structure is undergoing erection. Prior to pouring of the concrete for the wall slab 12, the insert 10 and its associated similar inserts are placed over the hardened concrete of the floor slab 14, preferably at the corner regions thereof, as shown in FIG. 6, and the concrete is then poured to form the wall slab 12. As will be described in greater detail presently, such positioning of the inserts over the floor slab 14 and retention of the inserts in the interior of the forming concrete during operations, is facilitated by anchoring the inserts to the wall slab form boards 18 by means of elongated lag screws 20 which pass through holes 22 in the boards 18 at appropriate locations. Portions of the inserts 10 may also be caused to rest upon any transverse reinforcing rods, such as the rods 24, which may be employed in the installation, but if no such rods are present in the immediate regions where the inserts are to be placed, the lag screws 20 alone will suffice properly to support the inserts in the concrete form.

After the inserts are in position within the wall slab form, the concrete is then poured to form the wall slab 12. After the concrete is hardened and the lag screws 20 and form boards 18 have been removed, the wall slab 12 with the anchoring inserts embedded therein is in readiness to be raised, and then tilted, into a vertical position next to the floor slab 14 or elsewhere as desired. Referring now to FIGS. 1 to 4, inclusive, the anchoring insert 10 which constitutes the present invention is of a composite nature, but nevertheless, is a unitary structure, and for the purpose of the following description, it will be considered as being embedded in one corner region of the wall slab 12 while the latter is horizontally positioned over the concrete floor slab 14. The insert 10 involves in its general organization a pair of nut-like wire helices 30, each of which has welded thereto an outrigger wing structure 32. The two helices, together with their respective wing structures 32 are connected together by a combined tie and anchor rod 34, this rod completing the assembly and constituting the principal feature of the present invention. The composite anchoring insert 10 thus consists of but five independently fashioned parts, namely, the two helices 30, the two wing structures 32, and the combined tie and anchor rod 34.

In manufacturing the anchoring insert 10, the helices 30 and their respective wing structures 32 are assembled together as identical sub-assemblies, and thereafter, the rod 34 is applied thereto to complete the insert. The sub-assemblies being thus identical, a description of one of them will suffice for the other. The wire helix 30 of each sub-assembly is tightly wound, which is to say that adjacent convolutions thereof abut against each other under considerable pressure. The helix extends horizontally when it is in its operative position within the wall slab 12 while the latter is on the floor slab 14. It is disposed within the confines of the concrete wall slab 12 and the outer end thereof terminates either flush with or a slight distance inwards of the end edge 40 of the wall slab 12 (see FIG. 5). The helix as a whole is disposed an appreciable distance above the lower side face 42 of the wall slab and is disposed a lesser distance below the upper side face 44 of the slab. The interior of the helix 30 defines an internal or female screw thread designed for reception therethrough of the shank portion of the lag screw 22 which holds the anchoring insert in position within the wall form which is defined by the boards 18, both before and during concrete-pouring operations. This internal screw thread is also designed for reception therein of a lag screw 46 which is shown in connection with the dotted line disclosure of FIG. 5 and constitutes an element of an anchor assembly 48 by means of which slab tilting-up operations are accomplished as will be described presently.

The outrigger wing structure 32 which is attached to each helix 30 lies in a horizontal plane and consists of a U-shaped loop of wire stock of approximately the same gauge as that of the wire that is used to form the helix. The loop has its free end regions 52 welded as at 54 to the underside of the helix at diametrically disposed regions thereacross and the side legs 56 of the loop diverge slightly as heretofore indicated, the dual anchoring insert 10 of the present invention is adapted to be supported within the combined tie and anchor rod 34 which connects together the two aforementioned sub-assemblies (30, 32) is formed from rod stock, it having a diameter appreciably greater than that of the wing structures 32. As shown in FIG. 1, the rod 34 is provided with two inverted U-shaped saddle portions 62, each including inner and outer parallel legs 64 and 66, and a curved connecting bight portion 68. The bight portion 68 of each saddle portion 62 is welded as at 70 (see FIG. 3) to the side of one of the helices 30 in tangential fashion and the parallel legs 64 and 66 clear the associated helix and extend vertically downwardly to a region close to the lower side face 42 of the wall slab 12. The lower ends of the inner legs 64 are connected together by a horizontal straight section 72 while the lower ends of the outer legs 66 are turned laterally to provide horizontal terminal sections 74 which are crucial with the straight section 72. As heretofore indicated, the dual anchoring insert 10 of the present invention is adapted to be supported within the combined tie and anchor rod 34, this rod completing the assembly and constituting the principal feature of the present invention. The composite anchoring insert 10 thus consists of but five independently fashioned parts, namely, the two helices 30, the two wing structures 32, and the combined tie and anchor rod 34.
a rectangular form which is defined by the form boards so that the common plane of the wing structures extend horizontally. Preferably, but not necessarily, these wing structures rest upon one or more of the horizontal reinforcing rods. The lag screws pass through the holes in one of the form boards and extend into the helices so that the anchoring insert is secured within the confines of the form against dislodgement when the concrete is poured. It will be understood that these three similar anchoring inserts will be similarly positioned in the form for ultimate embedment in the three corner corners of the wall slab to be formed. After the wet concrete of the wall slab has been poured, suitable stricking operations are performed upon the upper face of the concrete and the latter is levelled in the usual manner. When the concrete has become set, the various lag screws are removed and the form boards are stripped from the wall slab.

In order that the wall slab may be hoisted from its horizontal position on the floor slab and then tilted into a vertical position for wall-forming purposes as previously described, the lag screws are threaded into the helices and constitute media whereby the wall slab may be detachably connected to a crane or other overhead hoisting mechanism. Still consider the wall slab to be in its horizontal position on the floor slab preparatory to hoisting operations, the lag screws pass through the holes of the angle piece and serve to clamp this angle piece hard against the end edge of the hardened wall slab. The horizontal flange of the angle piece is provided with a hole for receiving the shank portion of an eye bolt, the latter being operatively connected to one of the cables of a hoist and serving in associated relation with the crane or other overhead hoisting mechanism. The details of the hoisting hoist hanger have not been disclosed herein since it forms no part of the present invention. It is deemed sufficient to state that the cable passes loosely over a sheave and that the opposite ends of the cable are connected in a manner previously described to respective dual anchoring inserts in the various corner regions of the slab.

The dotted line disclosure of FIG. 5 illustrates the manner in which the wall slab is handled during tilting of the slab between its horizontal position and its ultimate vertical position. This dotted line disclosure shows one end region of the slab during the tilting process. It will be observed that when the slab is horizontal or in such position that a major portion of the upward thrust of the dual anchoring insert is normal to the plane of the slab, the relatively long wing structures which extend deep into the concrete from the end edge thereof offer a large anti-torque reaction and prevent angular displacement of the helices within the concrete, which, at the time of hoisting, may not be fully hardened. The combined tie and anchor rod additionally offers a certain amount of anti-torque reaction, but its principal purpose is to lend support to the helices from a region deep down in the concrete below the upper face of the wall slab, thus preventing the being transmitted to the helices through the saddle portions and also to establish a connection between the two sub-assemblies, as previously described. The rod further contributes to the prevention of tilting of the helices when the slab is horizontal and to the prevention of pulling out of the helices through the upper end edge of the slab when the latter is suspended in its vertex position immediately prior to movement into its final position above the floor slab.

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 as far as the invention has particularly been pointed out in the accompanying claim is the same to be limited.

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

As a new article of manufacture, an anchoring insert adapted for embedment in a poured concrete slab and to form an anchor for a pair of lag screws or the like, said insert comprising a pair of open-ended wire helices disposed in spaced relation and adapted to have their forward ends disposed directly inwards of and opening onto one vertical edge surface of the slab with the axes of the helices extending horizontally and in parallelism, the interior of said helices forming internal screw threads for receiving the shanks of the lag screws, a reaction wing structure for each helix in the form of a loop of wire having coplanar leg portions and a connecting high portion, said leg portions having their outer end regions welded to the outside of the associated helix at the opposite disposed side regions thereof and the loop extending rearwardly of the helix, the two reaction wing structures extending in a common horizontal plane, and a piece combined tie and anchor rod of materially heavier stock than the helices and the reaction wing structures, extending between said helices and serving to maintain the helices in their fixed spaced relationship, said rod having integral inverted U-shaped saddle portions at its opposite end regions respectively and including inner and outer leg regions which straddle the respective helices on opposite sides thereof and in spaced relationship therefrom, also straddling the free end regions of the leg portions of the associated wing structures, and depend below the helices an appreciable distance, and also including linearly straight high portions which seat directly upon and are welded directly to the top regions of the helices, the lower ends of the inner legs of the saddle portions being connected together by an integral extensional joint in a hoist, radially disposed over and the lower ends of the outer legs being turned laterally outwards to provide integral horizontal end sections which are coaxial with the medial straight portion.

References Cited by the Examiner

UNITED STATES PATENTS

2,504,313 4/1950 Fearon et al. 50—508
2,794,336 6/1957 Ballou 50—517

OTHER REFERENCES

Superior Concrete Accessories, Inc.: Catalog No. 600, pages 14–22.

FRANK L. ABBOTT, Primary Examiner.

HENRY C. SUTHERLAND, Examiner.