May 4, 1965 H. G. BALLOU 3,181,276

DUAL ANCHORING INSERT FOR A CONCRETE SLAB

Filed May 7, 1962 2 Sheets-Sheet 1

Fig. 1.

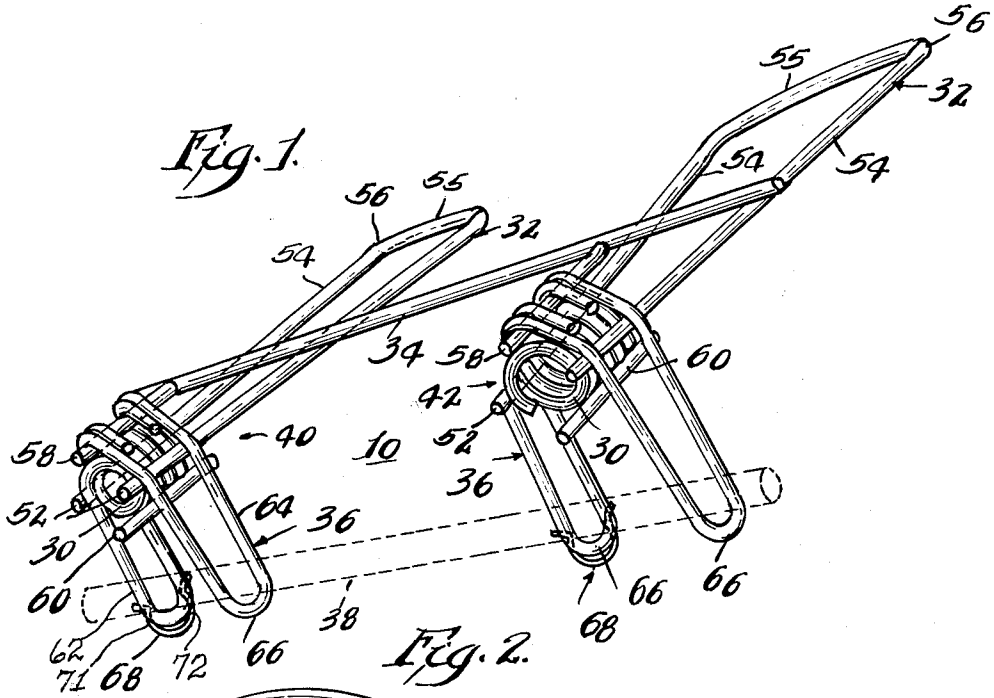


Fig. 2.

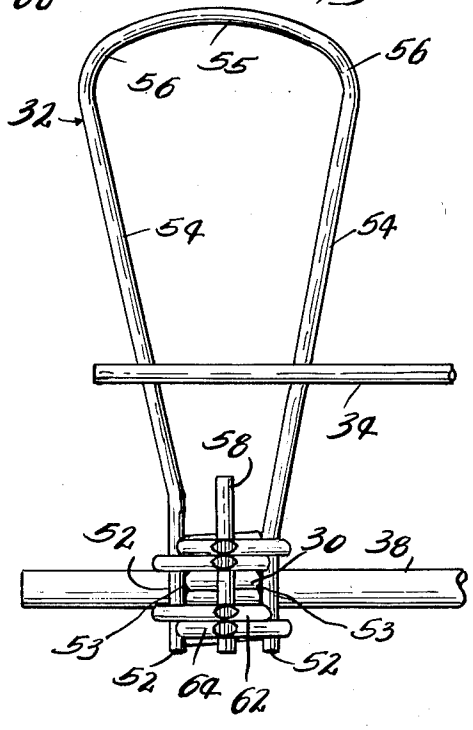
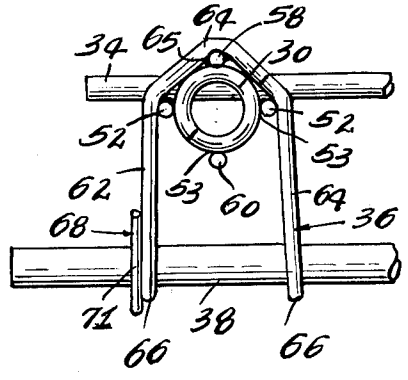


Fig. 3.



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DUAL ANCHORING INSERT FOR A CONCRETE SLAB

Filed May 7, 1962 2 Sheets-Sheet 2

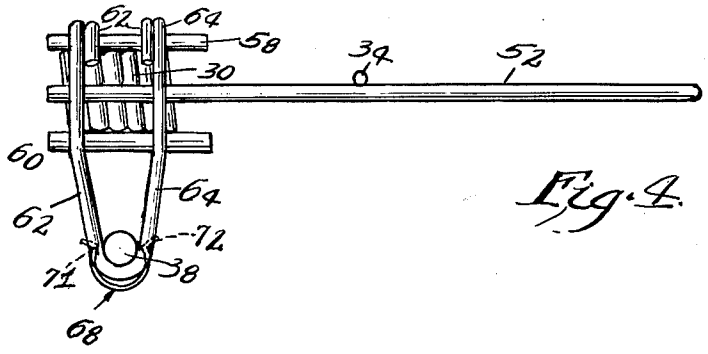
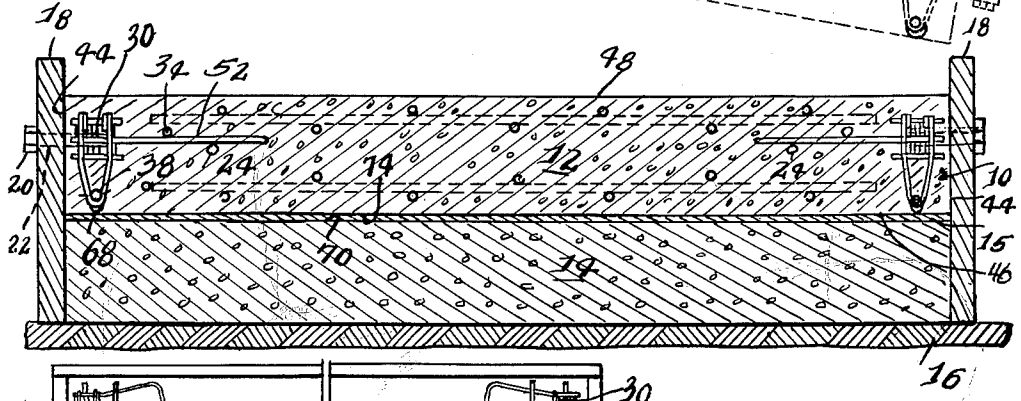


Fig. 4.

Fig. 5.



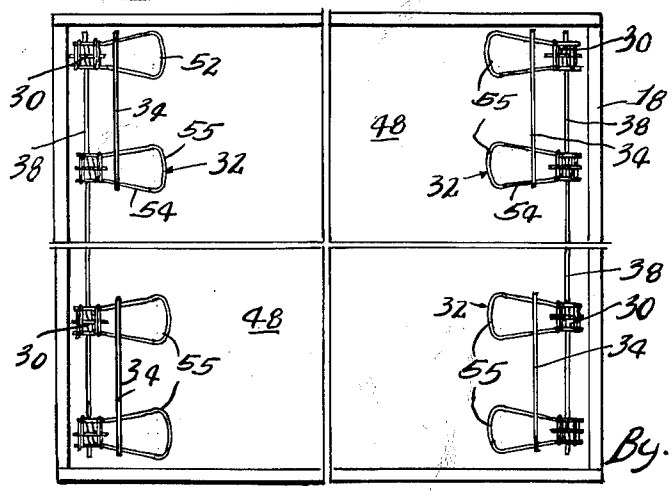


Fig. 6.

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DUAL ANCHORING INSERT FOR A CONCRETE SLAB

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3 Claims. (Cl. 50—82)

The present invention relates generally to wire-formed inserts for concrete slabs. More particularly, the invention is concerned with an anchoring insert which is designed for use in connection with concrete wall slabs 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, with similar inserts in the other corner 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 constructed according to the present invention is, however, not necessarily limited to such particular use and may find use wherever an anchor point is required in a concrete structure undergoing formation. Irrespective, however, 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 threadedly receive therein the shank portion of a lag screw or other attaching device. This form of insert exposes the helix through the upper face of the 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. Various outrigger coil extensions have heretofore been provided for preventing

tilting of the helix, but the present invention affords an outrigger construction which is of improved design and is more effective than any of the outrigger structures which have heretofore been provided in connection with slab edge-lifting anchor inserts.

Where 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 hoist 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 when the latter are used for lifting purposes. The present invention obviates this danger of slab cleavage or breakage by providing an outrigger structure which, in addition to reinforcing the helix against angular tilting movement 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.

In carrying out this object, the invention contemplates the provision of an anchoring insert wherein the helix is provided with a wire-formed saddle having depending sides, which, when the anchoring insert is operatively supported within the slab form as a preliminary to pouring of concrete into the form for slab-forming purposes, extend well into the lower region of the form, and from in these lower regions a cradle within which there may be placed a length of rod stock, the rod stock being supported in the cradle in a horizontal position directly above the level of the bottom of the form until after the concrete is poured, whereupon the length of rod stock becomes a deep anchor for the helix within the concrete. The rod stock is not especially manufactured for this purpose or supplied by the manufacturer as an element of the anchoring insert, but rather, it may be a suitable length of a scrap reinforcing bar which is usually to be found in the vicinity of any large-scale wall-erecting operation. Thus, the cost of the anchoring insert, considering the use of such scrap material, is relatively low.

A still further object of the invention is to provide an anchoring insert of the type under consideration and wherein the aforementioned rod-receiving cradle has associated therewith a spring clip which is formed of wire stock and is so shaped and designed that it performs the dual function of, first, holding the cradle slightly elevated from the slab form base, and of, secondly, affording a yieldable hold-down means for securing the loosely positioned rod in place during pouring of wet concrete into the form for slab-forming purposes.

Other objects and advantages of the invention not at this time enumerated, will readily suggest themselves as the following description ensues.

In the accompanying two sheets of drawings forming a part of this specification, one illustrative embodiment of the invention in a typical environment has been disclosed by way of example and not by way of limitation.

In these drawings:

FIG. 1 is a perspective view of a dual lag screw anchoring insert constructed in accordance with the principles of the present invention;

FIG. 2 is a fragmentary top plan view illustrating one of two helices employed in connection with the anchoring insert, together with certain supporting structure therefor;

FIG. 3 is a front elevational view of the structure shown in FIG. 2;

FIG. 4 is a side elevational view of the structure shown in FIG. 2;

FIG. 5 is a fragmentary vertical sectional view taken through a tilt-up type concrete wall slab 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 hoist 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 insert 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 as the slab **12** in FIG. 5, and to form with such inserts a medium whereby the slab may be detachably connected to a crane or other overhead hoist 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.

Insofar as the actual handling of the slab 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 slab. Briefly, and as described in this patent, the wall slab **12** is formed by pouring wet concrete over the surface of a previously cast 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 floor slab for placement or positioning purposes. The floor slab **14** rests on a fill or foundation **16** at the site where the building 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 position during concrete-pouring 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 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 any other floor slab described.

The anchoring insert **10** 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**. As its principal components, the insert **10** comprises a pair of nut-like wire helices **30**, each of which has welded thereto a wing structure **32**. The two wing structures **32** are connected together by a transverse connecting rod **34**, the rod thus serving, in effect, to maintain the two helices **30** in spaced-apart relationship. Each helix **30** also has associated therewith a saddle **36**, the two saddles being adapted loosely to receive therein a lower traverse bar **38** which bridges the distance between the two saddles **36** and preferably extends outwardly beyond the sides of the saddles. Each helix **30**, together with its associated wing structure **32** and saddle **36** constitutes what will hereinafter be termed an anchoring insert subassembly, the two subassemblies being substantially rigidly connected together by the transverse connecting rod **34**, and when so connected together, form the dual anchoring insert of the present invention. For convenience of description, one of the anchoring insert subassemblies has been designated in its entirety by the reference numeral **40**, while the other subassembly has been designated by the reference numeral **42**. The two anchoring insert subassemblies **40** and **42** thus constitute the entire composite dual anchoring insert. **10** The traverse bar **38** being a separately formed element and designed for loose positioning within the saddles **36**, may constitute an element of the dual anchoring insert when the latter is operatively installed within the wall slab form. The traverse bar **38**, however, is not necessarily a saleable element of the combination of parts which cooperate to make up the dual anchoring insert since it ordinarily will not be furnished by the manufacturer. Actually, this traverse bar will consist of a length of scrap reinforcing rod which may be found at the scene of any large-scale building operation.

The two anchoring insert subassemblies **40** and **42** are identical in construction and, there fore, a description of one of them will suffice for them both. The fact that there are two such identical subassemblies gives rise to the designation of the present invention as a dual anchoring insert. Under certain circumstances, as for example where a small wall slab is concerned, it may be found advisable to employ a single assembly similar to one of the subassemblies **40** or **42**, in which case, the transverse connecting rod **34** will be omitted while the loosely-disposed traverse bar **38** will be centered within the cradle **36**.

Considering now one of the anchoring insert subassemblies, for example, the assembly **40**, the wire helix **30** is tightly wound, which is to say that adjacent convolutions thereof abut against each other. The helix extends horizontally and one end thereof is disposed within the confines of the concrete wall slab **12** and terminates a slight distance from the end edge **44** thereof (see FIG. 5.) The helix **30** as a whole is disposed an appreciable distance above the lower side face **46** of the wall slab and is disposed a lesser distance below the upper side face **48** of the wall slab **12**. The interior of the helix **30** defines an internal screw thread which is designed for reception therethrough of the shank portion of the lag screw **22** which holds the anchoring insert in position within a wall form both before and during concrete-pouring operations. This internal screw thread is also designed for reception therein of a lag screw, such as the lag screw **50**, which is shown in connection with the dotted line disclosure of FIG. 5 and constitutes an element of an anchor assembly **51** by means of which slab tilting-up operations are accomplished, as will be described hereafter.

The wing structure **32** which is attached to the helix **30** lies in a horizontal plane and consists of a loop of wire stock of approximately the same gauge as that of the wire that is used to form the helix **30**. The loop has its free end regions **52** welded as at **53** to the outer side of the helix **30** at diametrically disposed regions thereacross and

the side legs 54 of the loop diverge slightly and are connected together by a straight bight portion 55, this bight portion being connected to the legs 54 on a gradual curve as indicated at 56. The wing structure 32 is capable of being supported on one or more of the transverse reinforcing rods 24 when such transverse reinforcing rods are employed in the wall slab form and are sufficiently close to the end edge 44 of the slab that they may be engaged by the wing structure 32.

At diametrically disposed regions which are spaced 90° from the positioning of the free end regions 52 of the wing structure 32, two relatively short wire lengths or rods 58 and 60 are welded to the outer side of the helix 30 and extend parallel to said free end regions. The forward or outer ends of these two wire lengths or rods terminate in the same vertical plane as the plane of the free end regions 52 of the wire loop which constitutes the wing structure 32.

The saddle 36 which is associated with the anchoring insert subassembly 40 is comprised of two parts, each in the form of a length of wire stock which is bent into elongated U-shape configuration with the free end regions thereof turned out of the plane of the loop to provide a hook-like structure which is hung, so to speak, over the helix 30 and is welded in position thereon. The two hook-like parts are designated in the drawings by the reference numerals 62 and 64 and are best seen in FIGS. 3 and 4. The width of the hook-like part 62 is slightly less than the width of the hook-like part 64 so that the hook portion of the first mentioned hook-like part may be straddled by the hook portion of the last mentioned part as appears in the upper regions of FIG. 4. These hook-like parts are not hung directly on the helix 30, but rather they are hung on and welded as at 65 to the upper short wire length or rod 58 and pass over and around the free end regions 52 of the wing structure 32. The side regions of the saddle 36 depend downwardly below the level of the helix 30 an appreciable distance and terminate in generally horizontally extending bight portions 66 which are spaced a slight distance above the lower face 46 of the wall slab 12. There are four of these bight portions 66, two for each hook-like part, and are designed loosely to receive therein in cradle-like fashion the previously mentioned traverse bar 38. In order to prevent upward displacement of the traverse bar 38 during pouring of concrete in the wall slab form, a spring clip 68 of U-shape design has one leg 71 welded to the part 62 near the lower end thereof and has its other leg 72 projecting in detent fashion into the cradle portion of part 62 so that the traverse rod 38 may be snapped into position within the spring clip at the time of placement thereof in the cradle and, thereafter, held in position.

As shown in full lines in FIG. 5 and as heretofore indicated, the dual anchoring insert 10 is adapted to be supported within a rectangular structure form which is defined by the form boards 18 with the common plane of the wing structures 32 extending horizontally. Preferably, these wing structures rest upon one or more of the horizontal reinforcing rods 24. The lag screws 20 pass through the holes 22 in one of the form boards 18 and extend into the helices 30 so that the anchoring insert as a whole is secured within the confines of the form against dislodgement when the concrete is poured. The spring clips 68 in addition to performing their functions of retaining the traverse rod 38 in position within the cradle-like bight portions 66 of the saddles 36, also function as feet for supporting the forward end region of the anchoring inserts 10 on the upper face 70 of the floor slab 14 after initial placement of the insert within the form so that the position of the holes 22 for drilling purposes in alignment with the axes of the helices 30 may be accurately gauged. It will be understood that three similar anchoring inserts 10 will be similarly positioned in the form for ultimate embedment in the three other corners of the wall slab 12 to be formed. It also will be understood that traverse bars such as the bars 38 of scrap material will be loosely positioned in the various insert cradles.

After the wet concrete of the wall slab 12 has been poured, suitable strickling operations utilizing a screed are performed upon the upper face of the concrete and the latter is levelled in the usual manner. When the concrete of the wall slab 12 has become set, the various lag screws 20 are removed and the form boards 18 are stripped from the slab 12. In order that the wall slab 12 may be hoisted from its horizontal position on the floor slab 12 and then tilted into a vertical position for wall-forming purposes as previously described, the lag screws 20 or the lag screws 50 are threaded into the helices 30 and constitute media whereby the wall slab 12 may be detachably connected to a crane or other overhead hoist. Still considering the wall slab 12 to be in its horizontal position on the floor slab 14 preparatory to hoisting operations, the lag screws 50 pass through the then vertical flange 76 of an angle piece 78 and serve to clamp this angle piece hard against the end edge 44 of the hardened wall slab 12. The horizontal flange 80 of the angle piece 78 is provided with a hole 82 for receiving the shank portion of an eye bolt 84, the latter being operatively connected to one of the cables 86 of a hoisting harness in associated relation with the crane or other overhead hoist. The details of the hoisting harness have not been disclosed herein since it forms no part of the present invention. It is deemed sufficient to state that the cable 86 passes loosely over a sheave 88 and that the opposite ends of the cable 86 are connected in a manner previously described to respective dual anchoring inserts provided in adjacent corner regions of the slab 12.

The manner in which the wall slab 12, in its horizontal position, is first hoisted vertically and then tilted into position against the floor slab 14 has been disclosed in the aforementioned Patent No. 2,794,336 and need not be described herein. However, for illustrative purposes, the dotted line disclosure of FIG. 5 shows one end region of the slab during the tilting process. It will be observed that when the slab 12 is horizontal or in such position that a major portion of the upward thrust of the dual anchoring insert 10 is normal to the plane of the slab, the relatively long wing structures 32 which extend deep into the concrete from the end edge 44 thereof offer a large anti-torque reaction and prevent angular displacement of the helices 30 within the concrete, which, at the time of hoisting, may not be fully hardened. The traverse bar 38 additionally offers a certain amount of anti-torque reaction, but its principal purpose is to lend support to the helices 30 from a region deep down in the concrete below the upper face 48 of the wall slab, this support being transmitted to the helices through the side legs 54 of the cradles 36. As the wall slab 12 tends to assume a more vertical position, the anti-torque characteristic of the wing structures 32 decreases and the fact that these wing structures are generally triangular in shape and have diverging legs 54 becomes increasingly important since this triangular shape of the wing structures serves to prevent endwise pulling of the helices outwardly through the end face 44 of the wall slab 12. The saddles 36 and the traverse bar 38 contained therein also contribute toward this function. The traverse connecting rod 34 also contributes toward the prevention of tilting of the helices when the slab 12 is horizontal and toward the prevention of pulling out of these helices through the end face 44 of the slab when the latter is vertical.

Whereas the dual anchoring insert 10 has been described as being adapted for embedment in one corner portion of a tilt-up type wall slab, it is to be understood that it is capable of being used in various other forms or types of concrete slabs. It is also to be understood that the invention is not to be restricted to the details set forth since these may be modified within the scope of the ap-

pended claims without departing from the spirit and scope of the invention.

Having thus described what I claim as new and desire to secure by letters patent is:

1. 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, said insert comprising a pair of 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 interiors of said helices forming internal screw threads for receiving the shanks of the lag screws, a reaction wing for each helix and in the form of a loop of wire having coplanar leg portions and a connecting bight portion, said leg portions having their free end regions welded to the outside of the associated helix at diametrically spaced regions and the loop extending rearwardly of the helix, said two reaction wings being coplanar and extending in a common horizontal plane, a transverse connecting rod welded to each wing at regions rearwardly of the helices and serving to maintain the wings, and the helices to which the wings are welded, in spaced relationship, and a separately formed wire saddle for each helix and having its bight portion extending around its respective helix so as to receive the helix therein, said saddle having side legs of upright U-shape configuration which straddle the helix on opposite sides thereof and also straddle the free end regions of the leg portions of the associated reaction wing and depend below the helix an appreciable distance, the lower ends of said side legs constituting bight portions which, in combination with each other, define an upwardly presented open cradle adapted to receive therein loosely an elongated traverse bar, the traverse bar being adapted to bridge the distance between the two cradles defined by the two saddles.

2. 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, said insert comprising a pair of 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 interiors of said helices forming internal screw threads for receiving the shanks of the leg screws, a reaction wing for each helix and in the form of a loop of wire having coplanar leg portions and a connecting bight portion, said leg portions having their free end regions welded to the outside of the associated helix at diametrically spaced regions and the loop extending rearwardly of the helix, said two reaction wings being coplanar and extending in a common horizontal plane, and a separately formed inverted saddle member for each helix, having its bight portion extending around and seated upon the helix so as to receive the helix therein, and having vertical side legs which straddle the helix on opposite sides thereof and also straddle the free end regions of the leg portions of the associated reaction wing and depend below the helix an appreciable distance, the lower ends of said vertical side legs having generally horizontal wire portions which, in the concrete embedment, constitute reaction anchoring means for the side legs to prevent upward movement of the latter in the concrete embedment.

3. The combination with a horizontally disposed poured concrete slab of a composite anchoring insert embedded in the slab and forming an anchor for a pair of lag screws, said insert comprising a pair of wire helices disposed in spaced relation and having their forward ends disposed directly inwards of and opening onto one vertical edge surface of the slab in the upper region thereof and with the axes of the helices extending horizontally and in parallelism, the interiors of said helices forming internal screw threads for receiving the shanks of the lag screws, a reaction wing for each helix and in the form of a loop of wire having coplanar leg portions and a connecting bight portion, said leg portions having their free end regions welded to the outside of the associated helix at diametrically spaced regions and the loop extending rearwardly of the helix, said two reaction wings being coplanar and extending in a common horizontal plane, and a separately formed inverted saddle member for each helix, having its bight portion extending around and seated upon the helix so as to receive the helix therein, and having side legs which straddle the helix on opposite sides thereof and also straddle the free end regions of the leg portions of the associated reaction wing and depend below the helix an appreciable distance so as to closely approach the lower face of the slab, and a rigid horizontally disposed reaction member connecting the lower ends of at least one leg of each saddle member with at least one leg of the other saddle member and serving to prevent upward movement of the saddle members in the poured concrete slab.

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