SYSTEM FOR FORMING A MOVABLE SLAB FOUNDATION

Inventors: Frederick S. Marshall, Arlington, TX (US); David A. Bryan, Plano, TX (US)

Correspondence Address:
BRACEWELL & GIULIANI LLP
P.O. BOX 61389
HOUSTON, TX 77208-1389 (US)

Related U.S. Application Data

Provisional application No. 61/031,904, filed on Feb. 27, 2008.

Publication Classification

Int. Cl.
E02D 27/34 (2006.01)
E04B 1/00 (2006.01)

U.S. Cl. 52/126.6; 52/297; 52/741.15

ABSTRACT

A system for forming a movable slab foundation comprises a support sleeve encased within a slab foundation. The support sleeve surrounds a support member that rests upon a support surface. The support sleeve is capable of moving axially along the length of the support member.
SYSTEM FOR FORMING A MOVABLE SLAB FOUNDATION

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to provisional application 61/031,904, filed Feb. 27, 2008.

FIELD OF THE INVENTION

[0002] This invention relates in general to forming an adjustable foundation, and in particular, to a concrete slab foundation capable of being raised above the ground.

BACKGROUND OF THE INVENTION

[0003] Many structures have been built on foundations or slabs made of concrete poured on top of soil. Constant changes in the weather and moisture levels in the soil frequently cause damage to such a foundation. In many instances, the foundation may buckle or even crack. This phenomenon occurs for a variety of reasons, including uneven changes in the water content of supporting soils, uneven compacting of soils, and uneven loads being placed on soils. Over time, uneven movement in the soils under a foundation can cause a foundation to bend or crack.

[0004] Therefore, it would be desirable to provide a method and apparatus that would allow a foundation to be poured on top of soil and subsequently raised to a desired height to eliminate potential problems caused by soil movement and/or problematic soils.

SUMMARY OF THE INVENTION

[0005] A support surface is comprised of a concrete pier with a base plate encased therein. The base plate has anchor bolts extending therefrom and into the concrete pier a selected distance. A vertical support member has a substantially cylindrical hollow body with first and second ends. The first end of the support member body is in abutting contact with the base plate.

[0006] A support sleeve has a hollow body with inner and outer surfaces. The support sleeve surrounds the support member. The inner surface of the support sleeve body has threads contained therein. The outer surface of the support sleeve body has reinforcing bars connected to and extending outwardly therefrom. A plurality of nuts are also connected to and extend outwardly from the outer surface of the support sleeve body. A plurality of eye bolts are connected to the plurality of nuts and extend upwardly therefrom.

[0007] The support sleeve and the reinforcing bars extending therefrom are encased within a slab foundation. The support sleeve and the slab foundation are capable of moving axially along the length of the support member.

[0008] A lifting member has a body with first and second ends and is positioned such that it is surrounded by the support member. The first end of the lifting member body is in abutting contacting with the base plate. The lifting member has a length greater than the desired final height of the slab foundation.

[0009] A locking nut has a hollow body with inner and outer surfaces and is positioned in abutting contact with the second end of the support member. The outer surface of the locking nut has threads therein adapted to engage the threads on the inner surface of the support sleeve.

[0010] A lifting device is coupled to the second end of the body of the lifting member to move the support sleeve and the slab foundation axially along the length of the support member to a desired height. A plurality of attachment members are connected to and extend between the plurality of eye bolts and the lifting device. The lifting device is activated causing the attachment rods to move simultaneously, thereby causing the support sleeve and the slab foundation to move axially along the length of the support member. The support sleeve and the slab foundation are lifted above the ground to a desired height.

[0011] Once the slab foundation and support sleeve have reached a desired height, the locking nut will be in contact with the top of the support sleeve. In order to secure the slab foundation and the support sleeve at the desired height, the locking nut is screwed into the threads on the inner surface of the support sleeve. The support sleeve, slab foundation, and locking nut rest upon the second end of the support member body. Once the locking nut is securely connected to the support sleeve, the attachment rods, hydraulic jack, and lifting rod may be removed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is a sectional view of the pier supported slab foundation raised above ground level.

[0013] FIG. 2 is a sectional view of a single slab support, illustrating the concrete pier, base plate, and support member.

[0014] FIG. 3 is a side view of the support sleeve fixture, shown prior to its placement around the support member.

[0015] FIG. 4 is top view of FIG. 3.

[0016] FIG. 5 is a bottom view of FIG. 3.

[0017] FIG. 6 is an isometric view of the pier and support member, with the support sleeve placed around the support member.

[0018] FIG. 7 is an isometric view of FIG. 6, with the concrete slab poured, the lifting member installed with the lifting device mounted atop, and the locking nut placed around the lifting member.

[0019] FIG. 8 is a side view of FIG. 7 with the concrete slab and support sleeve assembly raised above ground level.

[0020] FIG. 9 is a side view of the pier and support member, with the slab and sleeve locked in place with the locking nut, and the lifting device and lifting member removed.

[0021] FIG. 10 is a side view of FIG. 9, with the eye bolts removed, and the slab locked into place with the locking nut.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Referring to FIG. 1, foundation slab 11 may be used to support a house or other building. In this embodiment, slab 11 is of concrete and is supported above the ground a few feet by support surfaces or piers 13. Piers 13 are of concrete and have base plates 15 embedded within them. Base plates 15 have anchor bolts 17 that extend a selected distance into concrete piers 13.

[0023] Referring to FIG. 2, the holes for piers 13 are dug with a diameter such that base plates 15 are fully encased within the concrete. Once the holes are dug, piers 13 are formed by pouring concrete into the holes. The base plates 15 are then embedded in the concrete of piers 13 such that the top of base plate 15 is flush with surface of the concrete. Anchor bolts 17 are connected to base plates 15 and extend into the concrete a distance below base plate 15. A plurality of supporting members or supporting pipes 19 are positioned such
that a first end portion of each supporting pipe 19 rests on a corresponding base plate 15. Supporting pipes 19 extend upwardly a selected distance from each base plate 15. The length of supporting pipes 19 can be varied to accommodate various desired slab 11 heights.

[0024] Referring to FIG. 3, a support sleeve 21 with a greater diameter than supporting pipe 19, and cut with a length equal to the desired thickness of the concrete slab 11 is constructed so that it may slide over supporting pipe 19. The inner surface 23 of sleeve 21 has threads 25 formed therein and extending along a length of sleeve 21. Reinforcing bars (rebar) 27 are connected to the outer surface of sleeve 21. In this embodiment, a first portion 29 of rebar 27 is welded to sleeve 21 vertically along the length of sleeve 21. A second portion 31 of rebar 27 is connected to and extends outwardly and downwardly at an angle from first portion 29 of rebar 27. A third portion 33 of rebar 27 is substantially perpendicular to support sleeve 21 and extends between first portion 29 and second portion 31 of rebar 27. Rebar 27 is welded around the outer peripheries of sleeve 21 at 60 degree intervals. Two nuts 35, offset from rebar 27, are welded to opposite sides of an end portion of sleeve 21. A pair of eye bolts 37 are screwed into nuts 35. The lengths of eye bolts 37 can be varied depending upon the desired thickness of slab 11, but will always be of a length such that they protrude upwardly from slab 11.

[0025] Referring to FIGS. 4 and 5, rebar 27 are welded and extend from the sleeve 21 at positions that create an asterisk-like pattern. Nuts 35 are positioned parallel with one another and offset from rebar 27 and are welded in place on opposite sides of sleeve 21. Eye bolts 37 are aligned with and screwed into nuts 35.

[0026] Referring to FIG. 6, the sleeve assembly (FIG. 3) is then slid down supporting pipe 19, and lowered to the desired height for pouring slab 11. Concrete slab 11 is then poured, which embeds rebar 27 and the sleeve assembly (FIG. 3) within slab 11. The concrete is kept from bonding to concrete pier 13, base plate 15, and eye bolts 37 by a bond breaker layer (not shown). The tops of eye bolts 37 are left protruding from the top of concrete slab 11.

[0027] Referring to FIG. 7, after the cement and slab 11 have hardened, a lifting member or solid lifting rod 39, with a smaller diameter than supporting pipe 19, is inserted into supporting pipe 19 and lowered until it makes contact with base plate 15. The length of lifting rod 39 is greater than the desired final height of slab 11. After lifting rod 39 is in place, a locking nut 41 with a diameter greater than lifting rod 39 but equal to supporting pipe 19 is placed around the support rod 39. Locking nut 41 has threads on its outer surface to mate with threads 25 (FIG. 3) on inner surface 23 of sleeve 21. Locking nut 41 is slid down support rod 27, until it comes into abutting contact with the top of support pipe 19, which corresponds to the desired height of slab 11. A lifting device is then mounted on the top of each support rod 39. In this embodiment, the lifting device is a hydraulic jack 43 mounted on the top of each support rod 39. Attachment members or attachment rods 45 are then attached to eye bolts 37, in order to lift slab 11 to its desired height. Hydraulic jack 43 is then connected to attachment rods 45. Referring to FIG. 8, hydraulic fluid pressure is then applied simultaneously to all of the jacks 43, causing foundation slab 11 to be lifted above the ground to the desired height.

[0028] Referring to FIG. 9, once slab 11 has reached its desired height, locking nut 41 will be in contact with the top of sleeve 21. In order to secure slab 11 at the desired height, locking nut 41 is screwed into the threads 25 (FIG. 3) on the inner surface 23 of sleeve 21. The support sleeve 21, slab foundation 11, and locking nut 41 rest upon the second end portion of the support member 19. Once locking nut 41 is securely connected to sleeve 21, attachment rods 45, hydraulic jack 43, and lifting rod 39 are removed.

[0029] Referring to FIG. 10, after removing hydraulic jack 43, eye bolts 37 are unscrewed from nuts 35 and removed from the slab 11, leaving holes 47 on the top surface of slab 11. In the event that the height of slab 11 needs to be adjusted, eye bolts 37 may be reinserted into slab 11 and screwed into nuts 35 which are welded to concrete encased sleeve 21. At that point, lifting rod 39 would be reinserted, and hydraulic jack 43 and attachment rods 45 would be reconnected. The locking nut 41 would then be unscrewed from sleeve 21, and slab 11 could be raised and lowered to a desired height using hydraulic jack 43. In the event that slab 11 needs to be raised to a height greater than the current supporting pipe 19 allows, slab 11 can be lowered to its original position and supporting pipe 19 may be replaced with a supporting pipe with a length to accommodate the new desired height. Once the desired height has been reached, as previously illustrated, slab 11 may be secured in place with locking nut 41, and hydraulic jack 43, attachment rods 45, lifting rod 39, and eye bolts 37 may be removed.

1. A system for forming a movable slab foundation, the system comprising:
   a slab foundation;
   at least one support surface;
   at least one substantially vertical support member having a hollow body with first and second ends, the first end abuttingly contacting the at least one support surface; and
   at least one support sleeve surrounding the at least one support member, the at least one support sleeve being encased within the slab foundation and being capable of moving axially along the length of the at least one support member.

2. The system of claim 1, further comprising:
   at least one lifting member surrounded by the at least one support member, the at least one lifting member having a body with first and second ends and a length greater than the desired height of the slab foundation, the first end abuttingly contacting the at least one support surface, the second end adapted to be coupled to a lifting device to move the at least one support sleeve and the slab foundation axially along the length of the at least one support member; and
   a locking nut abuttingly contacting the second end of the body of the at least one support member and securely connected to the at least one support sleeve.

3. The system of claim 2, wherein the at least one support sleeve further comprises:
   a hollow body with inner and outer surfaces, the inner surface having threads contained therein, and the outer surface having at least one reinforcing bar connected to and extending outwardly therefrom, the outer surface also having a plurality of nuts connected to and extending outwardly therefrom and adapted to receive a plurality of bolts for attachment to the lifting device; and wherein the locking nut further comprises:
   a hollow body with inner and outer surfaces, the outer surface having threads in engagement with the threads on the inner surface of the at least one support sleeve to
thereby secure the axial position of the at least one support sleeve and the slab foundation along the length of the at least one support member.

4. The system of claim 3, wherein the at least one reinforcing bar further comprises:
   a first portion connected to the at least one support sleeve vertically along the length of the at least one support sleeve;
   a second portion connected to and extending outwardly and downwardly at an angle from the first portion; and
   a third portion substantially perpendicular to the at least one support sleeve, connected to and extending between the first portion and the second portion.

5. A system for forming a movable slab foundation, the system comprising:
   a slab foundation;
   at least one support surface;
   at least one substantially vertical support member having a substantially cylindrical hollow body with first and second ends, the first end abuttingly contacting the at least one support surface;
   at least one support sleeve surrounding the at least one support member, the at least one support sleeve having a hollow body with inner and outer surfaces, the inner surface having threads contained therein, the outer surface having at least one reinforcing bar connected to and extending outwardly therefrom, the outer surface of the body also having a plurality of nuts connected to and extending outwardly therefrom, the outer surface of the body and the at least one reinforcing bar being encased within the slab foundation and the at least one support sleeve and the slab foundation being capable of moving axially along the length of the at least one support member;
   a plurality of eye bolts connected to the plurality of nuts and extending upwardly from the slab foundation;
   at least one lifting member surrounded by the at least one support member, the at least one lifting member having a body with first and second ends and a length greater than the desired height of the slab foundation, the first end abuttingly contacting the at least one support surface; and
   a locking nut positioned in abutting contact with the second end of the at least one support member, the locking nut having a hollow body with inner and outer surfaces, the outer surface having threads therein adapted to engage the threads on the inner surface of the at least one support sleeve to thereby secure the axial position of the at least one support sleeve and the slab foundation along the length of the at least one support member.

6. The system of claim 5, wherein the system further comprises:
   a lifting device coupled to the second end of the body of the at least one lifting member to move the at least one support sleeve and the slab foundation axially along the length of the at least one support member; and
   a plurality of attachment members connected to and extending between the plurality of eye bolts and the lifting device.

7. The system of claim 5, wherein the at least one support surface further comprises:
   a concrete pier; and
   a base plate encased within the concrete pier, the base plate having anchor bolts extending from the base plate and into the concrete a distance.

8. The system of claim 7, wherein the at least one reinforcing bar further comprises:
   a first portion connected to the at least one support sleeve vertically along the length of the at least one support sleeve;
   a second portion connected to and extending outwardly and downwardly at an angle from the first portion; and
   a third portion substantially perpendicular to the at least one support sleeve, connected to and extending between the first portion and the second portion.

9. A method for forming a movable slab foundation, the method comprising:
   placing a plurality of support surfaces below an intended slab foundation area;
   placing a plurality of support members in abutting contact with the plurality of support surfaces;
   placing a plurality of support sleeves over the plurality of support members and sliding them down in abutting contact with the plurality of support surfaces;
   forming a slab foundation such that it encases the plurality of support sleeves; and
   simultaneously lifting the plurality of support sleeves to move the slab foundation along the length of the plurality of support members to a desired height.

10. The method of claim 9 further comprising:
    securely connecting the plurality of support sleeves to the plurality of support members at a desired height, so as to secure the axial position of the slab foundation along the length of the plurality of support members.

11. The method of claim 10 further comprising:
    placing a plurality of lifting members within the support members such that first ends of the plurality of lifting members are in abutting contact with the plurality of support surfaces;
    connecting a plurality of lifting devices to the second ends of the plurality of lifting members;
    connecting the plurality of lifting devices to the plurality of support sleeves; and
    simultaneously actuating the plurality of lifting devices.

12. The method of claim 10, wherein actuating the plurality of lifting devices is performed by an automatic lifting system connected to control actuation of the lifting assemblies simultaneously.

13. The method of claim 10, wherein securely connecting the plurality of support sleeves to the plurality of support members comprises connecting the plurality of support sleeves to a plurality of locking nuts such that the plurality of locking nuts rest upon the plurality of support members.

14. The method of claim 9, wherein the plurality of support surfaces comprise a base plate encased within a concrete pier.