LIFTING AND CRIBBING SYSTEMS

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Applied No.: 11/829,882

Filed: Jul. 27, 2007

Publication Classification

Int. Cl. E04C 23/06 (2006.01)

U.S. Cl. ........................................ 254/93 R

ABSTRACT

Underlying surface lift systems and methods are disclosed that facilitate the lifting and moving of constructions, including but not limited to structures, and machines, implements, building materials, earth, rock, and other massive weighted and/or large dimensioned objects or materials. The underlying surface lift systems and methods may be used or performed in combination with one or more support elements to the construction or other item to be lifted, such as steel I-beams or wooden beams or other supportive elements. The invention comprises in some embodiments underlying surface lift systems and methods, alone or in combination with or performed with supportive elements generally, such as beams and other devices or elements. Further embodiments may include an underlying surface lift apparatus having a support plate and a lift device in adjustable connection with the support plate. In some embodiments a pivot saddle is the adjustable connection of the support plate and the lift device. The invention may comprise technology that facilitates the lifting and moving of constructions such as structures or other objects, particularly those having support elements, while reducing the costs and hazards of traditional jack systems and without the added costs and risks associated with complex crane operations. Other disclosed embodiments are methods of lifting from an underlying surface, business methods of lifting and moving constructions objects, or materials, and methods of cribbing constructions, objects or materials are further disclosed. Still other methods such as those corresponding to each apparatus and assemblies are also disclosed, as well as methods of doing business. Applications may include the lifting and relocating of structures such as temporary or extension buildings to new locations and other lifting and moving solutions and may be provided in combination with other relocating technologies.
LIFTING AND CRIBBING SYSTEMS

BACKGROUND OF THE INVENTION

[0001] Technologies for the lifting and cribbing of structures and other constructions are well known and are particularly applied in the implementation of relocating existing structures such as mobile homes, storage structures such as barns and sheds, extension or remote classroom buildings, and other structures. Lifting and cribbing technologies relating to massive constructions and traditional jack systems have historically dominated the market for lifting and relocation of massively weighted and/or large dimensioned structures.

[0002] Various forms of jacking means have been previously developed to aid in lifting and relocation of constructions, including but not limited to structures, and machines, implements, building materials, earth, rock, and other massive massively weighted and/or large dimensioned objects or materials. Jacks have been developed and implemented in the past that are supported by the surface underlying the object or material to be lifted, such as a floor or ground surface, and that extend the piston of the traditional jack against the object or material in order to achieve sufficient lifting force to lift the object or material off of the underlying surface. One particular application is in the lifting, locating, and relocating of housing structures such as extension classrooms provided in part to increase the capacity of schools having growing numbers of attending students.

[0003] Traditionally, in the movement of a structure such as a house, mobile home, or other structure, the structure has been previously set upon support elements such as one or more steel I-beams or other supportive element to not only support the weight and application of the structure but to allow future lifting and relocation of the structure. In the traditional lifting sequence, a surface of the supportive element above the underlying surface might be used as the point of contact for the one or more jacks. Typically, however, the only reliable and safe surface for these types of massive lifting and relocation applications is the lower surface of the supportive element, a surface that is typically in contact with the underlying surface. In the instance of, by way of example, a classroom structure supported by two I-beams, the bottom surface of the lower flange portion (lower horizontal portion or plate of the I-beam) is in direct contact with the underlying surface that is typically earth or a concrete pad. When in contact with the underlying surface, traditionally the means for accessing the lower flange portion for lifting would either require a separate lifting means, for example a crane attached to the I-beams, to lift the structure and expose the lower flange portion to the jack or the use of cleats that extend from the jack that might be inserted between the underlying surface and the lower flange portion. Traditional jack systems further provide the extending portion or piston of the jack in an upper relation to the cylinder of the jack, necessitating the traditional configuration of corresponding cleats of the jack at the upper portion of the piston and well above the underlying surface. This configuration is not directly a solution unless the crane operation mentioned above is employed or some means were to allow the cleats at the piston to be at a level of the bottom surface of the lower flange, at least in part due to the configuration of traditional jack systems.

[0004] However, the insertion of cleats of a traditional jack system under supportive elements is difficult likely because of the weight of the structure and direct contact between the supportive element such as an I-beam and the underlying surface. One solution may have been to simply insert the cleat as much as possible between the I-beam and the underlying surface to achieve a first lift, crib the I-beams and structure with supportive elements such as piers to relieve the jacks, and then readjust the cleats of the jack to better support the I-beam and structure. However, even this method is likely only a theoretical solution as the cleats of the traditional jack system are only configurable on the jack to be above the underlying surface in any configuration of the jack pre-operation, as for example previously described in relation to the configuration of the jack in traditional systems. This is due to the fact that the traditional jack systems will be positioned at or above the underlying surface and the bottom surface of the I-beam before a lift. Furthermore, and even if it were possible, only a partial positioning of the cleat under the I-beam would create a tenuous support of the I-beam and structure.

[0005] One potential option for the traditional jack system might have been to remove portions of the underlying surface so that the jacks could be positioned at or below the underlying surface and to expose more of the supportive element, for example to expose more of the lower flange portion of the I-beam, for lifting. However, this option is extremely impractical, requiring digging and removal of earth or concrete, substantially complicating lift and requiring additional labor and time. Another previous option may have been to locate the structure above ground and potentially remaining cribbed on piers, creating not only an unsightly overall appearance but a potentially unsafe condition for supporting the structure. A further previous option may have been to locate the structure in a pre-dug excavation that would allow support of the support element and structure by only a portion of the underlying surface while the excavated volume would allow access to the bottom surface of the supportive element. In application this might have been an excavation below the original underlying surface that would be left as a partial excavation or even a crawl space below the underlying surface and structure. This potential option may not be preferred as the excavation or crawl space may not be desired and the support of the structure is likely only partial respective of the underlying surface or requires additional supportive elements such as piers.

[0006] Another primary weakness of the traditional jack systems is that the supporting element of the jack, such as a foot or plate, in contact with the underlying surface must be able to accommodate non-level surfaces as may be found on typical underlying surfaces, such as bare earth applications. One potential option of traditional systems has been to provide a foot that is attached to the cylinder of the jack and utilized in direct contact with the underlying surface in the traditional jack configuration as described above. A significant weakness of this arrangement, in addition to the disadvantages and short-comings previously described, is that the cylinder portion of the traditional jack and the plate cannot typically accommodate for non-level underlying surfaces. One solution may have been to have provided some swivel connection between the jack cylinder and the foot or plate; however, this configuration still suffers from the disadvantages and short-comings previously described while further lacking the use of more mechanically and structurally stable portions of the jack. It may have been a recognized need to consider other options for stabilizing traditional jack systems, particularly given the amount of weight and dimensions involved for structures and other objects to be lifted and relocated, whereas the traditional jack systems typically have
a significant possibility of collapsing given what may have been a tenuous connection and support given the traditional jack configuration generally and traditional cylinder and foot or plate configurations.

Hereinafter those in the industry may not have considered the possibility of other jack configurations and the use of other components of the jack, such as the extending piston, in more immediate use as assisting in the support function of the jack system while also serving in part to lift the structure or object. It may have been heretofore even a recognized drawback in traditional jack systems that the use of the piston would serve as anything but the conventional portion of the jack to be in lifting connection with the structure and supporting element, a jack element with traditionally less surface contact area and support that may have thought to be inadequate and unsafe to support and lift massive constructions or objects.

In addition to all of the deficiencies previously described, the prior art may suffer from one or more of the following deficiencies. The prior art may require further and additional lifting systems and separate and additional support elements or other supportive solutions to achieve a desired result, such as the incorporation or separate use of crane technologies to lift from above the structure as previously described. Typical crane options are relatively expensive in operation and require not only specialized operators but also greatly increase the risk of structural damage or even bodily harm should a drop or failure of the system occur, such as may be due to traditional connection means such as chains or given that crane technologies require lifting forces and movement of the structure corresponding to greater distances and increased risk in light of traditional jack systems.

SUMMARY OF THE INVENTION

Underlying surface lift systems and methods are disclosed that are provided in application for the lifting and moving of constructions, including but not limited to structures, and machines, implements, building materials, earth, rock, and other massive weighted and/or large dimensioned objects or materials. The underlying surface lift systems and methods may be used or performed in combination with one or more support elements to the construction or other item to be lifted, such as steel I-beams or wooden beams or other supportive elements. The invention comprises in some embodiments underlying surface lift systems and methods, alone or in combination with or performed with supportive elements generally, such as beams and other devices or elements.

The invention in some embodiments may comprise an underlying surface lift apparatus, having a support plate, a lift device in adjustable connection with the support plate, a lift support element connected with the lift device, and a lift element connected with the lift support element that is configured for connection with a support element when in contact with the underlying surface, wherein the lift device is configured to provide a lifting force applied from the lift element to a contact surface of the support element in contact with the underlying surface, the contact surface not in contact with the underlying surface, and a supportive force applied to the support plate in supportive connection with the underlying surface.

Furthermore, in some embodiments, the invention may be an underlying surface lift apparatus, having a first lift device, a second lift device operable for lift corresponding to the first lift device, a first lift support element connected with the first lift device, a second lift support element connected with the second lift device, and a lift element connected with the lift support elements and configured for connection with a support element in contact with an underlying surface.

In still other embodiments, the invention may comprise an underlying surface lift apparatus having a lift device and a lift element connected with the lift device and configured for connection with a support element in contact with an underlying surface, wherein the lift device is configured to provide a lifting force applied from the lift element to a contact surface of the support element not in contact with the underlying surface.

The invention in still further embodiments may comprise an underlying surface lift apparatus having removable connection with a support element of a construction or object and providing lift at a periphery of the construction or object and at a height above a bottom support element surface wherein the bottom support element surface is in contact with an underlying surface.

Further embodiments may include an underlying surface lift apparatus having a support plate, a lift device in adjustable connection with the support plate and having an extending lift force element, a lift support element connected with the lift device, and a lift element connected with the lift support element that is configured for connection with a support element in contact with the underlying surface, wherein a supportive force is applied from the support plate to the underlying surface in an adjustable configuration and a lifting force is applied from the extending lift element of the lift device to a support element in contact with the underlying surface. In some embodiments a pivot saddle is the adjustable connection of the support plate and the lift device.

The invention may comprise technology that facilitates the lifting and moving of constructions such as structures or other objects, particularly those having support elements, while reducing the costs and hazards of traditional jack systems and without the added costs and risks associated with complex crane operations. The invention may be more structurally stable than traditional jack technologies. The invention may further facilitate lifting, moving and cribbing operations by reducing the need for either intermediate lifting, forcing cleats under supportive members, or the requirement of first having cribbed the object to be lifted or moved or having to provide an excavation or other open volume below the underlying surface. Other features are disclosed as embodiments of the invention.

Methods of lifting from an underlying surface, business methods of lifting and moving constructions, objects or materials, and methods of cribbing constructions, objects or materials are further disclosed. In some embodiments, a method of lifting a construction, object or material in contact with an underlying surface is disclosed, having the steps of providing a lift device at the underlying surface in supportive connection with the underlying surface, and lifting the construction, object or material from a contact surface not in contact with the underlying surface. In some embodiments, the step of lifting is comprised of lifting the construction, object or material from a contact surface of a support element.

Furthermore, in some embodiments, a method of cribbing a construction, object or material is disclosed, and cribbing above an initial lift height to a transport height. In some embodiments, a method of cribbing a construction, object or material is disclosed, having the steps of providing
a lift device at an underlying surface in supportive connection with the underlying surface, lifting the construction, object or material from a contact surface not in contact with the underlying surface, and in some embodiments to an initial lift height, and providing supportive elements to support the construction, object or material. Further steps may comprise adjusting the lift device from the underlying surface to a location above the underlying surface and in supportive connection with the underlying surface, and lifting the construction or object from the initial lift height to a second or more heights that may be a transport height.

[0018] Still other methods such as those corresponding to each apparatus and assemblies are also disclosed, as well as methods of doing business. Applications may include the lifting and relocating of structures such as temporary or extension buildings to new locations and other lifting and moving solutions and may be provided in combination with other relocating technologies.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] FIG. 1 is an isometric view of one embodiment of the present invention in a first lift position.
[0020] FIG. 2 is an isometric view of the embodiment of FIG. 1 in a second lift position.
[0021] FIG. 3 is an isometric view of the embodiment of FIGS. 1 and 2 in a cribbed lift position.
[0022] FIG. 4 is an isometric view of the embodiment of the FIGS. 1 through 3 in a second cribbed lift position.
[0023] FIG. 5 is an isometric view of the embodiment of the FIGS. 1 through 4 in a third lift position.
[0024] FIG. 6 is an isometric view of an embodiment of the present invention in a first lift position.
[0025] FIG. 7 is an isometric view of the embodiment of FIG. 7 in a second lift position.
[0026] FIG. 8 is a side view of an embodiment of the present invention.
[0027] FIG. 9 are top, side and partial views of an embodiment of the present invention; FIG. 9A is a top view of a support plate in accordance with the present invention; FIG. 9B is a side view of a support plate and pivot connection of a lift force element in accordance with the present invention; FIG. 9C is a partial exploded view of the pivot connection of FIGS. 9A and 9B.
[0028] FIG. 10 is a top view of the embodiment of FIG. 8.
[0029] FIG. 11 are a top view of an embodiment of the present invention; FIG. 11A is a top view of a lift assist contact surface element in accordance with the present invention; FIG. 11B is a top view of an embodiment of the present invention having the lift assist contact surface element.
[0030] FIG. 12 is a top view of an embodiment of the present invention.
[0031] FIG. 13 is a front view of the embodiment of FIG. 12.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0032] The present invention is described in preferred embodiments that address one or more inadequacies of the prior art. Accordingly, embodiments of the invention are shown and described in the Figures, written description, and claims and throughout the disclosure of this application, as one or more apparatus, assemblies, processes, methods, and methods of doing business.

[0033] Reference to constructions, objects, or materials to be lifted and/or relocated in accordance with the present invention may be any construction, including but not limited to one or more structures such as a house, classroom or mobile home, or any object or material such as one or more machines, implements, building materials, earth, or rock, and may even be any massively weighted and/or large dimensioned object or material. While reference is made and particular application of some embodiments of the present invention are directed to massively weighted and/or large dimensioned constructions, objects or materials, the present invention is not necessarily limited to such applications as one skilled in the art would appreciate or to which previous technologies such as traditional jack systems have been applied.

[0034] The present invention in preferred embodiments is underlying surface based, as in apparatus, assembly, process, method, and method of doing business subject matter, and is utilized and performed in preferred embodiments with respect to an underlying surface providing support for the technology as well as, in many applications, at least in part support of the construction, object or material to be lifted and/or relocated. Accordingly, preferred embodiments of the invention correspond to and have application for support from an underlying surface, such as ground surface, concrete pads, support elements, or other underlying surface supporting a construction, object or material. In some embodiments, and by way of example, the underlying surface may be bare or landscaped earth, having a fairly uneven surface, or could be a graded or finished surface of fairly uniform level.

[0035] Furthermore, the present invention in some preferred embodiments is implemented in relation to the construction, object or material to be lifted. In some embodiments, the present invention is utilized and performed with respect to and in combination with one or more common support elements as further described herein. In other embodiments, the present invention is implemented directly with respect to the construction, object or material to be lifted. These support elements of construction, object or material to be lifted may include, but the invention not being limited to, the following as one skilled in the art would appreciate: 1-beams or other beams or supports having some surfaces not in contact with an underlying surface in traditional support applications, and in some preferred embodiments steel 1-beams having upper and lower horizontal flanges and a middle section in vertical relation to the flanges that together form an ‘I’ cross-section as one skilled in the art would appreciate. In an 1-beam application, the middle vertical section would comprise surfaces that in traditional application would not be in contact with the underlying surface, such as ground surface. FIGS. 1, 6, 8 and 13 of the present invention describe 1-beams supporting the structure to be lifted and/or relocated and are described in relation to an underlying surface 10 (represented as a surface shown in traditionally-depicted symbol form in some figures) as previously described and further described herein not in contact with a contact surface of the support element. All of the figures represent the invention in relation to an underlying surface.

[0036] In such embodiments, the parallel face surfaces of the middle vertical section of the 1-beam are not in contact with the underlying surface. The lower flange and its bottom surface are initially in contact with the underlying surface. One or both of the parallel faces may be incorporated to receive a lifting force in accordance with the present invention, and even in some embodiments the outer cross-sectional
The surface of the middle vertical section may receive a lifting force. As one skilled in the art would appreciate, other types of support elements could be accommodated in accordance with the present invention. The invention may even in some embodiments be applicable and useful in a lift or relocation of the construction, object or material and providing a lifting force in accordance with the present invention to a surface not in contact with the underlying surface that may be considered part of the construction, object or material and not an independent support element. In one example, a structure such as a house or mobile home may have incorporated into the structure l-beams or other elements having surfaces not in contact with the underlying surface. These surfaces could also be incorporated in accordance with the present invention, assuming the surface and the element itself are structurally capable for the lift.

Certain applications involving the massive weight or extreme dimension of a construction, object or material may effectively limit the type of support element used, such as steel l-beams; however, the present invention need not be limited in application to massively weighted or extreme dimensioned constructions, objects or materials. Furthermore, it should be understood that some embodiments of the present invention have significant advantages for such massively weighted or extreme dimensioned constructions, objects or materials, advantages and features of the present invention not heretofore available as a solution.

Several particular advantages stem from the present invention and in relation to the prior art. One is the ability to accommodate lifting or relocating of constructions, objects, or materials that are themselves or their support elements in contact with the underlying surface. The present invention allows for the ability to lift and relocate in an application wherein the support element, or the constructions, objects, or materials themselves are in direct contact with the underlying surface and without the need for additional consideration and steps of accommodating traditional jack systems or the incorporation and use of other lift systems such as cranes.

Another advantage is the structural integrity of the present invention. Connection with the support element in accordance with the present invention provides a removable connection that restrains the construction, object, or material and corresponding supportive elements during a lift that may not have been previously considered or even thought possible with traditional technologies.

Still further advantages are the ability for the system to handle massively weighted and/or extreme dimensioned constructions, objects, or materials, having the capacity to be able to lift and retain such constructions, objects, or materials with confidence in the ability to make the lift and hold and retain the desired height.

Accordingly, FIG. 1 describes one embodiment of the present invention, while reference is also made to FIGS. 2 through 6 and FIGS. 8 through 11. The underlying surface lift apparatus 20 is configured corresponding to a structure 12, support elements 14, in some applications steel l-beams, and underlying surface 10 in order to accomplish a lift. The underlying surface lift apparatus may comprise a lift device 22, and some preferred embodiments a first, second or more lift devices 24, 26. One or more lift devices may be utilized depending at least in part upon the weight and/or dimension of the construction, object, or material and even with consideration of the level of the underlying surface. The lift device or devices may have a support plate 28, and in some embodiments in adjustable connection 30 with the support plate, and still further adjustable connection 30 may be a pivot connection as described in FIG. 9. A lift support element 32 is connected with the lift device. In some preferred embodiments the lift support element may be a lift cylinder. In some embodiments the lift support element is a component of the lift device. The lift cylinder 32 in such arrangements not only facilitates operation of the lift device 22, such as in preferred embodiments wherein the lift device comprises a jack, but also serves to translate a lifting force to the support element. Furthermore, a lift element 34 may be connected with the lift support element. In some embodiments, lift element 34 is a lift bracket connected with the lift cylinder, and may be preferably connected with a weld or similar connection suitable for lift applications.

The lift element 34 is configured for connection with support element 14 when in contact with the underlying surface. Lift element 34, however, may be connected with support element 14 when support element 14 is not in contact with the underlying surface, such as when the support element is in contact with and supported by piers, such as described in FIG. 3, for example. Accordingly, operation of the lift device provides a lifting force applied from the lift element 34 to a contact surface 36 of the support element 14, the contact surface 36 not in contact with the underlying surface, the support element 14 in contact with the underlying surface, and a supportive force applied to the support plate 28 in supportive connection with the underlying surface.

In some embodiments, a lift force element 38 generates both the lift force as well as the corresponding supportive force applied to the support plate. In some embodiments the lift force element 38 is an adjustable connection with the support plate. In some preferred embodiments the lift force element 38 may be a lift piston. In some embodiments the lift force element 38 is a component of the lift device and may comprise, in preferred embodiments, a piston of a jack that is the lift device 22.

FIGS. 1 through 6 describe embodiments of the invention and further describe methods of lifting a construction, object or material. FIGS. 1 through 6 also describe methods of cribbing a construction, object or material.

Now in reference to FIG. 1, a method of lifting a construction, object or material in contact with an underlying surface is described. The first step, and as previously described, may be the provision of a lift device at the underlying surface in supportive connection with the underlying surface. Again, as shown and previously described, lift device 22, and in some embodiments one or more lift devices 24, 26, are in supportive connection with the underlying surface 10, and in this embodiment through connection with base plate 28 as described. The second step is to lift the construction, object or material from a contact surface not in contact with the underlying surface. As described in FIG. 1, lift occurs from force applied by lift element 34 to contact surface 36, a surface not in contact with the underlying surface 10. In some preferred embodiments, and in applications having use of support elements, the step of lifting is performed as lifting the construction, object or material from a contact surface of the support element. However, and as previously described, other embodiments may be performed on contact surfaces of the construction, object or material to be lifted.

FIG. 2 describes the structure 12 in a lifted configuration respective of underlying surface 10. Lifting forces 18 are translated through operation of lifting devices 24, 26.
through lift force element 28, lift support element 32 and lift element 34 to support elements 14. Corresponding supportive forces are translated through operation of lift devices 24, 26 through lift force element 28 and base plate 28 to the underlying surface 10. In certain embodiments, the lift brackets connected with the contact surface 36 of the support element, and in this embodiment the contact surface of I-beams, provide the lift force without contact with a surface in contact with the underlying surface. This achieves the advantages of being able to lift at the underlying surface without having to resort to the solutions previously described with respect to traditional methods.

[0047] FIG. 3 further describes cribbing of the construction, object or material. In combination with the descriptions of FIGS. 1 and 2, the cribbing may be performed from an initial height, such as at underlying surface, to a second height, such as a transport height. A first step may be performed as the provision of a lift device at the underlying surface in supportive connection with the underlying surface, as previously described. Furthermore, a second step may be performed as lifting the construction, object or material from a contact surface not in contact with the underlying surface, again as previously described, to an initial height. Third, supportive elements 16 are provided to support the construction, object or material. In some embodiments supportive elements 16 are piers or elements forming piers in support of the construction, object or material. In some embodiments, additional steps are provided whereby the lift device is adjusted from the underlying surface to a location above the underlying surface and in supportive connection with the underlying surface. FIG. 4 further describes this step as a adjusting the lift devices 24, 26 by use of supportive elements 16 and locating the lift devices at the initial height.

[0048] However, in the alternative, the underlying surface lift apparatus may be left in place as described in FIG. 3 or in a combination of support by cribbing the underlying surface lift apparatus as shown in FIG. 4, for further support by the apparatus or removal of the apparatus. In any event, the construction, object or material may now be either left in a supportive configuration or be prepared for relocation, such as in the application of a structure by providing a trailer under the structure, adjusting the height of the structure to allow removal of the supporting elements 16, via the underlying surface lift apparatus, and lowering the structure to the trailer surface (not shown).

[0049] As is then described in FIGS. 4 and 5, in some embodiments, the construction, object or material may be lifted from an initial height to a subsequent or final height. This height may correspond to a transport height that would allow for removal of the underlying surface lift apparatus, if desired and as previously described. The underlying surface apparatus is located above the underlying surface, yet in supportive connection with the underlying surface.

[0050] FIGS. 6 and 7 further describe another embodiment of the present invention and further reference is made to FIGS. 12 and 13. In accordance with these embodiments, the processes of the invention as described in relation to FIGS. 1 through 5 can be easily described and understood. In the embodiments of FIGS. 6 and 7, the underlying surface lift apparatus 120 may be operated as further described below and in similar fashion as the embodiments of the FIGS. 1 through 5 in providing methods of lifting a construction, object or material in contact with an underlying surface. The steps and operation are nearly identical to the embodiments of FIGS. 1 through 5, as one skilled in the art would also appreciate. Furthermore, although the embodiments of FIGS. 6 and 7 do not show supportive elements in application as in supportive elements 16 of FIGS. 1 through 5, one skilled in the art would appreciate that cribbing with such elements would follow similar procedures as described for and in FIGS. 1 through 6.

[0051] Now in reference to FIGS. 6, 7, 12 and 13 and in relation to the described underlying surface lift apparatus 120, the apparatus 120 is configured corresponding to a structure 12, support elements 14, in some applications steel I-beams, and underlying surface 10 in order to accomplish a lift. The underlying surface lift apparatus may comprise a lift assembly 122, and some preferred embodiments a first, second or more lift devices 124, 126. One or more lift devices may be utilized depending at least in part upon the weight and/or dimension of the construction, object, or material and even with consideration of the level of the underlying surface. In the present embodiment, however, each lift device may be operable for lift corresponding to another lift device. As shown in FIG. 7, lift device 124 is comprised of first and second lift devices. Lifting device 126 is also comprised of first and second lift devices. The first and second lift devices may be operated for corresponding lift between the first and second lift devices for each of the lift devices 124 and 126. Accordingly, a greater lift load may be handled and a great lift force generated at each support element 14. Embodiments of the invention may support use of only one lift device 124, or two or more as described.

[0052] The lift device 124, for example, comprises lift support elements 132, as does the embodiment providing lift device 126. Lift support elements 132, in this embodiment first and second lift support elements, are connected with the lift device 124, or are components of a lift device 124. A lift element 134 is connected with the lift support elements 132 and is configured for connection with a support element 14 in contact with underlying surface 10.

[0053] The lift device or devices may have support plates 128, and in some embodiments in adjustable connection 130 with the support plates. A lift support element 132 is connected with the lift device as previously described. In some preferred embodiments the lift support element may be a lift cylinder. In some embodiments the lift support element is a component of the lift device. The lift cylinder 132 in such arrangements not only facilitates operation of the lift device 122, such as in preferred embodiments wherein the lift device comprises one or more jacks, but also serves to translate a lifting force to the support element. Furthermore, lift element 34 may be connected with the lift support element 14. In some embodiments, lift element 134 is a lift bracket connected with the lift cylinders, as shown in FIGS. 6 and 7, and may be preferably connected with a weld or similar connection suitable for lift applications.

[0054] The lift element 134 is configured for connection with support element 14 when in contact with the underlying surface. Lift element 134, however, may be connected with support element 14 when support element 14 is not in contact with the underlying surface, such as when the support element is in contact with and supported by piers, such as described in reference to the other embodiments of FIG. 3, for
example. Accordingly, operation of the lift device 124 provides a lifting force applied from the lift element 34 to a contact surface 136 of the support element 14, the contact surface 136 not in contact with the underlying surface, the support element 14 in contact with the underlying surface, and a supportive force applied to the support plates 128 in supportive connection with the underlying surface 10.

[0055] In some embodiments, lift force elements 138 generate both the lift force as well as the corresponding supportive force applied to the support plates. In some embodiments the lift force element 138 is adjustably connected with the support plate. In some preferred embodiments the lift force elements 138 may be lift pistons. In some embodiments the lift force elements 138 are components of the first and second lift devices and may comprise, in preferred embodiments, pistons of jacks that are the lift device 124. As described in FIGS. 6 and 7, then, embodiments of the invention may comprise lift devices 124, 126 that in themselves each incorporate two or more lift devices.

[0056] In application, the embodiments of the invention of FIGS. 1 through 7 can be operated via a control system that controls the amount of lift occurring at the lift devices 24, 26 or 124, 126. In either embodiment, and in part to keep the construction, object or material level, the control of lift may be independent at each of the lift devices 24, 26, or independent at each of the lift devices 124, 126. In some embodiments, and in particular embodiments utilizing hydraulic or pneumatic jacks, a corresponding hydraulic or pneumatic control system, as understood by one skilled in the art, can be provided to control and coordinate the pressures in the individual lift devices, and even in the lift devices 124, 126 as a corresponding pressure or pressures for each of the first and second lift devices.

[0057] In reference to FIGS. 1 through 7, and in light of the previous discussion and in accordance with embodiments of the present invention, referring to more than one embodiment, an underlying lift system may further be described as having a lift device 22, 122 and a lift element 34, 134 connected with the lift device and configured for connection with a support element 14 in contact with an underlying surface 10. In this description of the invention, the operation of the lift device 22, 122 provides a lifting force applied from the lift element 34, 134 to a contact surface of the support element not in contact with the underlying surface. The concept, though previously described, can further be considered in broader detail given the unique aspect of lifting from the non-contact surface of the support element 14, or even a non-contact surface of the construction, object or material in some embodiments.

[0058] Still further in reference to FIGS. 1 through 7, and in light of the previous discussion, and again in accordance with embodiments of the present invention, referring to more than one embodiment, an underlying lift apparatus may further be described as having a lift device 22, 122, and a lift element 34, 144 in removable connection with a support element 14 and providing lift at a periphery of a construction, object or material and at a height above a bottom support element 14 surface, such as in the bottom surface of the bottom flange of an I-beam, wherein the bottom support element surface is in contact with an underlying surface 10. The concept, though previously described, can further be considered in broader detail given the unique aspects of lifting at a periphery of the support element, or even at a periphery of the construction, object or material, and at a height above the bottom surface of the support element 14, and in some embodiments corresponding to a height above the underlying surface, and from the non-contact surface of the support element 14, or even a non-contact surface of the construction, object or material in some embodiments.

[0059] Now in reference to FIGS. 8 and 10, and with reference to the previous discussion and figures, an embodiment of the invention is shown as lift device 24 and describing in detail lift element 34 with respect to surface 36 and support element 14. In some embodiments, lift element 34 may be a lift bracket connected to lift cylinder 32 and the I-beam middle vertical section that in traditional application would not be in contact with the underlying surface. A weld may be a preferred connection of lift bracket and lift cylinder, while a preferred and removable connection of the lift bracket and the I-beam may be one or a plurality of bolted connections.

[0060] Now in reference to FIG. 9, an embodiment of a plate 28 and adjustable connection 30 are shown. In some preferred embodiments, the adjustable connection comprises a pivot connection and mechanically, in some preferred embodiments, comprises a pivot saddle and corresponding pivot connection for the lift force element or lift piston in some embodiments. Again, as previously described, the provision of a support plate and an adjustable connection provides unique features of accommodating for the level of the underlying surface. Furthermore, provision of the adjustable connection in some instances pivot connection in association with the lift piston and not the cylinder provides a unique and additional function of the piston, the provision of the supportive force to the underlying surface, while allowing the cylinder to account more directly for lifting forces.

[0061] FIG. 11 further describe another aspect of the present invention. In some embodiments, a lift assist contact surface element 35 may serve to provide further connection of the lift element 34, in some embodiments a lift bracket, and the support element 14, preferably in some embodiments at the I-beam middle vertical section that in traditional application would not be in contact with the underlying surface. The lift assist contact surface element 35 further serves to allow various dimensions of support elements to be accommodated for connection with lift element 34. In some embodiments the lift assist contact surface element 35 may be a removable shim or bracket, while in alternative embodiments the lift assist contact surface element 35 may be a permanently welded material part of the lift element 34. In some embodiments, the configuration of the lift assist contact surface element 35 may be provided to accommodate for configurations of the support element. In one embodiment, the lift assist contact surface element 35 is provided with thicknesses and dimensions to not only allow an appropriate fit of the lift element to the support element, but may further be configured to allow for chamfered or curved surfaces of the support element, such as the radial surfaces between the I-beam middle vertical section and the flanges as one skilled in the art would appreciate. The lift assist contact surface element may be incorporated in all embodiments of the present invention as one skilled in the art would appreciate.

[0062] Now in reference to FIGS. 12 and 13, and as previously described, embodiments of the invention may further comprise support member 140 in embodiments incorporating plural lift devices 124, 126. In these embodiments, the support member 140 assists in having a corresponding lift between lift devices 124, 126 while further serving as connection for one or more lift elements 134.
As can be easily understood from the foregoing, the basic concepts of the present invention may be embodied in a variety of ways. It involves techniques as well as one or more apparatus, device and assembly, as well as devices, assemblages and several apparatus that may provide for the appropriate techniques. In this application, the techniques of the present invention in some embodiments are disclosed as part of the results shown to be achieved by the various devices, assemblages and several apparatus described and as steps that are inherent to utilization. They are simply the natural result of utilizing the devices, assemblages or several apparatus as intended and described. In addition, while some devices and apparatus are disclosed, it should be understood that these not only accomplish certain methods but also can be varied in a number of ways. Importantly, as to all of the foregoing, all of these embodiments are encompassed by this disclosure.

Further, each of the various elements or steps of the invention may also be achieved in a variety of manners. This disclosure should be understood to encompass each such variation, be it a variation of an apparatus embodiment, a method or process embodiment, or even merely a variation of any element of these. Particularly, it should be understood that as the disclosure relates to specific features of the invention, the words for each feature may be expressed by equivalent apparatus, device, assembly or method terms—even if only the function or result is the same. Such equivalent, broader, or even more generic terms should be considered to be disclosed for each element, step, or action. Such terms can be substituted where desired to make explicit the implicitly broad coverage to which this invention is entitled. As but one example, it should be understood that all actions or functions may be expressed as means for taking that action or achieving that function, or as an element which causes that action or has that function. Similarly, each physical element disclosed should be understood to encompass a disclosure of the action or function which is facilitated by that physical element.

Any acts of law, statutes, regulations, or rules mentioned in this application for patent; or any patents, publications, or other references mentioned in this application for patent are hereby incorporated by reference. In addition, as to each term used it should be understood that unless its utilization in this application is inconsistent with such interpretation as would be understood by one of ordinary skill in the art from this disclosure, common dictionary definitions should be understood as incorporated for each term and all definitions, alternative terms, and synonyms such as contained in the Random House Webster’s Unabridged Dictionary, second edition are hereby incorporated by reference. However, as to each of the above, to the extent that such references, information or statements incorporated by reference might be considered inconsistent with the patenting of the invention, such as contradicting disclosed features ascertained by a reading of these patent documents, such information and statements are expressly not to be considered incorporated by reference and more particularly as not made by the Applicant. Furthermore, as to any dictionary definition or other extrinsic evidence utilized to construe this disclosure, if more than one definition is consistent with the use of the words in the intrinsic record, the claim terms should be construed to encompass all such consistent meanings.

Furthermore, if or when used, the use of the transitional phrase “comprising” is used to maintain “open-end” disclosure herein, according to traditional disclosure and claim interpretation. Thus, unless the context requires otherwise, it should be understood that the term “comprise” or variations such as “comprises” or “comprising”, are intended to imply the inclusion of a stated element or step or group of elements or steps but not the exclusion of any other element or step or group of elements or steps. Such terms should be interpreted in their most expansive form so as to afford the applicant the broadest coverage legally permissible.

1. (canceled)
2. (canceled)
3. (canceled)
4. (canceled)

5. An underlying surface lift apparatus, comprising:
a support plate;
a lift device in adjustable connection with the support plate;
a lift force element configured to extend from said lift device;
a lift support element connected with said lift device; and
a lift element connected with said lift support element configured for connection with a support element in contact with an underlying surface;
wherein a supportive force is applied from said support plate to said underlying surface in an adjustable configuration and a lifting force is applied from said extending lift element to a support element in contact with the underlying surface.

6. An underlying surface lift apparatus as described in claim 5, wherein said adjustable connection comprises a pivot connection.

7. A method of lifting a construction, object or material in contact with an underlying surface, comprising the steps of:
providing a lift device at said underlying surface in supportive connection with the underlying surface; and
lifting the construction, object or material from a contact surface not in contact with the underlying surface.

8. A method of lifting a construction, object or material in contact with an underlying surface as described in claim 7, wherein said step of step of lifting comprises lifting the construction, object or material from a contact surface of a support element.

9. A method of cribbing a construction, object or material, comprising the steps of:
providing a lift device at an underlying surface in supportive connection with said underlying surface;
lifting the construction, object or material from a contact surface not in contact with said underlying surface; and
providing supportive elements to support the construction, object or material.

10. A method of cribbing a construction, object or material as described in claim 9, further comprising the steps of adjusting said lift device from said underlying surface to a location above said underlying surface and in supportive connection with said underlying surface; and lifting said construction, object or material from said initial lift height to a second height.

11. A method of cribbing a construction, object or material as described in claim 10 wherein said step of lifting comprises lifting said construction, object or material from said initial lift height to a transport height.

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