United States Patent

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[72] Inventor **William F. Manning**
Dallas, Texas

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[73] Assignee **Mobil Oil Corporation**
a corporation of New York

[54] **SUBSEA SATELLITE FOUNDATION UNIT AND METHOD FOR INSTALLING SATELLITE BODY THEREWITHIN**
28 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **166/.5,** 61/46.5, 61/72.3
[51] **Int. Cl.** **E21b 33/035,** E21b 43/01
[50] **Field of Search** ..... 166/.5, .6; 175/5—10; 61/46.5, 72.3

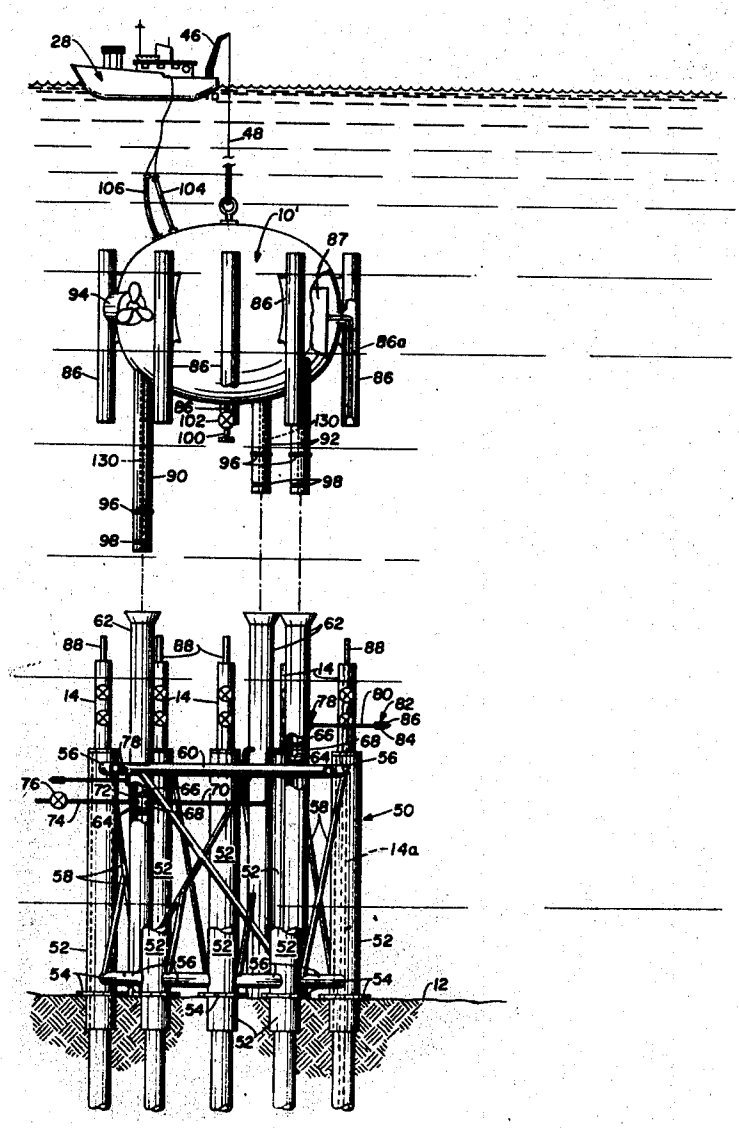
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Primary Examiner—Marvin A. Champion
Assistant Examiner—Richard E. Favreau
Attorneys—William J. Scherback, Frederick E. Dumoulin, Alan G. Paul, Donald L. Dickerson and Sidney A. Johnson

ABSTRACT: This specification discloses a method and apparatus for lowering a satellite body through a body of water to a foundation unit rigidly fixed on a marine bottom while preventing the motion of the surface handling vessel, from which the satellite body is being lowered, from being transferred to the satellite body as it comes into contact with the installed foundation unit. The apparatus comprises corresponding elements on the foundation unit and the satellite body which telescope together, trapping water therebetween. A remotely controlled bleeding off of the trapped water permits the satellite body to settle at a controlled rate in the foundation unit, the telescoping elements automatically locking together to insure that the satellite body is rigidly fixed in the foundation unit. The telescoping elements also orient the satellite body on the foundation unit so that stab connections between the satellite body and subsea wellheads, mounted on the foundation unit, come into registry and interlock to connect subaqueous wells drilled through the foundation unit, with production equipment within the satellite body. The subsea operations are assisted by a submersible work vehicle in attendance at the underwater site.



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SHEET 1 OF 2

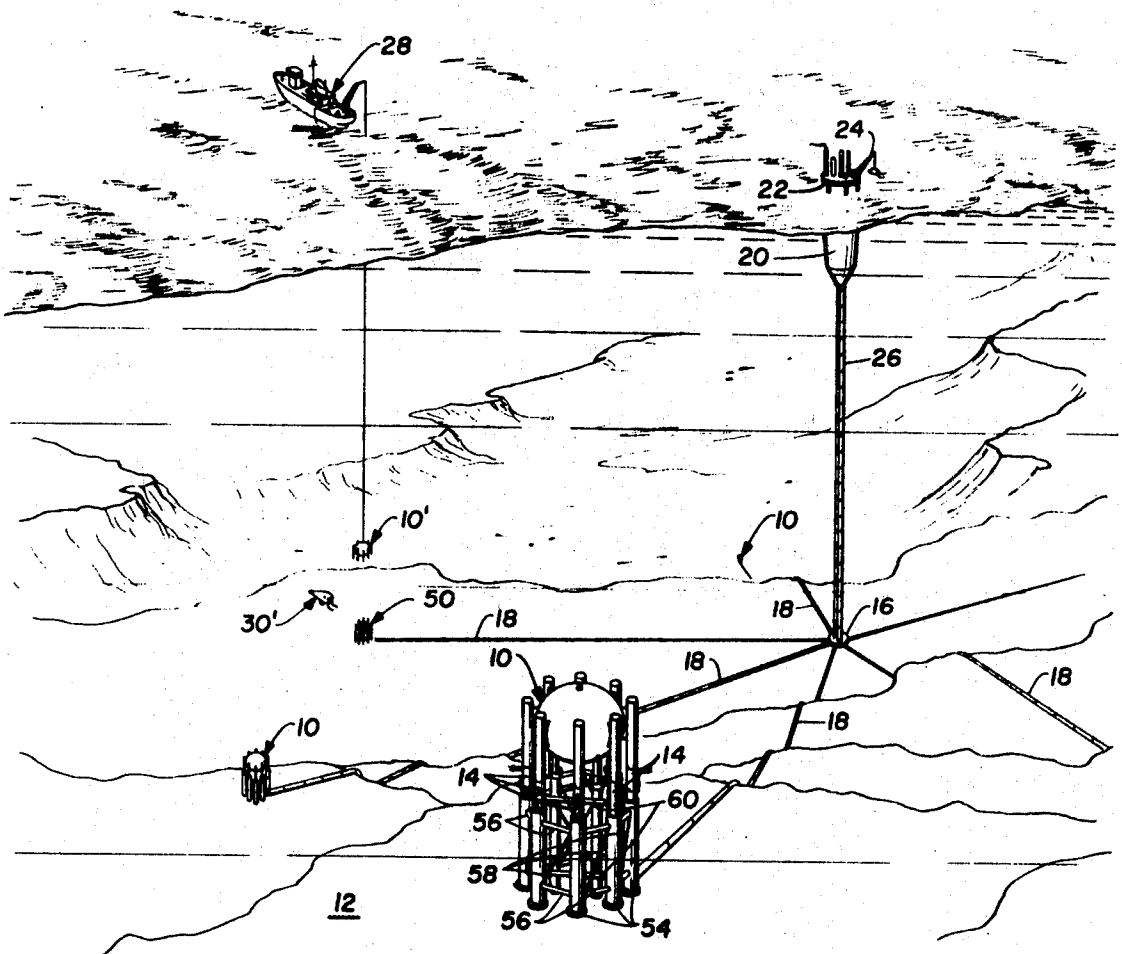
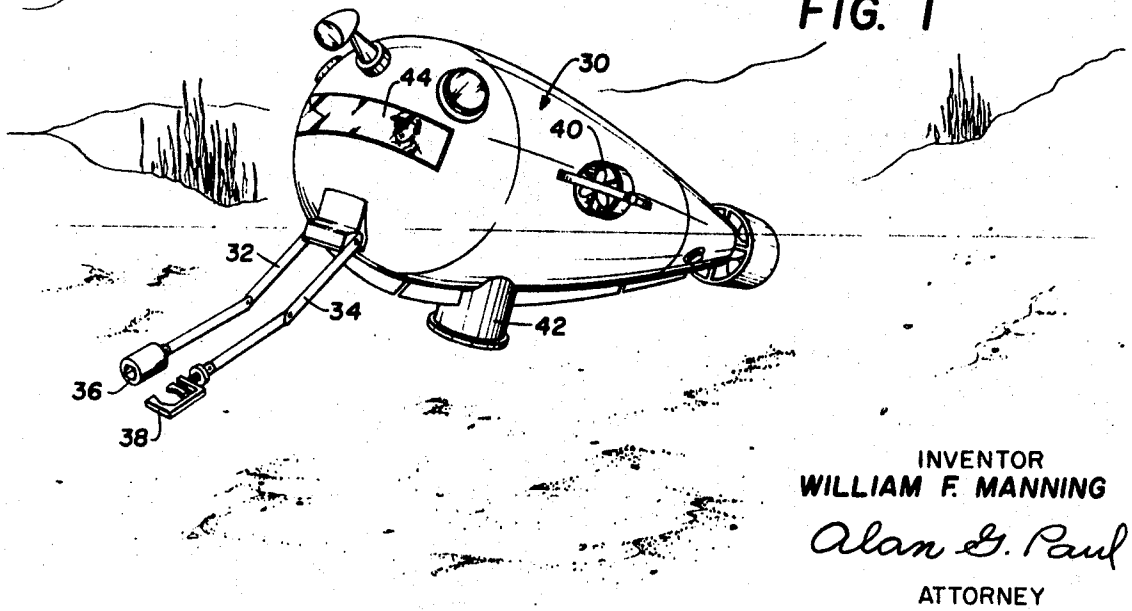


FIG. 1



INVENTOR
WILLIAM F. MANNING

Alan G. Paul

ATTORNEY

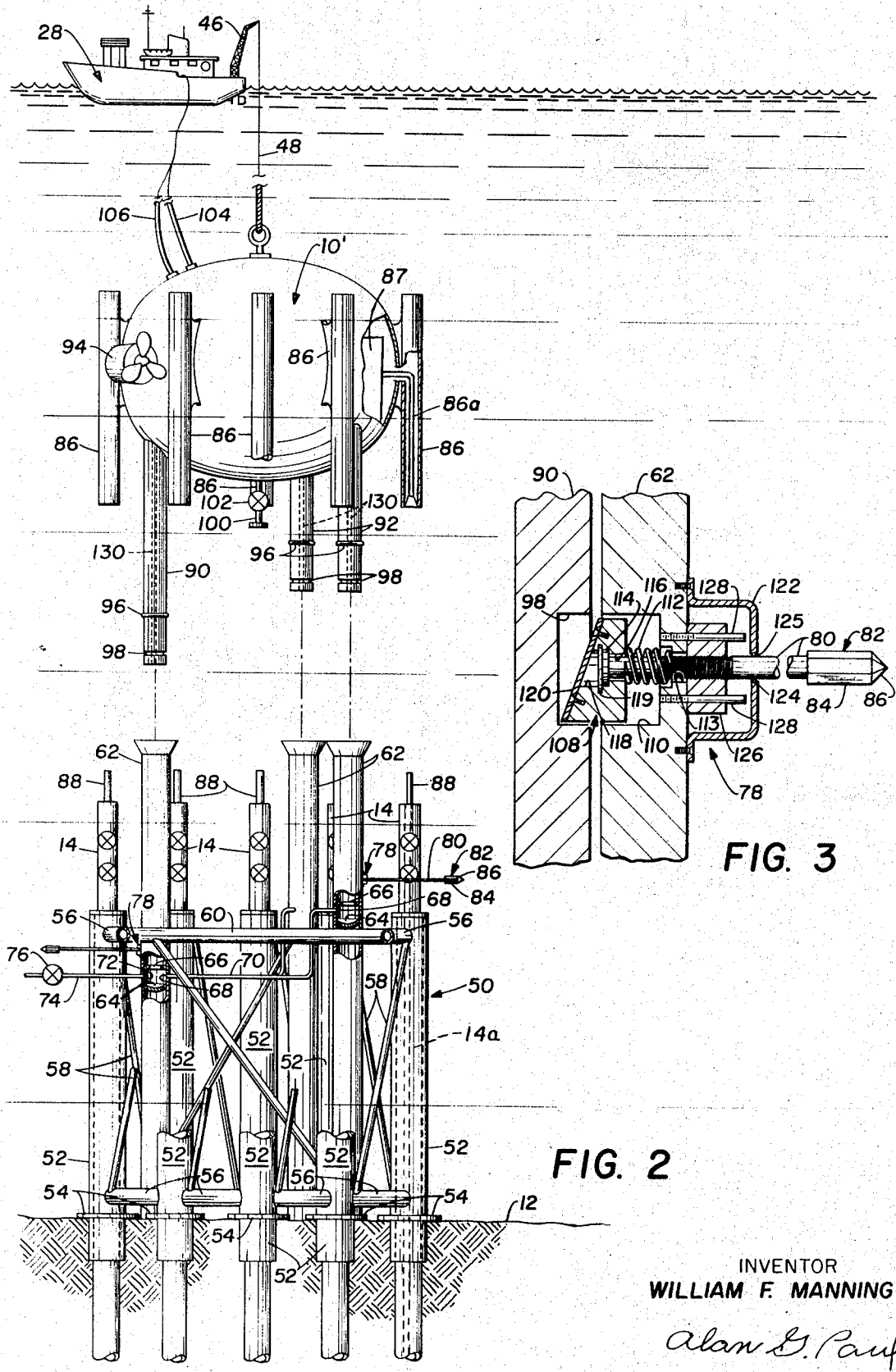


FIG. 2

FIG. 3

INVENTOR
WILLIAM F. MANNING

Alan G. Parker
ATTORNEY

SUBSEA SATELLITE FOUNDATION UNIT AND METHOD FOR INSTALLING SATELLITE BODY THEREWITHIN

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a foundation unit and a subsea satellite body therefor, forming a subsea satellite station, so designed as to control the contacting force between the foundation unit mounted on the marine bottom and a satellite body being lowered from a surface handling vessel, and to a method for installing the subsea satellite body in the foundation without transmitting surface wave movements to the satellite body as the satellite body comes in contact with the previously installed foundation unit.

2. Description of the Prior Art

The prior art has not at this stage presented adequate solutions to the problems associated with the lowering of a massive object from a floating surface handling vessel to a motionless foundation supported on the marine bottom. Any erratic motion transmitted through the object being lowered from the surface vessel, while the massive object is first contacting the foundation unit rigidly fixed to the marine bottom, could easily cost irreparable harm to both. The H. L. Shatto, Jr., U.S. Pat. No. 3,111,926. one of the few issued patents actually disclosing a subsea production satellite station, obviates this problem by providing a permanently buoyant satellite body which is held in position by tensioned anchor lines. Such an arrangement, however, has its own inherent problems such as the necessity of constantly reballasting the structure to hold a constant buoyancy under changing conditions and the ever present danger of the buoyant satellite breaking loose from its anchoring lines and destroying any and all equipment above. The J. A. Haeber U.S. Pat. No. 3,261,398, issued on Jul. 19, 1966, illustrates an entire subsea system having elements installed on a marine bottom. However, in this patent the procedures and equipment necessary for installing the bottom supported elements of the system are not disclosed.

SUMMARY OF THE INVENTION

The present invention includes a novel satellite foundation unit which comprises an outer circle of foundation jackets through which subaqueous wells will be drilled and an inner group of open, cylindrical stabbing sleeves which are interconnected with each other and the foundation jackets by an open framework. Each of the stabbing sleeves has a coaxial, cylindrical passage therethrough closed off by a partition above the lower end. Above the partition each stabbing sleeve has an annular ring fixed therein and between the respective annular ring and partition, a port, the ports of all of the stabbing sleeves being connected by a manifold. Fluid pressure in the manifold is controlled by a bleed valve actuatable from outside of the framework of the foundation unit by a submersible work vehicle attending the satellite installation procedure.

After the satellite foundation has been installed on the marine bottom and wells are completed through all of the foundation jackets, with their wellheads mounted on the upper ends of the jackets, a negatively buoyant satellite body is lowered from a surface handling vessel toward the foundation unit. The satellite body has a plurality of cylindrical stabbing columns depending vertically therefrom in such a configuration that one of the stabbing columns will fit into each of the open stabbing sleeves of the foundation unit forming therewith pairs of telescoping elements. The satellite body is angularly oriented with respect to the foundation unit with the help of one of the stabbing columns which is longer than the others. This longer stabbing column can be telescoped slightly into the corresponding stabbing sleeve first to provide an axis around which the satellite body is then rotated until the other stabbing columns are aligned with their respective stabbing sleeves. As all of the stabbing sleeves enter into the respective stabbing columns, the valve, controlling the bleeding off of trapped water within the stabbing sleeves of the foundation unit beneath the telescoping stabbing columns of the satellite body, is closed and the hoisting line between the satellite and the surface vessel is slacked off and/or removed so that the satellite body is supported solely on the trapped columns of water. The rate of descent of the satellite body into the foundation unit is now controlled by the opening of the bleed control valve, connected in the manifold system of the stabbing sleeves, by the submersible work vehicle which has a socket wrench on an articulated arm thereof for rotating a specially designed valve actuator. As the stabbing columns of the satellite body seat in the stabbing sleeves of the foundation unit, the lower ends of the stabbing columns abut the internally fixed annular rings. As the ends of the stabbing columns abut the annular rings, circumferential grooves in the lower ends of the columns register with automatic latches mounted in the walls of each of the stabbing sleeves. Detent fingers of the latches snap into circumferential grooves in the respective stabbing columns to secure the satellite body in place. At this time, the satellite body may be evacuated since it is prevented from rising by the connections with the foundation unit. The alignment of the stabbing columns of the satellite body with the stabbing sleeves of the foundation unit causes proper registry between stab-over connectors on the circumference of the shell of the satellite body and upstanding tubing nipples of the wellheads, topping the foundation jackets. As the satellite body settles into the foundation unit, the stab-over connectors telescope over the tubing nipples so as to provide fluid paths between the subaqueous wells and production equipment within the interior of the satellite body.

When it is necessary to raise the satellite body back to the surface, the satellite body is caused to become negatively buoyant, after which the spring latches are mechanically retracted under the control of the submersible work vehicle. The manifold is pressured up to raise the lower ends of the stabbing columns out of contact with the stops in the interiors of the stabbing sleeves and the hoist line is reconnected to the surface vessel for raising the satellite body back to the surface.

It is seen from the just completed discussion that when there is contact between the satellite body and the foundation unit, surface movements are not transmitted to the satellite body through the hoisting line. Therefore, it is possible to make the contact between the satellite body and the installed foundation unit as gentle as possible to prevent structural failures in either member. While the preceding discussion has dealt primarily with installing the satellite body in the foundation unit, once the foundation unit has been installed, it is realized that prior to this operation the foundation unit must be installed and leveled on the marine bottom. A three-piece foundation unit for accomplishing this operation is disclosed in the instant applicant's copending U.S. Pat. application Ser. No. 663,799 filed on Aug. 28, 1967, now U.S. Pat. No. 3,504,740. Such an arrangement could be adapted to the present foundation unit.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a pictorial illustration of a subsea production system with a satellite body being installed on one of the foundation units on a marine bottom to form a subsea satellite station. A submersible work vehicle of the type necessary to implement the installation is shown in attendance;

FIG. 2 is an enlarged side elevational view of the satellite body being lowered onto the foundation unit from a surface handling vessel; and

FIG. 3 is a fragmentary sectional view of one of the stabbing sleeves of the foundation unit with a portion of a stabbing column of the satellite body telescoped therewithin, particularly illustrating the structure of a spring latch for fixedly connecting a stabbing column of the satellite body into a respective stabbing sleeve of the foundation unit.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Now looking to FIG. 1, a subsea system for producing fluid minerals from a plurality of subaqueous wells is illustrated as

having a number of production subsea satellite stations, generally designated 10, spaced across a marine bottom 12, each satellite station 10 being centrally positioned within a closely spaced circular group of subsea wellheads 14. The produced fluids from the subaqueous wells are directed into the satellite stations 10 through the respective encircling subsea wellheads 14. The fluid streams being produced from the subsea wellheads 14 of each circular group are combined within the respective enclosed satellite stations 10 and are directed therefrom to a central main manifold 16 through a single flowline 18 extending from each satellite station 10. A floating storage tank structure 20, having an above-surface platform 22 with an offloading boom 24, is in fluid communication with the main manifold 16 through the interior of a tensioned tether pipe 26 anchored through the main manifold 16.

In the upper left-hand corner of FIG. 1 is illustrated the installation of a satellite body 10′ onto a foundation unit 50 fixed on the marine bottom 12. The satellite body 10′ is lowered from a surface handling vessel 28 with a submersible work vehicle 30′ being in attendance, near the marine bottom 12, to assist in the ensuing operations. At the lower end of FIG. 1, a similar submersible work vehicle 30 is shown in a larger scale to illustrate better its features. The submersible work vehicle 30 (and 30′) has a pair of articulated arms 32 and 34 carrying a socket wrench 36 and a vise grip tool 38, respectively. The submersible work vehicle 30 is further equipped with a pivotable positioning motor 40 (one shown) on each side to assist in locating the submersible work vehicle 30 adjacent a satellite station 10 when being installed. A lower port 42 of the submersible work vehicle 30 is connected with a rear compartment (not shown) within the shell thereof to permit a diver to be released at the installation site if one should be needed. The rear compartment is isolated from the pilot's compartments, seen through the front view plate 44, so that the diver after exposure in deep water can be kept in compression in the rear compartment while the front compartment is maintained at atmospheric conditions. This general type of submersible work vehicle is well known in the art, and specific vehicles of this type are more fully described in application Ser. No. 649,959 filed June 29, 1967, of Warren B. Brooks, Charles Ovid Baker, and Eugene L. Jones, and the references cited therein.

Now looking to FIG. 2, the satellite body 10′ and the foundation unit 50 are shown in more detail. The satellite body 10′ is lowered from the surface handling vessel 28 with a crane 46 and an interconnecting cable 48 to install the satellite body 10′ in the foundation unit 50, through which a plurality of subaqueous wells have been drilled and completed. The foundation unit 50 comprises an outer circle of foundation jackets 52 each extending a short distance into the unconsolidated upper formations of the marine bottom 12 and supporting the foundation unit 50, at least prior to the wells being completed therethrough, by enlarged circumferential bearing plates 54 (or a single large bearing mat). Parallel horizontal brace portions 56 fixedly interconnect the adjoining foundation jackets 52. For additional bracing, a diagonal 58 is located between each adjoining pair of foundation jackets 52 and the respective interconnecting parallel brace portions 56.

Within the parallel polygons formed by the upper and lower brace portions 56, and rigidly fixed thereto, are a pair of spaced horizontal triangular forms each comprising three braces 60, for supporting within the apexes thereof, vertical stabbing sleeves 62. Each of the stabbing sleeves 62 has an intermediate partition or cap 64 (seen within the broken away portion of the far right-hand stabbing sleeve 62) welded across the interior thereof. Just above the intermediate partition 64, in each stabbing sleeve 62, is welded an annular ring 66. Between the annular ring 66 and the intermediate partition 64 of each stabbing sleeve 62 is a port 68 extending through the wall of the respective stabbing sleeve 62.

Mounted in the wall of each stabbing sleeve 62 is a spring-loaded automatic latch, generally indicated at 78, having a release mechanism controlled by the rotation of a rigid horizontal retractor rod 80 having an actuator head 82 on the outer end thereof. The actuator head 82, an enlarged polygonal element 84 with a terminal conical section 86, is designed to be rotated by the socket wrench 36 carried by the articulated arm 32 of the submersible work vehicle 30. The ports 68 in the walls of the stabbing sleeves 62 are interconnected through a manifold 70. One of the stabbing sleeves 62 also has a second port 72 to which is fixed the inner end of a rigid horizontal tube 74. A shutoff valve 76 is fixed to the tube 74 near the outer end thereof beyond the periphery of the circular configuration of jackets 52. The valve 76 has an actuator head similar to the aforementioned actuator head 82 (shown diagrammatically) that is designed to be rotated also by the socket wrench 36 on the articulated arm 32 of the submersible work vehicle 30.

The satellite body 10′, being lowered from the surface handling vessel 26 by the cable 48, has a plurality of stab-over connector units 86 for mating with upstanding tubing nipples 88 of the wellheads 14 to extend production and control passages 14*a* of the subaqueous wells into the shell of the satellite body 10′. Each connector unit 86 has a fluid passage 86*a* therethrough, the lower end of which is adapted to receive nipple 88 therein to form a fluid connection. Connector unit 86 has been shown schematically since any known stab-over units can be used, e.g., one such as disclosed in U.S. Pat. No. 3,090,437, issued May 21, 1963. Passages 86*a* allow flow of produced minerals from wellhead 14 to production equipment 87 which is located inside satellite body 10′. Production equipment 87 is preferably of the type shown in U.S. Pat. No. 3,366,173, issued Jan. 30, 1968. The stab-over connector units 86 are spaced around the shell of the satellite body 10′ so that one stab-over connector unit 86 is provided for each wellhead 14. The satellite body 10′ also has one elongated vertical stabbing column 90 and a pair of shorter vertical stabbing columns 92 arranged to telescope into the stabbing sleeves 62 to orient the satellite body 10′ with respect to the foundation unit 50 to provide proper registry for the stab-over connector units 86. Each of the stabbing columns 90 and 92 has at least one sealing O-ring 96 mounted in a circumferential groove thereon and a lower open circumferential groove 98. A reversible dynamic positioning motor 94 is mounted on the shell of the satellite body 10′ to rotate the satellite body 10′ to provide for proper alignment. Alternatively, water or air jets (not shown) can be provided to perform the same function. At least an air line 104 and an electrical line 106 are connected between the satellite body 10′ and the surface handling vessel 28. The satellite body 10′ also has a buoyancy control port 100 extending from the lower end thereof which is controlled by a valve 102. The valve 102 has an extended valve actuator, shown only diagrammatically, of the type previously described.

In operation, as the satellite body 10′ is lowered from the surface handling vessel 28, it is caused to be negatively buoyant by opening the valve 100 to flood at least a portion of the interior thereof. The amount of water allowed to enter the satellite body 10′ can be controlled from the surface handling vessel 28 through the air line 104 or from the submersible work vehicle 30′. As the satellite body 10′ is lowered through the water, it is so aligned that the longer stabbing column 90 telescopes into one of the stabbing sleeves 62. The satellite body 10′ is then rotated until the other two stabbing columns 92 are coaxial with the respective stabbing sleeves 62. This alignment is brought about, from the surface vessel 28, under the direction of the submersible work vehicle 30′, either by the control of the positioning motor 94 through electrical line 106, or by the application of air through the line 104 and selected air jets fixed in the shell of the satellite body 10′. When the proper alignment is obtained, the satellite body 10′ is lowered until the shorter stabbing columns 92 are just within the upper end of the stabbing sleeves 62. At this time the valve 76, which has been open until this time, is closed to trap water within the stabbing sleeves 62 above the intermediate partitions 64, and the cable 48 is slacked off from the surface han-

dling vessel 26 so that the satellite body 10' is supported on the three columns of water trapped within the sleeves 62. Alternatively, air, or water, under pressure can be applied through the tube 74 to raise the satellite body 10' enough, with the stabbing columns 90, 92 still in the stabbing sleeves 62, to slack off the cable 48. The cable 48 can be disconnected thereafter at any time. The valve 76 is then gradually opened slowly to allow water to escape at a predetermined rate from the sleeve 62 through the manifold 70 so that the satellite body 10' slowly settles into the stabbing sleeves 62 until the lower ends of the stabbing columns 90 and 92 abut the annular rings 66. As the stabbing columns 90 and 92 settle down into the stabbing sleeves 62, spring latches 78 lock into the open circumferential grooves 98 in the stabbing columns 90 and 92, securing the satellite body 10' cradled in place in the foundation unit 50. Air may then be pumped into the satellite body 10', through the line 104 to evacuate the excess water, the valve 100 then being shut, leaving the satellite body 10' filled with air and buoyant but held fixedly adjacent the marine bottom 12 cradled in its foundation unit 50. A representative spring latch 78 is shown in more detail in FIG. 3. The latch 78 consists of a camming detent finger 108 reciprocally mounted in a cutout 110 in the inner wall of the respective stabbing sleeve 62. The detent finger 108 is reciprocally received in the open circumferential groove 98 in the illustrated stabbing column 90 by first camming the detent finger 108 outward with the lower end of the stabbing column 90 moving down through the interior of the sleeve 62, the detent finger 108 springing inward into the open groove 98 as the groove 98 and the cutout 110 come into registry. The detent finger 108 is inwardly biased by a coil compression spring 112 located in the cutout 110 behind the detent finger 108. The retractor rod 80 extends from the detent finger 108 through the center of the coil spring 112 in the cutout 110, a center bore 113 in the wall of the sleeve 62 connecting the cutout 110 with the outer face of the wall of the sleeve 62, and terminates, as previously described, in an enlarged activator head 82 at a distance from the sleeve 62. The retractor rod 80 is connected to the detent finger 108 by a flange 114 axially fixed in an enlarged coaxial bore section 118 of a bore 116 of the detent finger 108 by a snap ring 119 locked into an undercut groove in the enlarged bore section 118. The enlarged bore section 118 is closed, at its inner end, by a hardened camming plate 120 bolted over the inner face of the detent finger 108. Outward of the stabbing sleeve 62, the retractor rod 80 extends through an coaxial aperture 125 in a waterproof compartment 122 fixed to the outer wall of the stabbing sleeve. An O-ring 124 in the inner wall of the aperture 125 provides a rotatable and slidable seal between the retractor rod 80 and the compartment 122. A nut 126 is threaded on a portion of the retractor rod 80 within the waterproof compartment 122, the nut 126 being nonrotatably slidable on a pair of parallel pins 128 tightly threaded into horizontal tapped holes in the outer wall of the stabbing sleeve 62 within the compartment 122. With this arrangement, the downward movement of the stabbing column 90 into conjunction with the detent finger 108 would cam the detent finger 108 outward against the action of the spring 112. The slidable mounting of the nut 126 on the pins 128 allows the nut 126 to move outward, within the compartment 122, as the retractor rod 80 is driven outward due to the outward movement of the detent finger 108. When the circumferential groove 98 of the respective stabbing column 90 comes into registry with cutout 110, the detent finger 108 springs inwardly into the circumferential groove 98 to axially fix the stabbing column 90 with respect to the stabbing sleeve 62.

When the satellite body 10' is to be raised back out of the foundation unit 50, the spring latches 78 must be released. This is accomplished by rotating the retractor rod 80 with the socket wrench tool 36, carried on an articulated arm 32 of the submersible work vehicle 30, the socket wrench tool 36 mating with the actuator head 82 located on the outer end of the retractor rod 80. A prescribed direction of rotation of the retractor rod 80 will shift the retractor rod 80 outward, the reaction forces causing the nut 126 to abut tightly against the outer wall of the stabbing sleeve 62, to completely withdraw the detent finger 108 from the circumferential groove 98. The release of the spring latches 78 permits the stabbing columns 90 and 92 to move axially upward with respect to the stabbing sleeve 62. Prior to reinstalling the satellite body 10' in the foundation unit 50, the retractor rods 80 of all of the latching units 78 should be rotated in the reverse direction to again allow the position of the detent finger 108 to be controlled by the camming forces on the inner camming plate 120 thereof acting against the inwardly biasing action of the compression spring 112.

When the satellite body 10' is to be brought back to the surface, the cable 48 and the air and electrical lines 104 and 106 respectively, are lowered from the surface vessel 28 and are reconnected to the satellite body 10' with the assistance of the vise grip tool 38 carried on an arm 34 of the submersible vehicle 30. The valve 100 is opened long enough to allow enough water to enter the satellite body 10' to obtain a slight negative buoyancy of the satellite body 10' and then is closed. With the satellite body 10' negatively buoyant, the three latches 78 are retracted with the aid of the submersible work vehicle 30, after which fluid under pressure is applied within the stabbing sleeves 62 above the partitions 64 and beneath the stabbing columns 90, 92 to raise the satellite body 10' up in the foundation unit 50 with the stabbing columns 90, 92 still partially telescoped within the stabbing sleeves 62. At this time the cable 48 is tensioned by the crane 46 and the satellite body 10' is hoisted to the surface. If the fluid under pressure applied within the stabbing sleeves is air, this will act as a cushion when the cable 48 is tensioned and some surface motions are transferred therethrough during the preliminary portion of the raising operation. If water is applied within the stabbing sleeves, the valve 78 should be opened as the cable is tensioned to prevent surface motions from being transferred to the foundation unit 50. The fluid under pressure in the stabbing sleeves 62, for raising the satellite body 10' up in the foundation unit 50, is obtained by injecting air into the stabbing sleeve 62 through internal conduits 130 coaxially located within the stabbing columns 90 and 92 and selectively connected at their upper ends within the satellite body 10' to the air line 104. Alternatively, a fluid connector portion may be fixed on the outer end of the rigid tube 74 so that an air line extending from the surface handling vessel 28 can be connected thereto to pump the air through the manifold 70 into the stabbing sleeves 62 in conjunction with the opening of the valve 76 by the submersible work vehicle 30. Still another alternative, also utilizing a fluid connection with the tube 74 would be that of having a retractable flexible line carried by the submersible work vehicle 30, which could be plugged into the fluid connector portion on the outer end of the tube 74. A pump, carried by the submersible work vehicle 30, would be utilized to pump water or air into the manifold 70 to perform the same function as the air line previously discussed.

Although the present invention has been described in connection with details of a specific method and apparatus, it is to be understood that such details are not intended to limit the scope of the invention. The terms and expressions employed are used in a descriptive and not a limiting sense and there is no intention of excluding such equivalents in the invention described as fall within the scope of the claims. For instance, the positioning of the stabbing columns and stabbing sleeves could be reversed, the stabbing sleeves being fixed to the satellite body 10' and the stabbing columns fixed to the foundation unit. Other modifications and changes within the scope and spirit of the invention will be obvious to the reader. Now having described the apparatus and method herein disclosed, reference should be had to the claims which follow.

I claim:

1. A subsea satellite foundation unit comprising at least one vertical stabbing sleeve, said stabbing sleeve being open at the upper end thereof to receive a depending stabbing column of a

satellite body being lowered through a body of water to said foundation unit when said foundation unit is fixedly located on a marine bottom, and means on said foundation unit for controlling the pressure of fluid trapped within said stabbing sleeve as a depending stabbing column of a satellite body enters and telescopes into said stabbing sleeve.

2. A subsea satellite foundation unit, as recited in claim 1, wherein there are a plurality of vertical stabbing sleeves, each of said plurality of stabbing sleeves being open at the upper end thereof to receive one of a plurality of depending stabbing columns of a satellite body being lowered through a body of water to said foundation unit, said means for simultaneously controlling the pressure of fluid trapped within each of said stabbing sleeves comprising a manifold interconnecting the interiors of said stabbing sleeves.

3. A subsea satellite foundation unit, as recited in claim 1, wherein said means for controlling the pressure of fluid trapped within each of said stabbing sleeves comprises a valve, and a valve actuating means extending beyond said foundation unit where said actuating means can be reached and controlled from an attendant submersible work vehicle.

4. A subsea satellite foundation unit, as recited in claim 1, wherein there is a releasable automatic latching means mounted on said stabbing sleeve having a detent finger extending into the interior of said stabbing sleeve for coacting with a groove in a stabbing column telescoping into said stabbing sleeve to secure the stabbing column in said stabbing sleeve.

5. A subsea satellite foundation unit, as recited in claim 4, wherein there is means for yieldably inwardly biasing said automatic latching means whereby the telescoping of a stabbing column into said stabbing sleeve will depress said detent finger of said automatic latching means outwardly into the wall of said stabbing sleeve, said detent finger moving inwardly again when a groove in the wall of a stabbing column telescoping into said stabbing sleeve comes into registry therewith.

6. A subsea satellite foundation unit, as recited in claim 5, wherein there is a manual retracting means for moving said detent finger outwardly into said wall of said stabbing sleeve to release a stabbing column secured in said stabbing sleeve, said manual retracting means comprising a retractor rod extending outwardly of said stabbing sleeve.

7. A subsea satellite foundation unit, as recited in claim 6, wherein said retractor rod extends out beyond said foundation unit and terminates, at the outer end thereof, in an enlarged head which can be actuated by a tool carried by an articulated arm of a submersible work vehicle.

8. A subsea satellite foundation unit, as recited in claim 1, wherein said means for controlling the pressure of fluid trapped within said stabbing sleeve comprises a fluid port in the wall of said stabbing sleeve and a partition in said stabbing sleeve sealing said interior of said stabbing sleeve below said fluid port.

9. A subsea satellite foundation unit, as recited in claim 8, wherein there is an annular ring fixed within said stabbing sleeve above said fluid port.

10. A subsea satellite foundation unit, as recited in claim 1, said foundation unit being fixedly supported on a marine bottom, at least one vertical foundation jacket forming an integral portion of said foundation unit, a subaqueous well completed through said foundation jacket and terminating in a subsea wellhead mounted on the upper end of said foundation jacket, and an upstanding tubing nipple for extending each production and control passage of said subsea wellhead whereby a stab-over connector unit of a satellite body will telescope over said upstanding tubing nipple when a stabbing column depending from a satellite body telescopes fully into said stabbing sleeve and said satellite body is properly oriented with respect to said foundation unit.

11. A subsea satellite foundation unit, as recited in claim 10, wherein there are a plurality of stabbing sleeves on said foundation unit for coacting with a plurality of corresponding stabbing columns depending from a satellite body, the coaction of said plurality of stabbing sleeves with a plurality of stabbing columns providing the proper orientation to register a stab-over connector unit of a satellite body with said upstanding tubing nipple of said subsea wellhead mounted on said foundation jacket of said foundation unit.

12. A subsea satellite foundation unit comprising a plurality of peripheral foundation jackets, means for rigidly interconnecting said foundation jackets in vertical alignment, a plurality of stabbing sleeves, means for rigidly interconnecting said stabbing sleeves in vertical alignment and for rigidly fixing said plurality of stabbing sleeves within said plurality of foundation jackets, said stabbing sleeves each being open at the upper end thereof to receive a corresponding depending stabbing column of a satellite body lowered through a body of water to said foundation unit located on a marine bottom, a port in the wall of each of said stabbing sleeves, partition means sealing the interior of each of said stabbing sleeves below said respective port, and an annular ring fixed within each of said stabbing sleeves above said respective port in said stabbing sleeve, a manifold extending between said ports for interconnecting the interiors of said stabbing sleeves, valve means associated with said manifold for controlling the pressure of fluid within each of said stabbing sleeves as the depending stabbing columns of a satellite enter said stabbing sleeves, manual means for actuating said valve means, said manual means being located beyond said peripheral foundation jackets, a releasable automatic latching means mounted on each of said stabbing sleeves, each of said releasable automatic latching means being provided with a detent finger and means for yieldably biasing said detent finger inward so that said detent finger will be yieldably depressed outward into the wall of said stabbing sleeve as a stabbing column telescopes into said stabbing sleeve camming said detent finger outward, said detent finger being adapted to move inward into a groove in the wall of a stabbing column as a groove in the wall of a stabbing column comes into registry therewith to secure a stabbing column in said respective stabbing sleeve, and manual retracting means for moving said detent finger out of a groove in a stabbing column and outward into said wall of said stabbing sleeve to release a stabbing column secured in said stabbing sleeve, said manual retracting means comprising a retractor rod extending outwardly beyond said peripheral foundation jackets.

13. A subsea satellite foundation unit, as recited in claim 12, being located on a marine bottom, a subaqueous well completed through at least one of said foundation jackets, said completed subaqueous well comprising a subaqueous wellhead mounted on the upper end of one of said foundation jackets, an upstanding tubing nipple connected to each production and control passage of said subaqueous well, extending from said wellhead whereby, when a satellite body is lowered to said foundation unit, and its depending stabbing columns telescope into said stabbing sleeves, a stab-over connector unit of the satellite body registers with said upstanding tubing nipple of said subsea wellhead to form a fluid connection from said subaqueous well into the shell of the satellite body.

14. A subsea satellite station comprising said satellite foundation unit, with at least one subaqueous well completed through the foundation jackets thereof, as recited in claim 13, further comprising a satellite body cradled in said foundation unit, said satellite body having a plurality of depending stabbing columns, each of said stabbing columns being telescoped into one of said plurality of stabbing sleeves of said foundation unit, with the lower ends of said stabbing columns being supported on said annular rings fixed within said stabbing sleeves, said satellite body being rigidly fixed in said foundation unit by said automatic latching means securing said stabbing columns in said stabbing sleeves, at least one stab-over connector unit fixed to the shell of said satellite body, said stab-over connector unit having a fluid path therewithin extending into the shell of said satellite body and being in fluid connection with production equipment within

said shell of said satellite body, the lower end of said stab-over connector unit telescoping over said upstanding tubing nipple to form a fluidtight connection between said upstanding tubing nipple and said stab-over connector unit whereby fluid produced through said subaqueous well is conducted into said production equipment with said shell of said satellite body.

15. A subsea satellite station, as recited in claim 14 wherein one of said plurality of stabbing columns is longer than the other of said plurality of stabbing columns whereby said longer stabbing column is first partially telescoped into the corresponding stabbing sleeve and then said satellite body is rotated to align said other stabbing columns and the corresponding stabbing sleeves.

16. A subsea satellite station comprising a foundation unit rigidly fixed on a marine bottom of a body of water and a satellite body cradled in said foundation unit, at least one pair of telescoping elements forming a connection between said satellite body and said foundation unit, one element of said pair of telescoping elements being fixed to said foundation unit, the other element of said pair of telescoping elements being fixed to said satellite body, a means for controlling the bleeding off of water trapped between said telescoping elements as said satellite body is lowered into said foundation unit rigidly fixed on said marine bottom and said pair of elements telescope fully together.

17. A subsea satellite station, as recited in claim 16, wherein one of said elements of said pair of telescoping elements is a stabbing column of cylindrical configuration.

18. A subsea satellite station, as recited in claim 17, wherein the other element of said pair of telescoping elements is a stabbing sleeve having a cylindrical passage open at least at the upper end thereof.

19. A subsea satellite station, as recited in claim 17, wherein the axis of said cylindrical stabbing column is vertically oriented when said elements are telescoped together with said foundation unit rigidly fixed on said marine bottom.

20. A subsea satellite body adapted to be cradled on a marine bottom in a preinstalled foundation unit comprising a watertight shell, a plurality of stabbing columns depending from said shell of said satellite body in a pattern corresponding to a plurality of stabbing sleeves on the preinstalled foundation unit, and a plurality of stab-over connector units spaced around said shell of said satellite body, each stab-over connector unit having at least fluid path therein extending into said shell of said satellite body whereby said stab-over connector units can coact with upstanding nipples of spaced subsea wellheads of subaqueous wells completed through the preinstalled foundation unit to form fluid paths from subaqueous wells into said shell of said satellite body.

21. A subsea satellite body adapted to be cradled on a marine bottom in a preinstalled foundation unit comprising a watertight shell and a plurality of vertical, spaced stabbing columns depending from said shell of said satellite body in a pattern corresponding to a plurality of stabbing sleeves of a foundation unit to be utilized therewith wherein one of said plurality of vertical, spaced stabbing columns is longer than the others of said plurality of stabbing columns whereby said longer stabbing column will begin to telescope into a corresponding stabbing sleeve before the others of said stabbing columns, whereby when said longer stabbing column starts to telescope into the respective stabbing sleeve, said satellite body can be rotated around said longer stabbing column to provide proper alignment of the others of said stabbing columns with the respective stabbing sleeves.

22. A subsea satellite body, as recited in claim 21, wherein there is means associated with said satellite body for reacting with the surrounding water for rotating said satellite body around said longer stabbing column when said longer stabbing column is telescoped partially in its corresponding stabbing sleeve.

23. A subsea satellite body, as recited in claim 22, wherein said means for rotating said satellite body in surrounding water is a positioning motor mounted on the outside of said shell of said satellite body.

24. A method for installing a subsea satellite body in a satellite foundation unit fixed on a marine bottom of a body of water to form a subsea satellite station, said satellite body comprising a watertight shell, said method comprising the following steps:

a. causing said satellite body to be negatively buoyant;
b. lowering said satellite body to said foundation unit fixed on said marine bottom from a surface handling vessel by a cable;
c. partially telescoping at least one pair of elements, a first element of said pair of elements being fixed to said satellite body and a second element of said pair of elements being fixed to said foundation unit, while still supporting said satellite body by said cable;
d. at least slacking off on said cable while supporting said satellite body on a column of water trapped between said elements of said pair of telescoping elements; and
e. bleeding water from said column of water to further telescope said pair of elements to fully cradle said satellite body in said foundation unit.

25. A method for installing a subsea satellite body in a satellite foundation unit fixed on a marine bottom of a body of water to form a subsea satellite station, said satellite body comprising a watertight shell, said method comprising the following steps:

a. causing said satellite body to be negatively buoyant;
b. lowering said satellite body to said foundation unit fixed on said marine bottom from a surface handling vessel by a cable;
c. partially telescoping a plurality of depending stabbing columns of said satellite body into respective vertical stabbing sleeves of said foundation unit while still supporting said satellite body by said cable;
d. supporting said satellite body on trapped columns of water in said stabbing sleeves beneath said stabbing columns;
e. at least slacking off on said lowering cable; and
f. bleeding water from said columns of water to further telescope said stabbing columns into said stabbing sleeves to fully cradle said satellite body in said foundation unit.

26. A method for installing a subsea satellite body in a satellite foundation unit, as recited in claim 25, wherein one of said depending stabbing columns is longer than the others, including the following additional steps prior to step c:

g. partially telescoping said longer of said plurality of depending stabbing columns into the corresponding stabbing sleeve while still supporting said satellite body by said cable; and
h. rotating said satellite body until said others of said plurality of depending stabbing columns are aligned with the corresponding stabbing sleeves.

27. A method for installing a subsea satellite body in a satellite foundation, as recited in claim 25, wherein there is a manifold interconnecting the trapped columns of fluid within said stabbing sleeves beneath said stabbing columns, and valve means including a manual actuator on said foundation unit for bleeding said trapped column of fluid, including the following additional step:

i. moving said manual actuator by a tool carried on an articulated arm of a submersible work vehicle observing the installation procedure.

28. A method for installing a subsea satellite body in a satellite foundation unit, as recited in claim 25, wherein a releasable automatic latching means is mounted on each of said stabbing sleeves, each of said releasable automatic latching means having a detent finger extending into the interior of the respective stabbing sleeve, and a corresponding groove formed on each of said stabbing sleeves for receiving said detent finger, including the following additional step to be performed as part of step f:

j. telescoping said plurality of depending stabbing columns into said corresponding stabbing sleeves until said detent fingers of said automatic latching means engage in said grooves of said stabbing columns to lock said satellite body cradled in said foundation unit.