United States Patent [19]

Baxter

[11] **3,887,083**

[45] **June 3, 1975**

[54] **SYSTEM FOR MOVING AND ALIGNING MODULAR HOUSE UNITS ONTO A FOUNDATION**

[75] Inventor: **Bobby G. Baxter**, Warrenton, Mo.

[73] Assignee: **The Binkley Company**, Warrenton, Mo.

[22] Filed: **Mar. 8, 1973**

[21] Appl. No.: **339,081**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 216,204, Jan. 7, 1972, Pat. No. 3,794,186.

[52] **U.S. Cl.** ..... **214/1 H**; 214/38 BA; 214/515

[51] **Int. Cl.** **B65g 67/24**

[58] **Field of Search** ..... 214/38 B, 38 BA, 38 BB, 214/1 H, 517; 238/13; 105/366 R, 368 B; 52/122, 745

[56] **References Cited**

UNITED STATES PATENTS

2,234,522 3/1941 Fleet ..... 105/178 X

3,231,121 1/1966 Powell 214/515

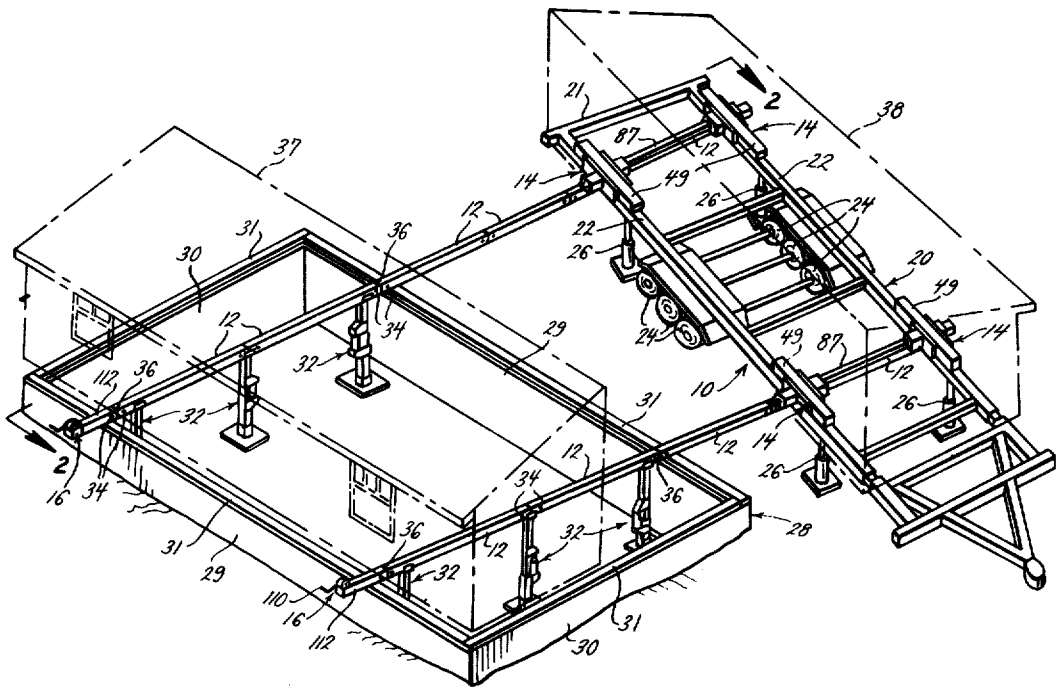
Primary Examiner—Robert G. Sheridan

Attorney, Agent, or Firm—Rogers, Ezell & Eilers

[57] **ABSTRACT**

This invention relates to a system and method for placing a module unit on a site foundation. In accordanced therewith means are provided for supporting a module unit alongside the foundation. Spaced tracks extend from between the module and support means across the foundation. Also included are first antifriction bearing means between the module and tracks for movement of the module along the tracks, second antifriction bearing means located between the module and the track for allowing transverse movement of the module relative to at least all but one of the tracks, and means between the first and second antifriction bearing means for providing rotation of the module unit relative to the tracks. Means are also provided for moving the module along the tracks.

10 Claims, 14 Drawing Figures



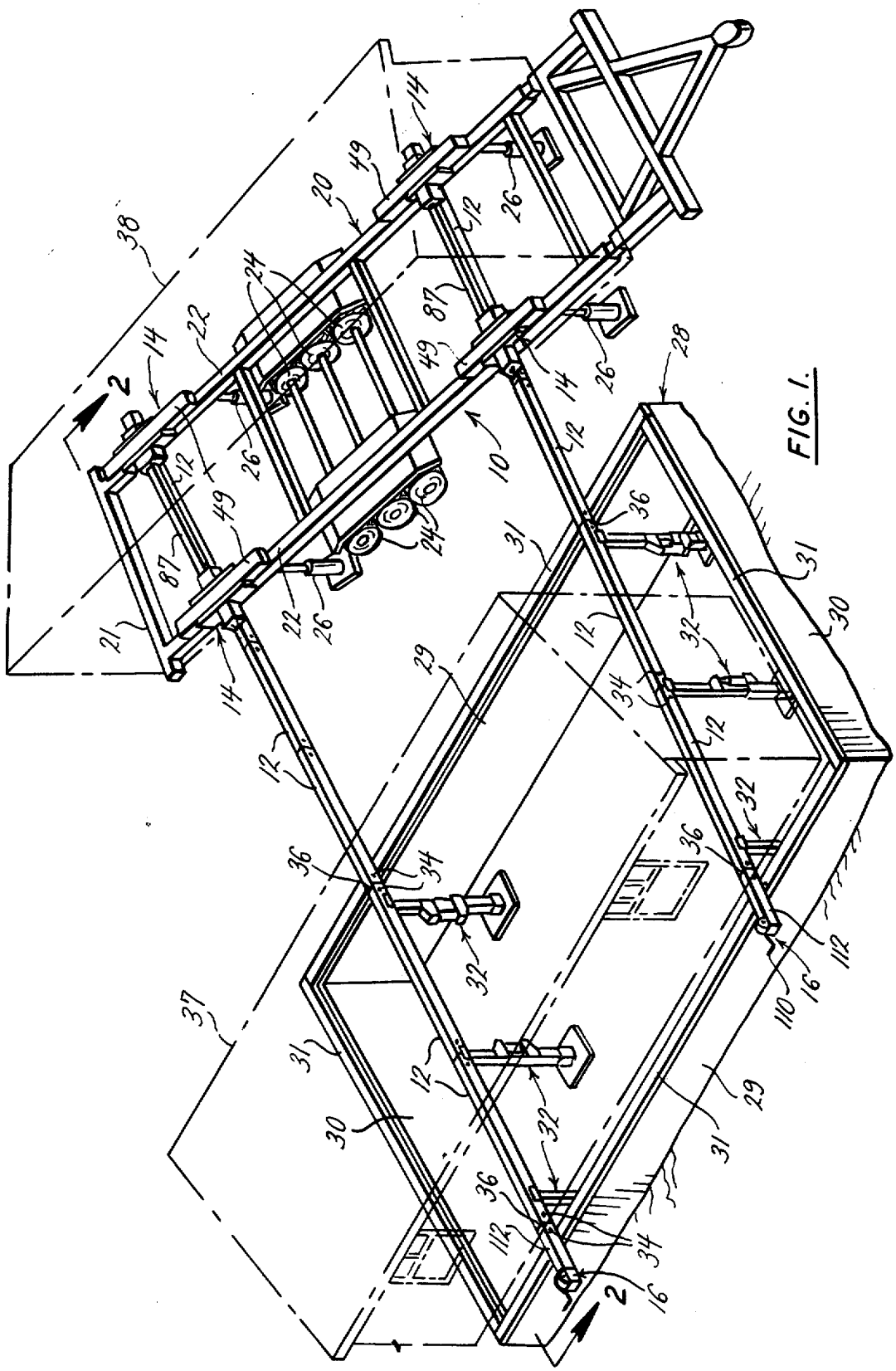


FIG. 1.

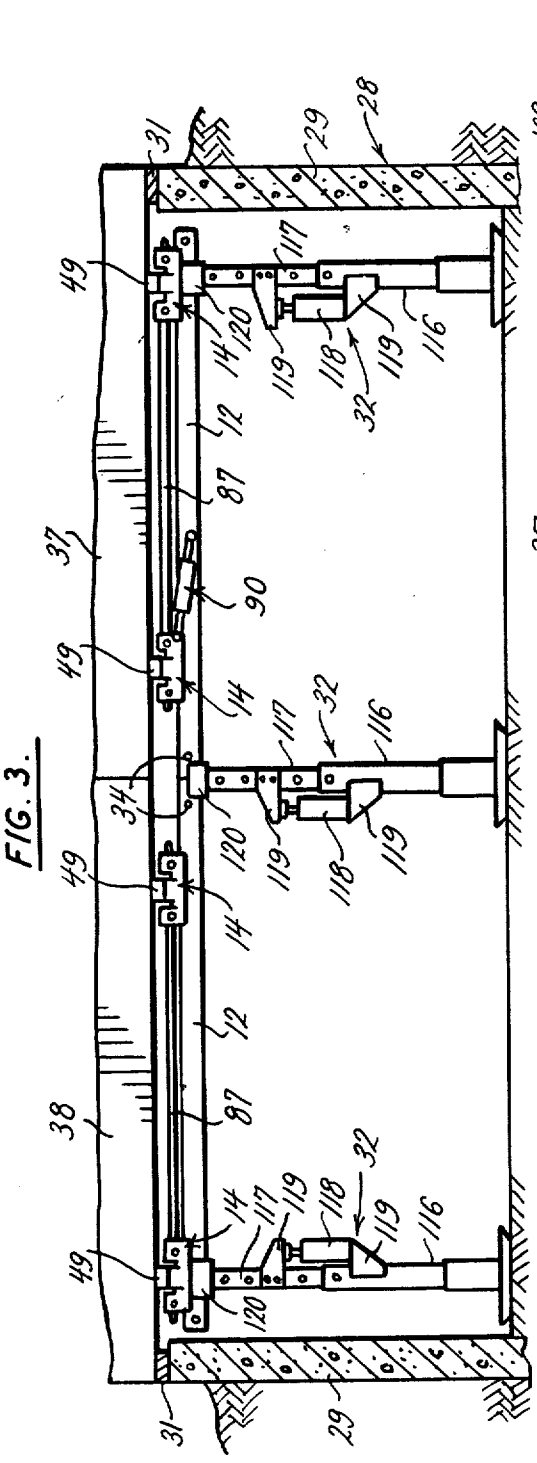


FIG. 3.

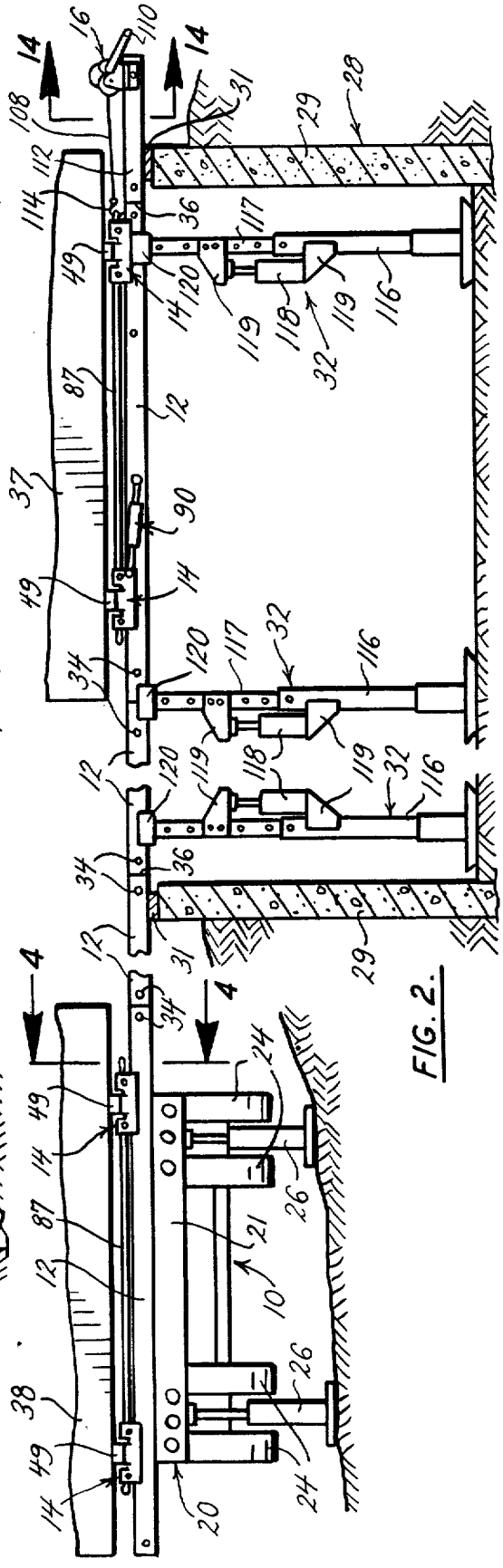
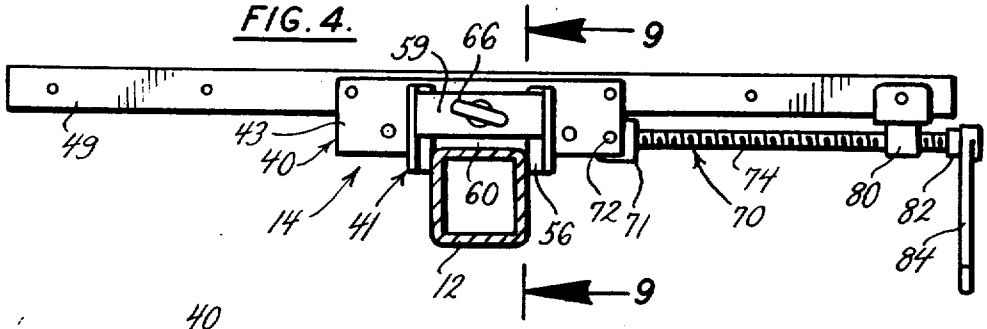


FIG. 2.

FIG. 4.



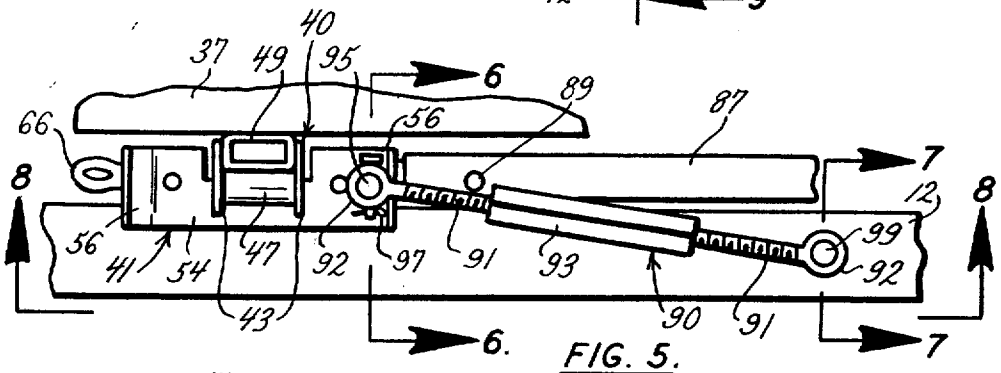


FIG. 5.

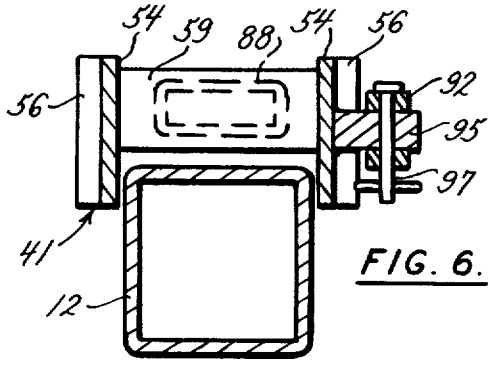


FIG. 6.

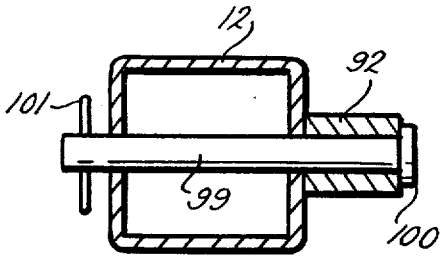


FIG. 7.

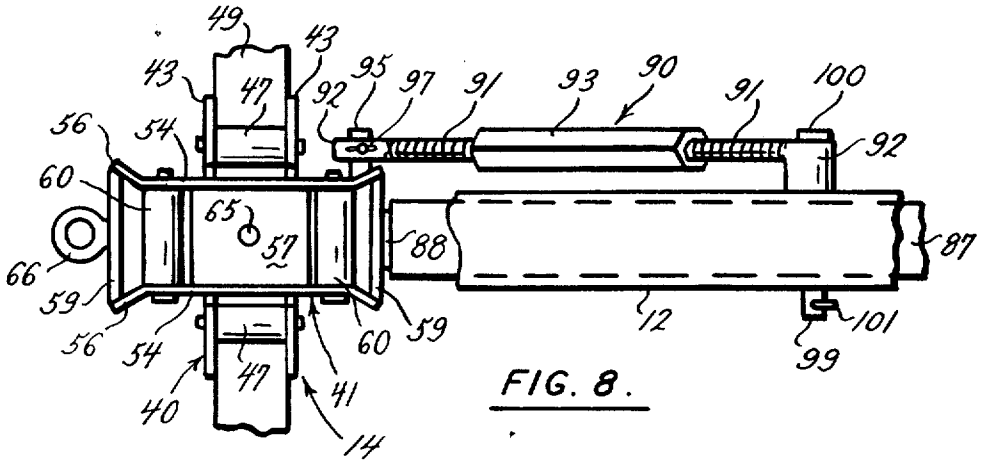
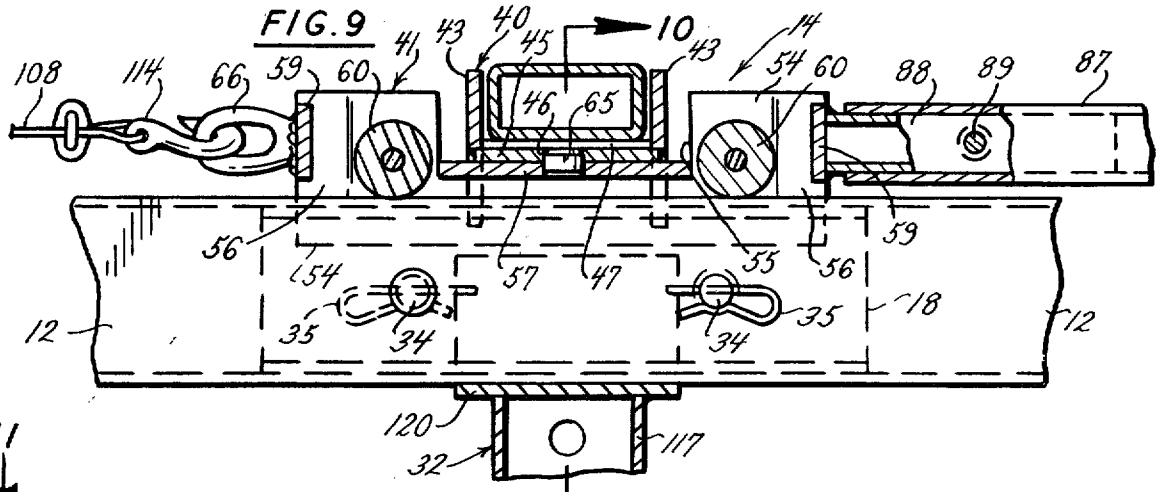


FIG. 8.

FIG. 9



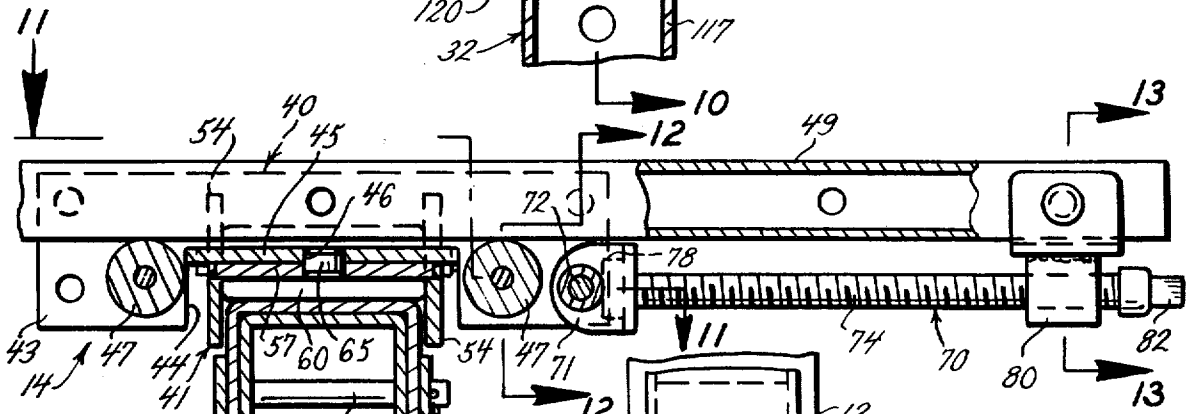
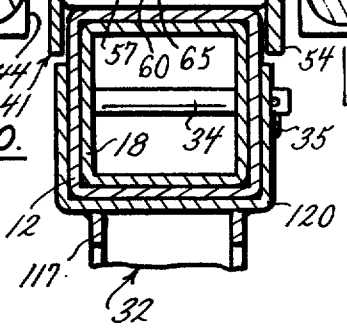


FIG. 10.



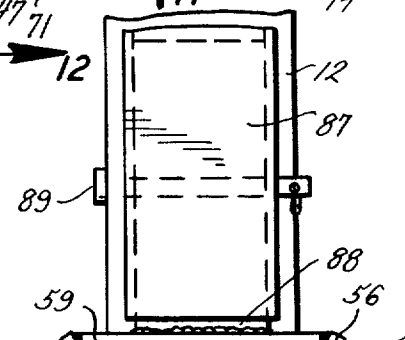


FIG. 11.

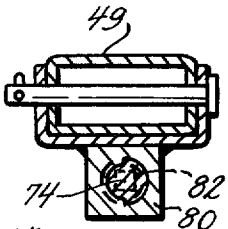
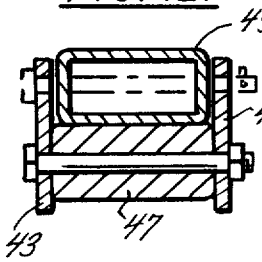


FIG. 13.

FIG. 12.



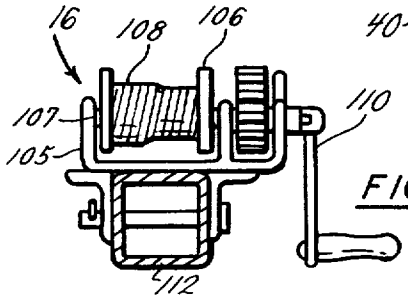


FIG. 14.

SYSTEM FOR MOVING AND ALIGNING MODULAR HOUSE UNITS ONTO A FOUNDATION

BACKGROUND AND SUMMARY OF THE INVENTION

This invention is a continuation-in-part of copending U.S. Pat. application Ser. No. 216,204, filed Jan. 7, 1972, now Pat. No. 3,794,186, and relates generally to the building arts and more particularly to a novel system and method for moving and aligning modular houses and the like onto foundations.

Heretofore house modules have been transported such as by tractor trailer from a fabrication point to a foundation site, and thereafter various means have been employed to move and align the module onto the foundation. In one such means rails have been used together with rollers for rolling the modules over the rails and onto the foundation. While this system has proven superior to other types of systems used, it has had problems caused by binding of the rollers as they move along the rails due to the rails being nonparallel and/or not properly aligned with the house foundation. Even with very careful rail alignment, which is difficult and time consuming at the job site, these problems still occurred.

Even after the module was moved over the foundation, there were difficulties in aligning the module in precise manner with the foundation walls. The rollers themselves offered no latitude in movement, and therefore the procedure was basically to lower the module onto the foundation and then by using brute force techniques, such as with jacks, levers, and the like, attempt to shove the unit in proper alignment. This was time consuming, required several additional men and was imprecise.

Many of these problems were solved by the method and system disclosed in copending U.S. Pat. application Ser. No. 216,204, by the same inventor, filed Jan. 7, 1972, be effectively eliminating the binding problem caused by the rails being unparallel, and by providing a method and system for precisely aligning the module with the foundation both quickly and easily. This invention represents still another improvement in such system and method, providing adjustability were the rails are not properly aligned relative to the house foundation.

Generally, this invention comprises means for supporting a module unit alongside a site foundation, spaced tracks extending from between the module and support means across the foundation, and a plurality of roller pads mounted between the module and the tracks such that the module is supported on the pads. Generally, each pad includes an upper body section, a lower body section, and a roller track segment. First roller means are provided for supporting the lower body section for movement along the track. Second roller means are provided for supporting the roller track segment on the upper body section for transverse movement of the roller track segment relative to the tracks, the module being supported on the roller track segments. Means are also provided for mounting the upper body section on the lower body section for rotation relative thereto about a generally vertical axis.

Hence, in accordance with this invention, means are provided for allowing movement of the module along the track, transverse movement of the module relative to the tracks, and rotation of the module relative to the

tracks about a generally vertical axis. The result is that the module can be quickly and easily moved from a support means alongside the foundation onto, and in precise alignment with, the foundation despite misalignment of the tracks and misalignment of the module relative to the foundation.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of a house foundation and a transporter showing the system and method of this invention, one module of a prefabricated house being shown in broken line on the foundation, and another module of the prefabricated house being shown in broken line on the transporter and ready for movement onto the foundation;

FIG. 2 is an enlarged view in section taken generally along the line 2—2 of FIG. 1;

FIG. 3 is a view similar to the right-hand portion of FIG. 2 as viewed from the end and beneath the foundation, and showing the modular units after being lowered into position on the foundation;

FIG. 4 is an enlarged view in section taken generally along the line 4—4 of FIG. 2;

FIG. 5 is an enlarged fragmentary view of the turnbuckle and roller pad assemblies portion of FIG. 2;

FIG. 6 is an enlarged view in section taken generally along the line 6—6 of FIG. 5;

FIG. 7 is an enlarged view in section taken generally along the line 7—7 of FIG. 5;

FIG. 8 is a view in section taken generally along the line 8—8 of FIG. 5;

FIG. 9 is an enlarged view in section taken generally along the line 9—9 of FIG. 4;

FIG. 10 is a view in section taken generally along the line 10—10 of FIG. 9;

FIG. 11 is a view in section taken generally along the line 11—11 of FIG. 10;

FIG. 12 is a view in section taken generally along the line 12—12 of FIG. 10;

FIG. 13 is a view in section taken generally along the line 13—13 of FIG. 10; and

FIG. 14 is an enlarged view in section taken generally along the line 14—14 of FIG. 2.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to the drawings more particularly by reference numerals, there are illustrated a tractor-drawn transporter generally designated by the reference numeral **10**, roller track segment **12** of square cross section, four six-way adjustment roller pads **14**, two winch assemblies **16**, and track connectors **18** (FIGS. 9 and **10**) of square cross section, all constructed in accordance with the teachings of the present invention.

The transporter **10** is of frame construction and includes an elongated frame **20** which is extensible by virtue of a tail unit **21** which telescopes into longitudinal frame members **22** and is locked into selected position by any well-known latching unit such as a bolt, pin, or the like. Three axles, each with two pairs of dual wheels **24**, support the transporter **10**, the number of wheels employed depending on the load requirements. Four hydraulic lift pads **26** are mounted upon the transporter **10** which incorporate hydraulic lines (not shown) connected to suitable power means such as, for example, power means actuated by the engine of the tractor employed to pull the transporter **10**, which is conventional

equipment. The transporter **10** described is one preferred design, but certainly other suitable transporters could also be used.

With particular reference to FIG. **1**, two spaced parallel articulated lengths of roller track segments **12** extend across the elongated transporter frame **20**, span the space between the transporter **10** and a prefabricated house foundation **28** having side walls **29** and end walls **30**, and extend across the side walls **29** of the foundation **28**. The segments **12** rest upon a wooden cap **31** and are supported between the side walls **29** by jacks **32**. The track connectors **18** telescope into abutting track segments **12** and are removably secured in position by clevis pins **34** and retaining cotter pins **35** (FIGS. **1**, **9**, and **10**). The track segments **12** between the side walls of the foundation terminate at abutting joints **36** just inside the inner surfaces of the side walls **29** for purposes to be described.

Again referring to FIG. **1**, the four six-way roller pads **14** are shown mounted on the two links of articulated track segments **12** supporting a second module **37** of a prefabricated house, the first module **38** thereof being shown in precision aligned position on the parallel articulated roller track segments **12** awaiting final positioning on the cap **31**.

Referring to FIGS. **9** through **11**, each six-way roller pad **14** includes an upper fabricated body section **40** and a lower fabricated body section **41**. The upper section **40** has two parallel side plates **43**, each including a central notch **44** in the lower edge thereof the notch **44** being somewhat wider than the width of the lower section **41**. The side plates **43** are spaced apart and held together by a horizontal plate **45** welded between the side plates **43** at the tops of the notches **44** such that the lower surface of the plate **45** extends slightly below the tops of the notches. The plate **45** has an aperture **46** therein at its center. A roller assembly **47** is mounted between the side plates **43** on each side of the notch **44** with the roller surfaces extending slightly above the upper surface of the plate **45**. A roller track segment **49** is disposed on the roller assemblies **47** for adjustment generally transversely of the links of the roller track segments **12** as will be more clearly described.

The lower body section **41** of each of the six-way roller pads **14** includes parallel side plates **54** each having a central notch **55** in the upper edge thereof, the notch **55** being somewhat wider than the overall width of the upper body section **40**. The side plates **54** have flared ends **56** and are spaced apart and held together by a horizontal plate **57** connected between the side plates **54** at the bottom of the notch **55**, the upper surface of the plate **57** being slightly above the bottom of the notch **55**. Reinforcing plates **59** are welded between the flared ends **56** of the side plates **54** for added support. A roller assembly **60** is rotatably mounted between the side plates **54** on each side of the notch **55** with the roller surface being slightly below the lower surface of the plate **57**. The roller assemblies **60** ride on the track segments **12**, the side plates **54** extending below the roller assemblies **60** to guide the six-way roller pad **14** in its movement along the track segments **12**. The inside width of the lower body section **40** is slightly greater than the width of the track segments **12** to allow free movement thereover. A pin **65** is welded to and extends upward from the plate **57** at its center, and a pull loop **66** is welded to one plate **59**.

The upper body section **40** is disposed transversely of the lower body section **41** with the notch **44** placed within the notch **55**, with the pin **65** extending into the aperture **46** of the plate **45**, and with the lower surface of the plate **45** resting on the upper surface of the plate **57**. With the upper body section **40** so positioned relative to the lower body section **41**, and with the notch **44** being somewhat wider than the width of the lower section **41**, and the width of the notch **55** being somewhat wider than the width of the upper section **40**, the upper section **40** is free to pivot about the pin **65** several degrees each way from normal to the lower section and hence the track segments **12**. This unique capability is of significant importance as will be described.

An adjustment assembly **70** (FIGS. **4** and **11** through **13**) is provided on one of the roller pads **14** for axially moving its roller track segment **49**, which assembly **70** includes a yoke assembly **71** pivotally mounted on a clevis pin **72** supported by and between the plates **43** adjacent one roller assembly. One end of a rotatably screw shaft **74** extends through an aperture in a yoke element of the yoke assembly **51** and is maintained against withdrawal by a collar **78** secured thereto. Secured near one end of the track segment **49** is a screw rider unit **80** which threadedly receives the screw shaft **74**. The other end of the screw shaft **74** is formed at **82** to receive a ratchet tool **84** for selectively rotating the screw shaft **74** to axially move the track segment **49** and a house module thereon.

Hence, the one roller pad **14**, having the adjustment assembly **70**, has its roller track **49** fixed for a particular setting of the screw shaft **74** to effectively fix the transverse position of the module resting thereon in relation to that roller pad. However, the roller track segment **49** of the other three roller pads **14** are free to adjust transversely to variations in spacing between the track segments **12** as the modules are moved thereover. The upper body section **40** and therefore the track segments **49** of all of the roller pads **14** are free to make angular adjustments as necessary for proper alignment of the module with the foundation.

There is also included a bar **87** connected between the roller pads **14** on each track. The connection is made by use of track connectors **88** welded to the plates **59** at the ends of the lower body sections **41** opposite the pull loops **66**, and by use of pins **89** for connecting the bar **87** to the track connectors. The purpose for the bar is to prevent a roller pad **14** from rolling freely should it not bear part of the load as where the tracks are uneven.

A turnbuckle assembly **90** is provided at selected ones of the pads **14** (FIGS. **2**, **3**, and **5** through **8**) which is connected between the pad **14** and the track segment **12** after the first modular unit **37** is positioned over the foundation to hold the first modular unit securely in place while the second modular unit **38** is moved over the track and positioned. The turnbuckle **90** is of a conventional type having oppositely threaded bolts **91** with eyelets **92** at their outer ends, the bolts being screwed into opposite ends of a suitably threaded elongated hex nut **93**. One end of the turnbuckle **90** is attached to the lower section **41** of the roller pad **14** by means of a pin **95** welded to and extending outwardly from the end of one of the side plates **54** and into the eyelet **92**. The end of the turnbuckle **90** is held onto the pin **95** by means of a cotter pin **97** extending through aligned holes in the pin **95** and eyelet **92**. The other end of the turn-

buckle **90** is secured to the track segment **12** by means of a pin **99** having a head **100**, which pin extends through the eyelet **92** and suitable apertures in the track segment **12**, and is held therein by means of a cotter pin **101**.

The turnbuckles **90** provide rigid, yet adjustable, connections between the pads **14** and track segments **12** to securely fix the position of the pad and hence the modular unit on the track. They are useful, for example, to prevent movement of the first module due to wind while the second module is moved into position.

Each winch assembly **46** is of conventional construction. Referring to FIGS. **1**, **2**, and **14**, the winch assembly **16** includes a U-shaped base **105** supporting a cable drum **106** by rotatable shaft **107**. A cable **108** is wound on the drum **106**. A handle **110** is removable connected to one end of the shaft **107**. A suitable lock (not shown) of a type commonly known in the art is provided to hold the drum **106** against reverse winding under tension on the cable **108** upon release of the handle **110**. The winch assembly **16** is bolted to a winch support **112** which is of the same square cross section as the roller track segments **12**, and which is mounted in abutting relation to a roller track segment **12** by means of a track connector **18** and clevis pins **34**. The free end of the cable **108** is secured to a hook **114**, which engages the pull hook **66** (FIG. **9**).

Each jack **32** has a base portion **116**, a telescoping upper portion **117**, and a hydraulic cylinder **118** connected by brackets **119** between the base and upper portion to raise or lower the upper portion relative to the lower portion of the jack. A U-shaped cradle **120** is mounted at the top of the jack to receive the track segments **12**.

OPERATION

To move and properly align the modular units **37** and **38** onto the foundation **28**, a transporter **10**, with the first module **37** mounted thereon is positioned generally parallel to the side walls of the foundation as shown in FIG. **1**. It is one of the novel features of this invention that this paralleling need not be exact, and this is a very practical consideration since due to the inherent nature of the equipment and the rough terrain near the job site, exact paralleling is virtually impossible and would certainly be very tedious and time consuming. Hence, for the purposes of this illustration, it is assumed that the transporter is not exactly parallel with the side walls of the house foundation.

With the module **37** in position on the transporter, the track segments **12** and the roller pads **14** are positioned as shown between the module and transporter. It is to be understood that the module **37** may not, and most likely will not, be aligned exactly with the frame of the transporter, which also is not required with this invention. One way to position the track segments **12** and roller pads **14** between the module and transporter is to lower the jacks **26** to lift both the transporter and module. Blocks or the like are then inserted between the ground and the module, and the jacks raised to separate the transporter from the module so that the track segments **12** and roller pads **14** can be positioned therebetween. With the track and pads in place, the transporter is again lifted with the jacks **26** to again support the module so that the blocks can be removed. When the transporter is lifted the second time, it is made generally even with the top of the foundation as shown in FIG. **2**. Next, the other track segments **12** are positioned between the transporter and the foundation and across the side walls **29** of the foundation as shown in FIG. **1**.

It does not matter where the roller pad **14** having the adjustment assembly **70** is positioned, but it is preferable to position it so that it will be near an outside wall of the foundation after the module is in place for easy access in making final adjustments.

The hook **114** of the winch assembly **16** is placed in the eyelet **66** attached to the roller pads **14** nearest the foundation and then by operating the winch assemblies **16** the first module **37** is pulled over the track segments **12** and positioned with its long outside wall aligned with the furthest side wall **29** of the foundation.

It is one of the primary features of this invention that the track segments **12** need not be exactly parallel making precise measurements unnecessary. In fact, the tracks can be aligned by simply eyeballing. Any misalignment is compensated by the six-way roller pads **14**. Furthermore, it is not necessary that the module **37** be parallel to the side walls **29** of the foundation prior to movement over the tracks **12** since such misalignment is also compensated by the six-way roller pads **14**.

As heretofore described, the roller track segment **49** of the roller pad **14** having the adjustable assembly **70** remains fixed for a given position of the screw shaft **74**, which effectively fixes the transverse position of that portion of the module **37** resting thereon with respect to the track **12**. However, as the module moves over the track on the roller pads, the other three pads, each having a roller track segment **49** which is free to move transversely on the rollers **48** with respect to the roller pad upper and lower sections **40** and **41**, automatically adjust for variations in track alignment, such as where the tracks are non-parallel, preventing any binding between the roller pads and the track and making it extremely easy to move the module over the track. In automatically making this adjustment the roller track segments **49** of the other three roller pads remain fixed with respect to the module since the module is resting thereon, but as the distance between the spaced segments of the tracks varies, the roller pad sections **40** and **41**, which are adapted to move over the rails **12**, are also allowed to move back or forth as necessary with respect to the roller track segments **49**. Also, if as the module **37** is moved over the tracks **12** it becomes necessary to parallel the module with the side walls **29** of the foundation, this may be easily accomplished by simply turning the module as necessary, the turning and paralleling being made easy by the rotation capability of the upper section **40** relative to the lower section **41** about the pin **65** of each of the roller pad assemblies **14**.

Thus, in this manner the long outside wall of the module **37** is precisely aligned with the side wall **29** of the foundation. The end walls of the module are then aligned with the end walls **30** of the foundation by adjusting the screw shaft **74**. Thus, by adjustment of the screw shaft **74** and operation of the winches **16**, precise alignment can be achieved between the module and the foundation because of the automatic adjustment capabilities of the six-way roller pad assemblies **14**. After the module **37** is properly positioned, it may be fastened in place by use of the turnbuckles **90**.

With the module **37** in proper alignment over the foundation and supported by the jacks **32**, a second

module **38** is similarly pulled over the tracks **12** by use of the hooks **114** and the winch assemblies **16**, and it too is properly aligned over the foundation and with respect to the first module **37**. As best shown in FIGS. **2** and **3**, the track segment joints **36** are located just inside the walls **29** of the foundation, so that with the track segments **12**, roller pads **14** and modules **37** and **38** supported by the jacks **32** as shown in FIG. **2**, the track segments **12** between the transporter and the foundation, and the winch supports **112** can be easily disconnected from the track segments **12** over the foundation by simply removing the pins **34**. By lowering the jacks **32**, the tracks **12**, pads **14**, and modules **37** and **38** are lowered until the modules rest in precise alignment on the cap **31**. The outer ends of track segments **12** clear the walls **29** of the foundation as the jacks are lowered. After removing the turnbuckles **90**, further lowering of the jacks **32** allows removal of the roller pads **14** and track segments **12**.

From the foregoing, it is obvious that a novel method and system has been described for moving and aligning modular units onto a foundation, which eliminates the problems caused by misalignment of the tracks and of the modular units relative to the foundation, and which otherwise fulfills the objects of this invention.

Various changes and modifications may be made in this invention, as will be readily apparent to those skilled in the art. Such changes and modifications are within the scope and teaching of this invention as defined by the claims appended hereto.

What is claimed is:

1. A module moving system for placing a module unit on a site foundation comprising means for supporting the module unit alongside the foundation, spaced tracks extending from between the module and support means across the foundation, first antifriction bearing means between the module and tracks for movement of the module along the tracks, second antifriction bearing means located between the module and the tracks for allowing transverse movement of the module relative to at least all but one of the tracks as the space between the tracks varies along their length, means between the first and second antifriction bearing means for providing rotation of the module unit relative to the tracks, and means for applying force to move the module along the tracks.

2. The module moving system of claim **1** wherein the transverse position of at least one module location is fixed relative to the one track.

3. The module moving system of claim **2** including means for adjusting the fixed relative position of the module with respect to the one track at the one location.

4. The module moving system of claim **1** wherein the support means is a transporter having means adaptable for transporting the module to the site location.

5. The module moving system of claim **1** wherein there are a plurality of first and second antifriction bearing means and rotation means, each including an upper body section and a lower body section, first roller means for supporting the lower body section for movement along a track, a roller track segment, second roller means for supporting the roller track segment on the upper body section for transverse movement of the roller track segment, the module being supported on the roller track segments, and means for mounting the upper body section on the lower body section for rotation relative thereto about a generally vertical axis.

6. The module moving system of claim **5** including guide means for holding the lower body sections on the tracks, and for holding the roller track segments on the upper body sections.

7. The module moving unit of claim **5** including means for adjustably fixing the transverse position of at least one roller track segment relative to the track on which it is supported.

8. The module moving system of claim **7** further including a screw shaft and rider, one end of the screw shaft being attached to the upper body section, the rider being attached to the roller track segment to threadedly receive the screw shaft, whereby turning of the screw shaft varies the fixed relative position of the roller track segment with respect to the upper body section.

9. A module moving system for placing a module unit on a site foundation comprising means for supporting the module unit alongside the foundation, spaced tracks extending from between the module and support means across the foundation, a plurality of six-way roller pads between the module unit and the tracks, each six-way roller pad including an upper body section having a notch in its lower side and a lower body section having a notch in its upper side, the width of the notch in the upper body section being somewhat wider than the overall width of the lower body section, and the width of the notch in the lower body section being somewhat wider than the overall width of the upper body section, first roller means for supporting the lower body section for movement along a track, a roller track segment, second roller means for supporting the roller track segment on the upper body section for transverse movement of the roller track segment relative to the track, the module being supported on the roller track segments, means for mounting the upper body section on the lower body section such that the notch in the upper body section fits within the notch of the lower body section for rotation relative thereto about a generally vertical axis, and means for applying force to move the module along the tracks.

10. The module moving system of claim **9** wherein the rotation mounting means further comprises a pin in one body section and an aperture in the other body section through which the pin extends, the body sections having opposed bearing surfaces for rotation of the one body section relative to the other about the pin.

* * * * *