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Vaughn et al.

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[45] **Sept. 30, 1975**

[54] **ADJUSTABLE METAL SCAFFOLD**

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[52] **U.S. Cl.** **182/82;** 182/152; 182/223

[51] **Int. Cl.²** **E04G 3/08**

[58] **Field of Search** 182/223, 222, 187, 152, 182/179, 178, 131, 82, 152

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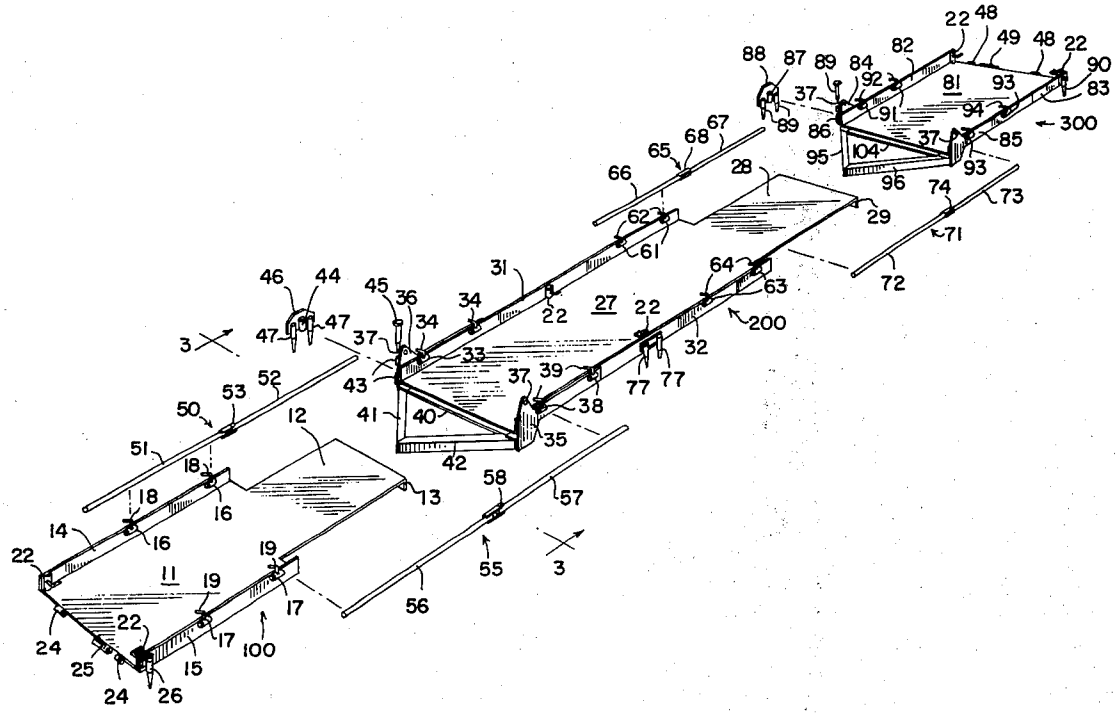
Primary Examiner—Reinaldo P. Machado

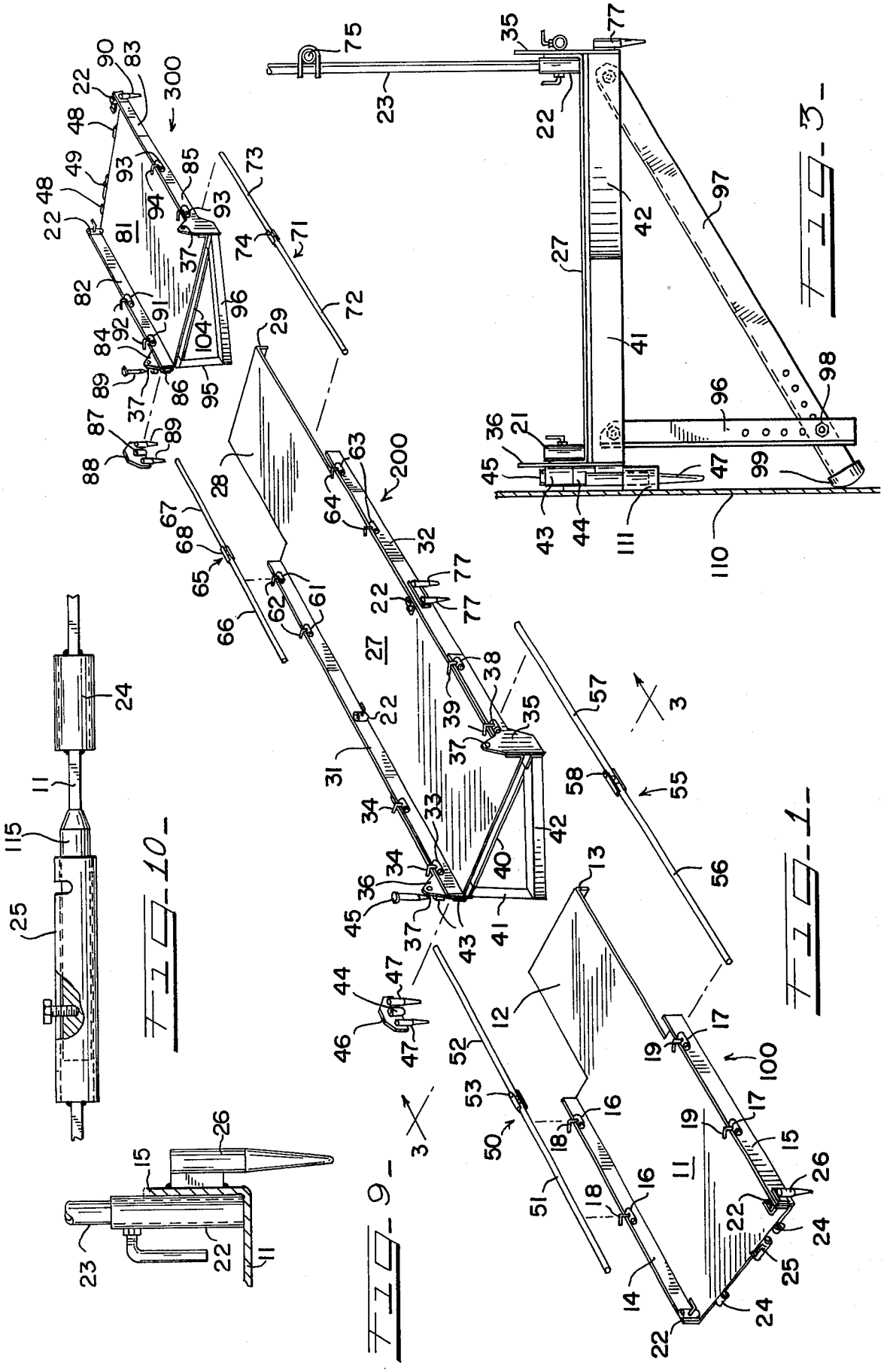
Attorney, Agent, or Firm—Merriam, Marshall, Shapiro & Klose

[57] **ABSTRACT**

A scaffold module having a first section comprising a horizontal deck having a tongue of reduced width extending outwardly from one end of the deck, a middle section comprising an elongated horizontal deck having a tongue of reduced width at one end of the deck and a support means extending outwardly from the second end of the deck, said first section tongue being in slidable contact with the top of the support means, and with the bottom, of the middle section deck, and a third section comprising a horizontal deck and a support means extending outwardly from one end of the deck, said middle section tongue being in slidable contact with the top of the support means, and with the bottom, of the third section deck.

9 Claims, 15 Drawing Figures




FIG. 1
FIG. 3
FIG. 9
FIG. 10

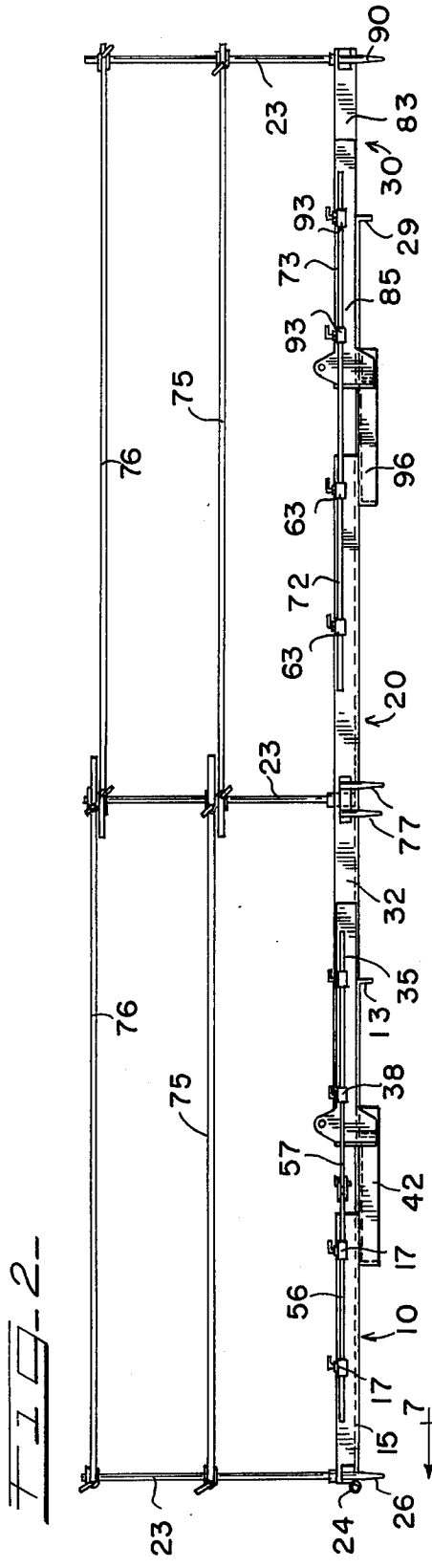


FIG-2-

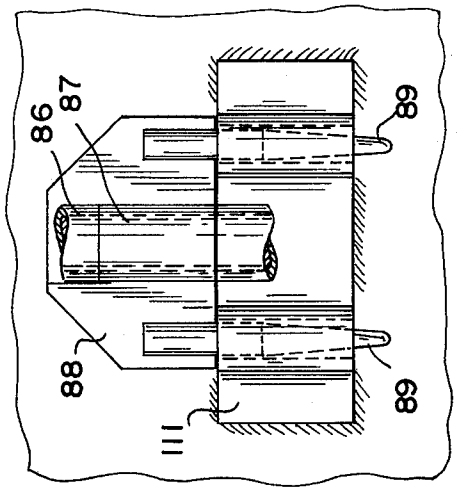


FIG-7-

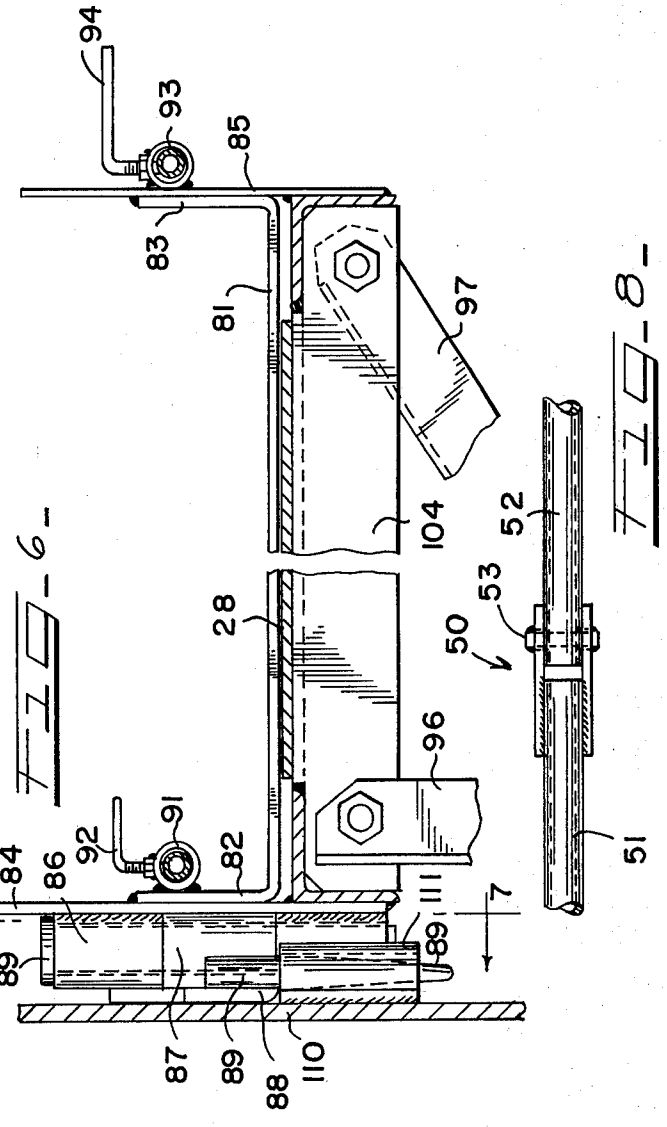


FIG-6-

FIG-8-

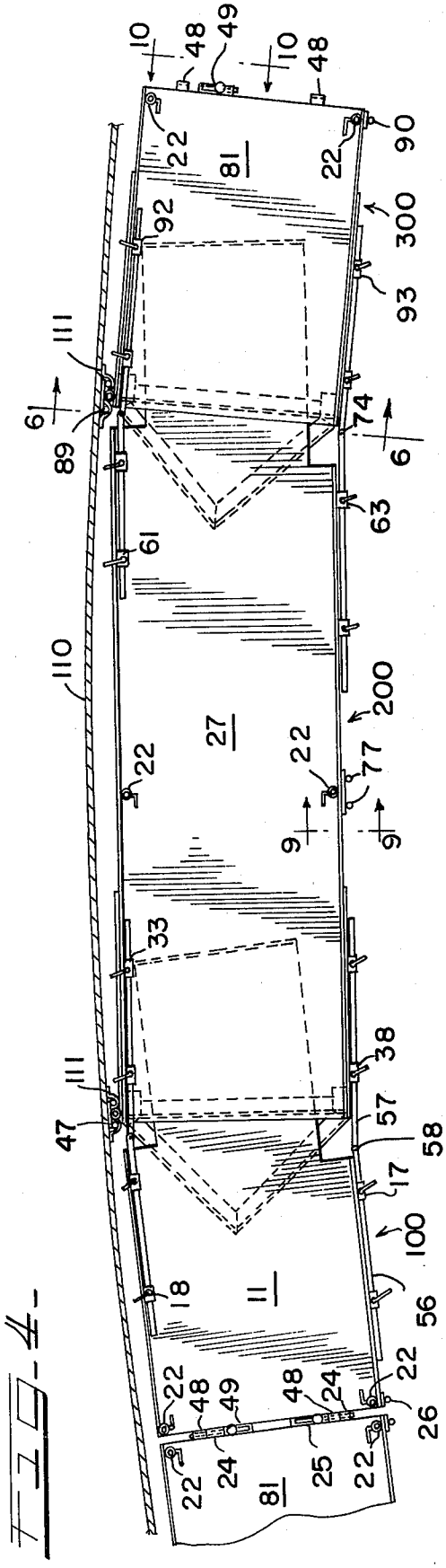


FIG. 4

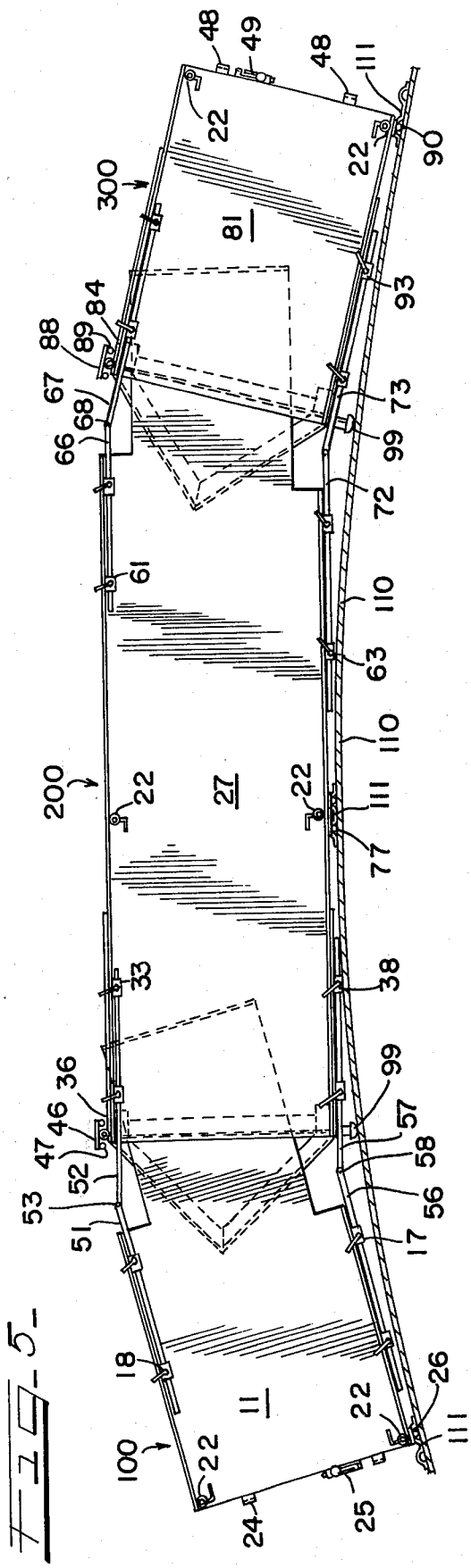


FIG. 5

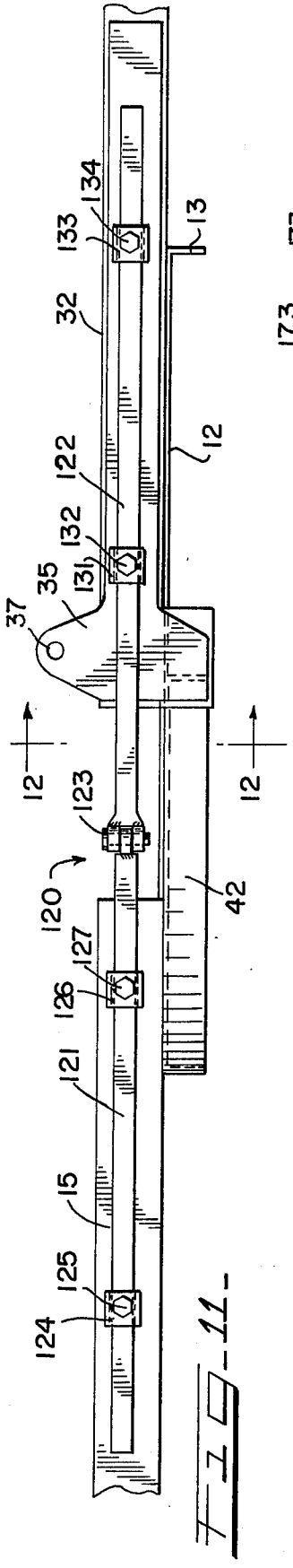


FIG-11

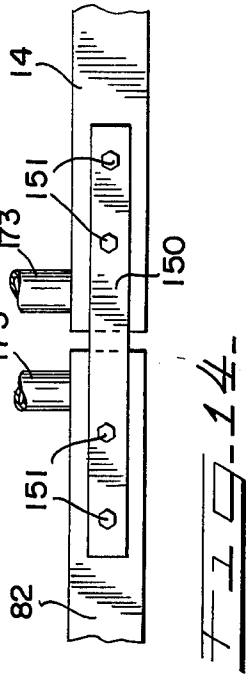


FIG-14

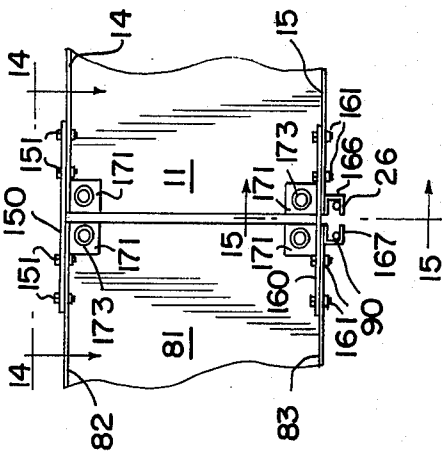


FIG-13

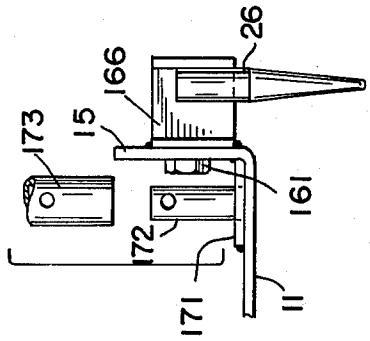


FIG-15

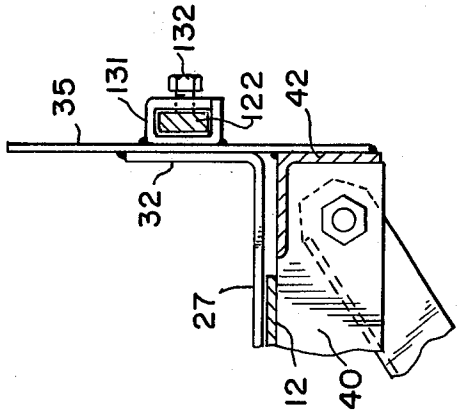


FIG-12

ADJUSTABLE METAL SCAFFOLD

This invention relates to scaffolds. More particularly, this invention pertains to adjustable scaffold modules which can be used on vertical surfaces which are planar, cylindrically convex or cylindrically concave.

Many commercial structures are erected which have vertical surfaces which are curved or arced in a horizontal plane. For example, many large tanks and vessels, cooling towers, smoke stacks, water towers and the like have vertical cylindrical or similar surfaces. The erection of such structures generally requires that workmen have ready access to the surface as the erection progresses so that the necessary welding, bolting and cutting to join the pieces together can be accomplished readily and safely. Normally, one type or another of scaffolding is used to support the workmen in a suitable position so that they can perform such functions.

Much of the scaffolding used on construction and erection is made especially for the job. This involves time consuming cutting and assembly of the scaffolding and a substantial amount of waste since when the job is completed much of the scaffolding is discarded.

A type of lattice-like or cage-like scaffold structure is employed in the construction and erection industry. Such a scaffold requires that it be mounted on the ground level. It does not lend itself to mounting on the structure being built and moved upwardly as construction progresses. Furthermore, the work deck used with such lattice-like scaffold is of the temporary plank type which is generally recognized to be considerably less safe than is desired. Furthermore, a lattice-type scaffold does not readily adapt itself to work on cylindrical surfaces. There is accordingly a need for an improved scaffold for use in the construction and erection industries which is readily adaptable for use on vertical flat or vertical cylindrical surfaces, whether positioned on the concave or convex side, and which can be moved up the surface as work progresses.

According to the present invention, there is provided a scaffold module comprising a first section having a horizontal deck with a tongue of reduced width extending outwardly from one end of the deck, a middle section comprising an elongated horizontal deck having a tongue of reduced width at one end of the deck and a support means extending outwardly from the second end of the deck, said first section tongue being in slidable contact with the top of the support means and with the bottom of the middle section deck, and a third section comprising a horizontal deck and a support means extending outwardly from one end of the deck, said middle section tongue being in slidable contact with the top of the support means and with the bottom of the third section deck. The first section is slidable longitudinally and laterally with respect to the middle section. In addition, the first section can be rotated either clockwise or counter-clockwise with respect to the middle section so that it can be positioned at an angle thereto to thereby adapt the two sections to either the concave or convex curved surface of a vertical cylindrical structure to be worked on. Similarly, the third section is slidable longitudinally and laterally with respect to the middle section and, in addition, the third section is also rotatable in a horizontal plane with respect to the middle section so that it can be positioned at an angle with respect to the middle section to thereby be placed in close position to the convex or the concave side of a vertical cylindrical surface.

The described scaffold module is also advisably provided with means to releasably secure at an angle the first section to the middle section, and the middle section to the third section, to thereby hold all of the sections together in fixed releasably secure arrangement so that a workman can safely move from one section to the other without the sections sliding apart and rendering the scaffold module unsafe.

The means used to secure the first section to the middle section, and the middle section to the third section, can comprise an adjustable connector. One such type of connector which can be used has a first bar pivotally joined to a second bar. The first bar can be releasably and adjustably secured to the side edge of one section of the scaffold module and the second bar can be releasably and adjustably secured to the side edge of an adjoining section of the scaffold module. Thus, four such connectors can be employed with each scaffold module. Two connectors can join the first section to the middle section at opposing sides of the two sections, and two connectors can join the third section to the middle section at the opposing sides thereof. The pivotal joint of each connector permits the first section to be angled with respect to the middle section and, similarly, for the third section to be angled with respect to the middle section. Once the various scaffold module sections have been positioned as desired, the connectors are releasably secured so that the sections form a unitary scaffold module.

The scaffold module of this invention is intended to be used directly on a structure which is being built. For this purpose, installation vertical pins are provided along both sides of the scaffold module. The vertical pins are positioned so as to slide into retaining holes in brackets mounted on the surface of the structure being built. One side edge of the scaffold module is provided with pins at the outer ends of the first and third sections and with pins in the center part of one side of the middle section so that the scaffold module can be readily attached to the convex side of a vertical cylindrical surface. The other longitudinal side edge of the scaffold module is provided with vertical pins near the ends of the other side of the middle section for use in attaching the scaffold module to brackets on the concave side of a vertical cylindrical circular surface. The scaffold module thus lends itself to ready installation on either the inside or the outside surfaces of cylindrical shells such as are used in the construction of large size vessels and tanks.

The scaffold module is also advisably provided with at least a pair of supporting braces beneath the middle section deck. Braces are positioned so that they can bear against a vertical surface on which the scaffold module is mounted to aid in keeping the module level with respect to the surface being worked on. Triangular adjustable braces are generally most suitable for this purpose.

Each of the three sections comprising the scaffold module is generally provided with vertically projecting side flanges or walls to strengthen the deck against collapsing under load and to also prevent tools used by workmen from rolling off of the edge of the section decks.

On large size erection jobs a plurality of scaffold modules of the described type can be used. To make a

continuous scaffold structure out of the scaffold modules, the first section is provided with means at the outer end of the deck for releasably securing it to the end of the third section of an abutting similar but separate scaffold module. In addition, the outer end of the third section of the module is also provided with means so that it can be releasably secured to the end of the first section of an abutting similar but separate scaffold module. In this way, three consecutive scaffold modules can be releasably secured or joined together along either the outside or the inside of a vertical cylindrical shell or surface. Of course, additional scaffold modules can be joined to the end of any of the terminal scaffold modules.

When a series of joined together scaffold modules are positioned around a tank or similar structure under construction they form a strong stiffener which aids in resisting high winds.

The scaffold module of this invention can be rapidly jumped from one height to another on a vertical surface. It can be used on a flat surface, or on the inside or outside of a tank or vessel shell and it can be adapted to either side with a minimum of effort.

The scaffold module is advisably made of metal, although it can be made of other materials as is considered warranted by the type of use to which it is to be put.

The invention will be described further in conjunction with the attached drawings, in which:

FIG. 1 is an isometric exploded view of a scaffold module provided by the invention;

FIG. 2 is a front elevational view of the scaffold module of FIG. 1 with a hand railing installed;

FIG. 3 is an end view of the middle section of the scaffold module taken along the line 3—3 of FIG. 1;

FIG. 4 is a plan view of the scaffold module of FIGS. 1 to 3 shown mounted on the inside surface of a cylindrical tank having a vertical wall;

FIG. 5 is a plan view of the scaffold module of FIGS. 1 to 3 shown mounted on the outside of a cylindrical tank having a vertical wall;

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 4;

FIG. 7 is a view taken along the line 7—7 of FIG. 6;

FIG. 8 is a partial view of a connector having a pivotal joint used for holding the scaffold module sections together;

FIG. 9 is a sectional view taken along the line 9—9 of FIG. 4;

FIG. 10 is an end view of the latching mechanism when viewed along the line 10—10 of FIG. 4;

FIG. 11 is a side elevational view of a second embodiment of a connector for holding the scaffold module sections together;

FIG. 12 is a sectional view along the line 12—12 of FIG. 11;

FIG. 13 is a plan view of the ends of adjacent scaffold modules joined together by metal bars;

FIG. 14 is a side view along the line 14—14 of FIG. 13; and

FIG. 15 is a vertical sectional view along the line 15—15 of FIG. 13.

So far as is practical the same elements of parts which appear in the diferent views of the drawings will be identified by the same numbers.

As shown in FIG. 1, the scaffold module comprises a first section 100, a middle section 200 and a third section 300.

The first section 100 has a horizontal deck 11 with a tongue 12, of reduced width, extending outwardly from one end. The tongue has a downwardly depending flange 13 at the end. This flange serves to hold the tongue 12 in position with respect to the middle section 20 as will be subsequently seen. Projecting upwardly from the sides of deck 11 are upwardly projecting side flanges 14 and 15. A pair of spaced-apart pipe sections 16 are placed on the inside of side flange 14 and a pair of pipe sections 17, also spaced apart, are placed on the outside of side flange 15. Connector 50 comprising round bars or rods 51 and 52 which are connected together pivotally by pin 53, and connector 55 consisting of round bar or rod 56 and round bar or rod 57 pivotally joined together by pin 58, together serve to adjustably hold the first section 100 and the middle section 200 of the scaffold module together. Round bar or rod 51 slides horizontally through holes in pipe sections 16 and is releasably secured in place by means of locking screws 18. In a similar manner, round bar or rod 56 slides through holes in pipe sections 17 and is releasably secured in place by locking screws 19.

The first section 100 also has vertically positioned pipe sections 22 at the end of side flange 14, and at the end of side flange 15. These pipe sections receive vertical rods 23 (FIGS. 2 and 3) constituting part of a handrail. Pin 26 at the end of flange 15 is provided for mounting the scaffold module on a vertical surface as is more fully explained later herein. The first section 100 also has hinge portions 24 at the end of deck 11. In addition, bolt or latch mechanism 25 is provided at the end of deck 11 so that it can cooperate with the hinge portions 24, and hinge portions 48 and bolt mechanism 49 (like bolt mechanism 25) at the end of the third section 300 to thereby hingedly join the end of the third section 300 to the end of a similar first section 100 to thereby attach two of the scaffold modules together.

The middle section 200 of the scaffold module has a horizontal deck 27 and an outwardly extending tongue 28 of reduced width. Flange 29 depends downwardly from the end of tongue 28. Side flange 31 extends upwardly along one longitudinal edge of deck 27 and upwardly extending side flange 32 extends along the other longitudinal edge of deck 27. Spaced-apart pipe sections 33, with locking screws 34, are mounted on the inner edge of side flange 31. Round bar or rod 52 of connector 50 slides into holes in pipe sections 33 and is releasably secured therein by locking screws 34. Vertically positioned plate 35 is joined to the outside surface of side flange 32, and in a similar manner plate 36 is joined to the outside surface of flange 31. Each of the plates 35 and 36 has a hole 37 for use in lifting the scaffold by hook and cable. Spaced-apart pipe sections 38 are joined to the outside surface of plate 35. Each of the pipe sections 38 has a locking screw 39. The round bar or rod 57 of connector 55 is releasably positioned in holes in pipe sections 38 by the locking screws 39 to thus aid in releasably securing the first section 100 to the middle section 200.

The middle section 200 has a lateral brace 40 at one end spaced beneath the deck 27 to provide enough clearance for the tongue 12 to slide beneath the brace 40 and the bottom of deck 27. Support for the tongue

12 is further provided by the outwardly extending braces 41 and 42 which join to form an apex.

Hinge portions 43 (FIGS. 1 and 3) are mounted on the outside surface of lifting 36, and they are adapted to receive hinge portion 44 therebetween. Pin 45 extends through the hinge portions 43 and 44 to thereby complete the hinge. Hinge portion 44 is mounted on plate 46 containing pins 47.

Spaced-apart pipe sections 61 are mounted on the inside surface of the other end of side flange 31. Each pipe section 61 is provided with a locking screw 62. On the outside surface of side flange 32 are positioned spaced-apart pipe sections 63, each of which has a locking screw 64. Connectors 65 and 71 are used to releasably secure middle section 200 to third section 300. Connector 65 has round bar or rod 66 joined to round bar or rod 67 in a pivotal manner by pin 68. Round bar or rod 66 is adapted to be slid into holes in pipe sections 61 and to be releasably secured therein by locking screws 62. Connector 71 has a round bar or rod 72 joined pivotally to round bar or rod 73 by pin 74. Round bar or rod 72 is adapted to slide releasably in holes in pipe sections 63. Mounted on the outside surface of flange 32 is a pair of closely spaced-apart pins 77. Pipe sections 22 having locking screws are positioned vertically in the middle of side flange 31, and in the middle of side flange 32, for the purpose of releasably receiving the bottom end of vertical rods 23 constituting part of the handrail. Horizontal rods 75 and 76 are joined by clamps to the vertical rods or pipes 23 to thereby form the railing.

The third section 300 of the scaffold module has a deck 81 and upwardly projecting opposing side flanges 82 and 83. Lifting plate 84 is joined to the outside surface of flange 82 and lifting plate 85 is joined to the outside surface of flange 83. Holes 37 in plates 84 and 85 are used to lift the scaffold. Hinge portions 86 are vertically mounted on the outside surface of lifting plate 84. Hinge portion 87 on plate 88 cooperates with hinge portions 86 and pin 89 to hingedly secure plate 88 to the third section 300. Pins 89 are mounted on plate 88 and are used together with brackets 111 (FIG. 6) previously welded to a vertical metal surface to in part secure the scaffold section in place. Pin 90 mounted on side flange 83 is also used to secure the scaffold section to a vertical surface. Vertical pipe sections 22 are mounted on side flanges 82 and 83 respectively to receive upright rods or pipes 23 constituting part of the scaffold hand railing.

Spaced-apart pipe sections 91 having locking screws 92 are mounted on the inner face of side flange 82. The pipe sections 91 receive round bar or rod 67 of connector 65, and hold the same in a secure but releasable manner. Spaced-apart pipe sections 93 having locking screws 94 are mounted on the outside surface of lifting plate 85. Round bar or rod 73 of connector 71 is slidably and releasably secured in the pipe sections 93.

Lateral brace 104 extends the width of deck 81 and is spaced sufficiently far below the bottom of the deck so that tongue 28 of the middle section 20 can move slidably and rotatably beneath the brace 104 and the bottom of deck 91. Braces 95 and 96, which are joined together at their ends to form an apex, are positioned beneath tongue 28 to thereby provide additional support.

FIG. 3 illustrates a support system for maintaining the scaffold module horizontal when it is attached to a vertical surface. Brace 96 is rotatably connected at its top end to lateral brace 40 (FIG. 1) of the middle section 200. In addition, a brace 97 is also connected at its upper end to brace 40. Both of the braces 96 and 97 are adjustably connected together by means of a bolt 98 which can be positioned at an appropriate location in the series of holes at the end of each of the braces 96 and 97. Foot pad 99 on brace 97 is in bearing contact with the vertical plate 110 to which the scaffold is connected. The scaffold is connected to plate 110 by means of bracket straps 111 which are welded to plate 110. Each bracket strap 111 contains two closely spaced-apart holes into which the pins 47 are inserted from the top downwardly. A similar bracket strap receives the pins 89 when the scaffold is mounted on the inside or concave side of a vertical cylindrical surface as shown in FIG. 4.

FIG. 5 shows the scaffold module on the convex or outside surface of a vertical cylindrical plate 110. The scaffold module is mounted on the outside of the plate 110 by means of pins 26, 77 and 90 positioned in spaced-apart bracket straps 111 which are welded to the outside of the plate or shell 110. It is thus readily seen how the scaffold module can be easily positioned for use inside or outside of a vertical cylindrical plate or shell. The necessary adjustment is made by suitable positioning of the connectors 50, 55, 65 and 71 to rotate the first and third sections 100 and 300 with respect to the middle section 200.

The scaffold module can be readily joined to a similar scaffold module by placing the outer end of the first section 100 in abutting position with respect to the outer end of the third section 300 of a similar scaffold module. When so positioned the bolt 115 (FIG. 10) of bolt mechanism 25 is moved out through hinge portion 48 and into hinge portion 24. In a similar manner, a bolt is moved out of bolt mechanism 49 through hinge portion 24 into hinge portion 48. In this way the two abutting ends of two similar scaffold modules are joined together by two rotatable horizontal hinge mechanisms which can be released readily when the scaffold is to be disassembled and relocated.

The described scaffold module is readily moved up a tank shell as it is erected. Furthermore, by connecting a series of the described scaffold modules together and extending them around the tank during construction, a rigid girder is obtained which provides ancillary strength to the tank so that it can better resist high winds during the erection operation. Furthermore, the scaffold is made of substantial strength so that it can safely support the workmen engaged in such construction activities, thus protecting them from the possibility of falling.

FIGS. 11 and 12 of the drawings show an alternative form of connector which can be used in securing adjacent module sections together. The connector 120 comprises rectangular bars 121 and 122 which are hingedly or pivotally joined together by hinge pin 123. Bar 121 is slidably positioned in spaced-apart brackets 124 and 126 mounted on flange 15. Locking bolts 125 and 127 in brackets 124 and 126 releasably secure bar 121 in position. In the same manner, bar 122 is slidably mounted in spaced-apart brackets 131 and 133 on flange 32 having, respectively, locking bolts 132 and 134 for releasably securing the bar in position. Although only one connector 120 has been illustrated and described it should be understood that four such con-

nectors would be used on each scaffold module in the same way as connectors **50, 55, 65** and **71** have been illustrated and described.

FIGS. **13** and **14** illustrate an alternative way of joining together the adjacent ends of separate scaffold modules. Metal bar or plate **150** is bolted to the outside surfaces of flanges **82** and **14** by bolts **151,** and bar or plate **160** is bolted to the inside surfaces of flanges **83** and **15.** In this way the hinge portions **24** and **48** and bolt mechanisms **25** and **49** can be eliminated.

FIGS. **13** and **15** illustrate alternative means for mounting pins **26** and **90** on a scaffold module. Each of the pins **26** and **90** is joined to V-shaped brackets **166** and **167** joined respectively to flanges **15** and **83.** Greater strength is obtained by mounting the pins in this way rather than directly to the flanges. This same mounting means is recommended for pins **77.**

Also shown in FIGS. **13** and **15** is an alternative way to mount handlines on the scaffold. As shown in these figures, a plate **171** is joined to the corner of plate **11** and then round stub bar **172** is joined to plate **171.** Handline post **173** slides downwardly over stub bar **172** and can be secured thereto by a pin or bolt not shown. Similar handline mounting units are positioned as needed on the scaffold module sections. Cables can be joined to posts **173** to provide the needed safety handlines.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom as modifications will be obvious to those skilled in the art.

What is claimed is:

1. A scaffold module comprising:

a first section comprising a horizontal deck having a tongue of reduced width extending outwardly from one end of the deck;

a middle section comprising an elongated horizontal deck having a tongue of reduced width at one end of the deck and a support means extending outwardly from the second end of the deck;

said first section tongue being in slidable contact with the top of the support means, and with the bottom, of the middle section deck; and

a third section comprising a horizontal deck and a support means extending outwardly from one end of the deck;

said middle section tongue being in slidable contact with the top of the support means, and with the bottom, of the third section deck.

2. A scaffold module according to claim **1** including means to releasably secure at an angle the first section to the middle section, and the middle section to the third section.

3. A scaffold module comprising:

a first section comprising a horizontal deck having vertically projecting side flanges and a tongue of reduced width extending outwardly from one end of the deck;

a middle section comprising an elongated horizontal deck having vertically projecting side flanges, a tongue of reduced width at one end of the deck and a cantilevered support means extending outwardly from the second end of the deck;

said first section tongue being in slidable contact with the top of the cantilevered support means, and with the bottom, of the middle section deck; and

a third section comprising a horizontal deck having vertically projecting side flanges and a cantilevered support means extending outwardly from one end of the deck;

said middle section tongue being in slidable contact with the top of the cantilevered support means, and with the bottom, of the third section deck.

4. A scaffold module according to claim **3** in which the first, middle and third sections are metal.

5. A scaffold module according to claim **3** including an adjustable connector to releasably secure each side edge of the first section to the middle section, and each side edge of the middle section to the third section.

6. A scaffold module according to claim **5** in which each connector is a bar pivotally joined to a second bar, and the first bar is releasably secured to the side edge of one section and the second bar is releasably secured to the side edge of the adjoining section, said connectors being capable of securing at an angle the first section to the middle section, and the middle section to the third section.

7. A scaffold module according to claim **3** in which the first section has means at the other end of the deck for releasably securing it to the end of the third section of an abutting similar scaffold module, and the third section of the module of claim **3** has means at the other end of the deck for releasably securing it to the end of the first section of an abutting similar scaffold module.

8. A scaffold module according to claim **3** in which the middle section of a first side of the module has vertical pins near the ends of the section, and the second side of the scaffold module has vertical pins at the outer ends of the first and third sections and in about the center of the middle section, said pins being sized to fit into brackets mounted on a vertical surface to thereby support the scaffold module with one side of the module at a time adjacent said vertical surface.

9. A scaffold module according to claim **3** in which the middle section has a pair of braces beneath the deck which can bear against a vertical surface on which the scaffold module is mounted to keep the module level.

* * * * *