

[54] **MODULAR FIXED-LEVEL WORK PLATFORM**

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[57] **ABSTRACT**

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A plurality of identical platform and ladder modules can be releasably connected together in various combinations to achieve a unitary rigid structure that establishes a fixed level work platform of the desired configuration supported by steps providing access thereto. The construction of the modules permits them to be manufactured at one location, and individually shipped to a remote location where they can be assembled in-situ into the desired configuration.

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[51] Int. Cl.E04g 1/14

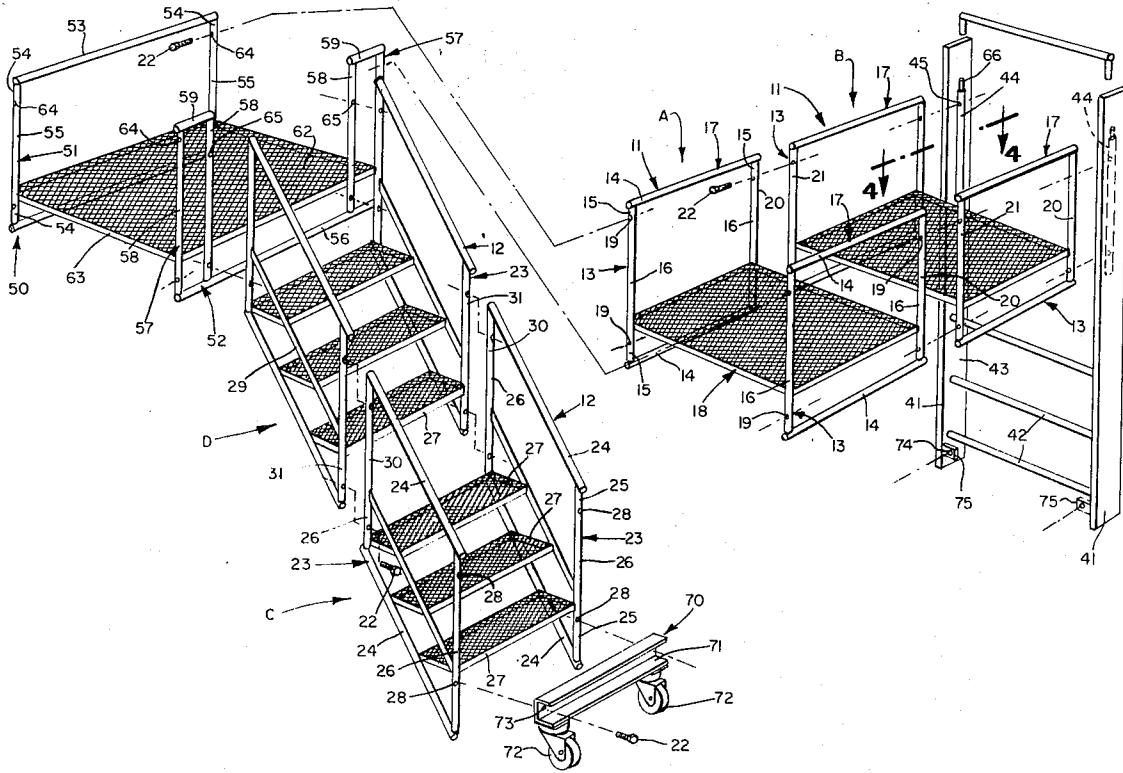
[58] Field of Search.....182/115, 113, 179, 178, 119, 182/118

[56] **References Cited**

UNITED STATES PATENTS

9 Claims, 4 Drawing Figures

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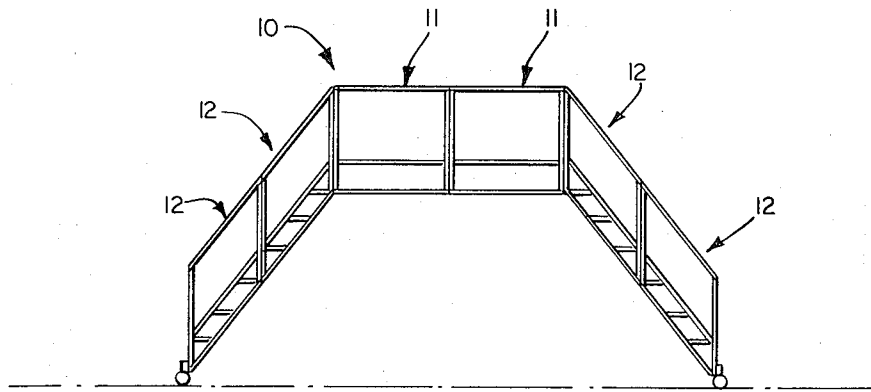


Fig. 1

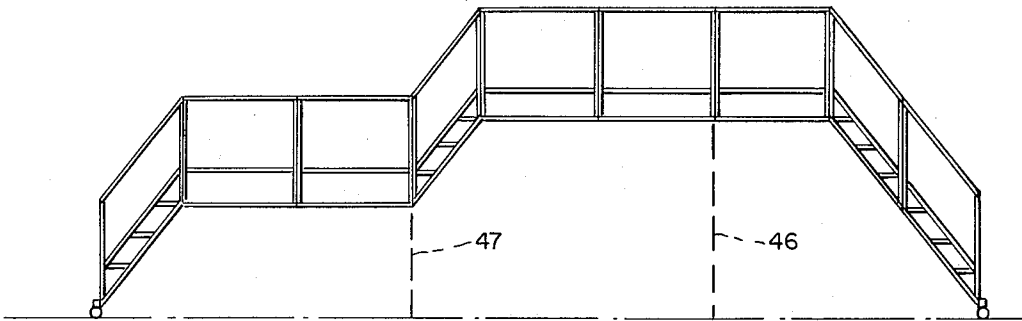


Fig. 3

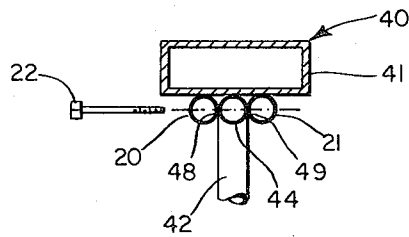


Fig. 4

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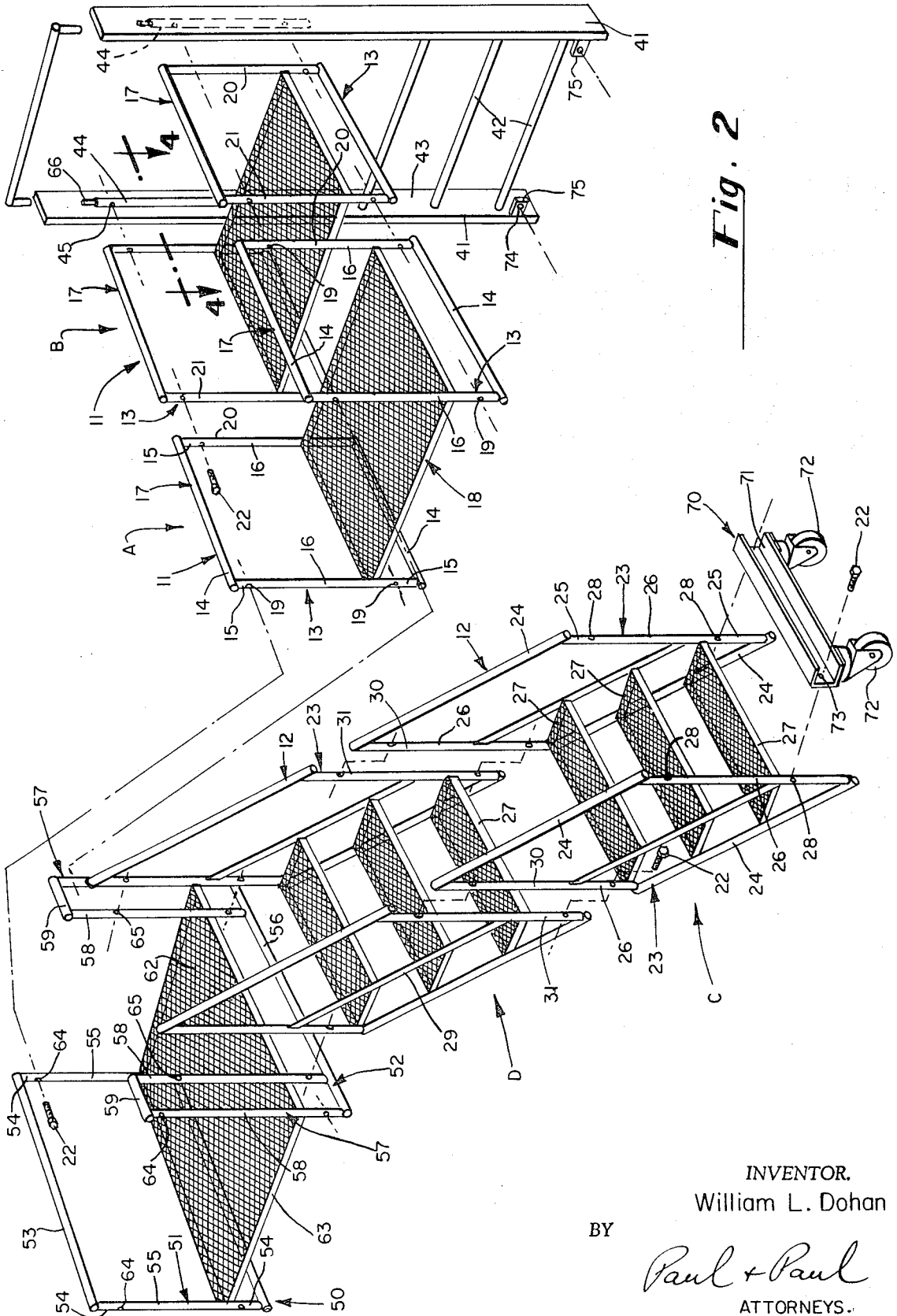


Fig. 2

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MODULAR FIXED-LEVEL WORK PLATFORM**BRIEF SUMMARY OF THE INVENTION**

This invention relates to fixed-level work platforms that can be constructed in-situ from a plurality of identical modules.

The conventional practice for providing manual access to existing machinery, equipment or physical structures, involves the custom-construction of a unitary structure peculiar to the size, shape and capacity of the particular project. When such construction is carried out at the site, the steps, platforms, supports, guardrails, etc. must be designed, laid out, fabricated and built at the site, a procedure usually inconvenient and likely to be more expensive than engaging a specialist to do this work in his shop. The latter approach, however, requires shipment of the completed platform to the site, a costly procedure in view of the usually large volume-to-weight ratio. In either case, the configuration of the structure so constructed is fixed, with the result that modification or re-use of the structure at a different location is not easily accomplished. It is the primary object of the present invention, therefore, to provide a fixed-level work platform which can be manufactured relatively inexpensively at a location remote from the site where it can be easily erected and, if necessary, modified as required.

Briefly, the invention involves providing a plurality of identical platform modules and ladder modules that can be releasably connected together in various combinations to achieve a unitary rigid structure that establishes a fixed-level work platform supported by steps or rung ladder sections that provide access thereto. By reason of the identical nature of the modules, they can be fabricated easily in large quantities at a central location; and pre-selected numbers can be relatively inexpensively shipped to a remote location where the modules can be assembled in a predetermined manner to establish the desired configuration. Furthermore, should the requirements of the user change, the original configurations can be modified easily, or even disassembled and transported easily to a new location.

The more important features of this invention have thus been outlined rather broadly in order that the detailed description thereof that follows may be better understood, and in order that the contribution to the art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter and which will also form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for designing other structures for carrying out the several purposes of this invention. It is important, therefore, that the claims to be granted herein shall be of sufficient breadth to prevent the appropriation of this invention by those skilled in the art.

BRIEF DESCRIPTION OF VIEWS OF THE DRAWING

For a more complete understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

FIG. 1 is a schematic side-view of a fixed-level work platform built in accordance with the present invention.

FIG. 2 is an exploded perspective view of a portion of another form of fixed-level work platform;

FIG. 3 is a schematic side view of still another form of fixed-level work platform.

FIG. 4 is a sectional view taken along the lines 4-4 of FIG. 2.

DETAILED DESCRIPTION

Referring now to FIG. 1, reference numeral 10 designates a typical fixed level work platform constructed in accordance with the present invention. Platform 10 is relatively simple and illustrates an assembly of two platform modules 11 and four ladder modules 12. Using different combinations of these modules, various platforms can be constructed to go around, over or under the most complicated shapes and establish single or multiple work surfaces accessible by steps.

As seen in FIG. 2, each platform module 11 comprises a pair of separate overlying identical rectangular frames 13 each of which has a pair of identical parallel horizontal members 14 attached to the free ends 15 of a pair of identical parallel vertical members 16. Members 14 and 16 are metal tubes and the attachment therebetween is by way of welding. The upper one 17 of the horizontal members 14 of each pair of frames 13 constitutes a handrail.

Intermediate the ends of vertical members 16 is located a platform defined by tread means 18 which may include a rectangular reinforced metal frame covered with a metal mesh and welded at each corner to one of the vertical members 16 which each contain a pair of spaced holes 19. The axis of each hole 19 is normal to the axis of the vertical members and aligned with the plane of the frames.

One of the simplest work platform would include two platform modules 11 connected together to establish a platform double the area of tread means 18. To achieve such a platform, the right-hand vertical members 20 of a pair of platform frames 13 of module A are abutted with the left-hand vertical members 21 of a pair of platform frames 13 of an adjacent module B whereby the handrails 17 of the modules are aligned, and holes 19 are aligned as shown in FIG. 2. Bolts 22 passing through aligned holes 19 are provided with nuts (not shown) by which module A is rigidly attached to module B. Vertical members 20, 21 abut throughout their entire length so that when modules A and B are bolted together a strong unitary work platform is established. One form of support for and access to this platform is provided by ladder modules 12 shown best in FIG. 1.

Referring again to FIG. 2, ladder modules 12 comprise a pair of separate overlying identical parallelogram frames 23 each of which has a pair of identical parallel inclined members 24 attached to the free ends 25 of a pair of identical parallel vertical members 26. Members 24 and 26 are metal tubes and the attachment therebetween is by way of welding. The upper one of the inclined members of each pair of frames 23 constitutes a handrail, and the other member constitutes a step support to which a plurality of spaced

step means 27 are attached. Each step means 27 comprises a rectangular frame on the surface of which is welded a metal mesh to provide a non-slip tread surface. Two corners of the frame of each step means are welded to member 24 with the metal mesh defining a plane perpendicular to the axes of vertical members 26 each of which contains a pair of spaced holes 28. The axis of each hole 28 is normal to the axis of vertical member 26 and is aligned with the plane of the frame. As shown in FIG. 2, a reinforcing bar 29 is welded to members 26 of each frame 23 and serves to support the projecting edge of each of the step means 27. The tread means 18 of each platform module 11 is vertically spaced from the lower horizontal member 14 of the platform frames by a distance equal to the vertical spacing between the planes defined by step means 27 of the ladder modules. The width of the step means 27 is such that the spacing between frames 23 of a ladder module is the same as the spacing between the frames 13 of a platform module. It should be understood that the number of step means shown and described is meant to be illustrative of the invention, and fewer or more step means can be provided.

In the event the particular use to which the work platform is to be put requires elevation of the platform to a height of twice one of the ladder modules, two of the latter modules can be connected together in a manner similar to which two platform modules are connected together. Accordingly, opposite vertical members 30 at the upper end of a pair of ladder frames 23 of one module C are abutted with opposite vertical members 31 at the lower end of the frames of another module D whereby the handrails of the modules (e.g., upper members 24 of each frame 13) are aligned, and holes 28 are aligned as shown in FIG. 2. Bolts 22 passing through aligned holes 28 are provided with nuts (not shown) by which module C is rigidly attached to module D. Vertical members 30, 31 abut throughout their entire length so that when modules C and D are bolted together a strong unitary ladder structure is established.

In order to construct the work platform illustrated in FIG. 1, two platform modules 11 would be bolted together as described above; and, to each of these modules would be bolted a pair of ladder modules that had been previously bolted together as described. In such case, the opposite vertical members 30 at the upper end of a pair of ladder frames 23 of ladder module D, for example, are abutted with, for example, right-hand vertical members 20 of platform module B whereby handrails 17 of the latter are contiguous to the upper inclined members 24 of the ladder module. Vertical members 26 of the ladder modules are the same length as vertical members 16 of the platform modules so that the holes 28 in members 26 are aligned with holes 19 in members 20. Bolts 22 can then be passed through the aligned holes to rigidly attach the ladder modules to the platform modules. Similarly, a pair of ladder modules can be attached to left-hand vertical members 21 of module A. In this way, the inline configuration shown in FIG. 1 can be constructed.

As shown in the drawing, all of the platform modules are identical, and all of the ladder modules are identical. All of the vertical members on the ladder module have mitred ends and are of the same length; and all of

the vertical members of the platform modules have square ends and are of the same length. In each ladder module, the upper and lower inclined members are the same length; and in each platform module, the horizontal members are the same length. Thus, members of only four different lengths are required for these modules. Preferably, the members are tubular and are welded together permitting conventional metal working equipment to be used to effect considerable time and material savings in fabrication of these two basic modules. Furthermore, the ladder and platform modules can be used in various work platforms. FIG. 3 is illustrative of one such variety. Many other configurations are of course possible.

In addition to being conducive to rapid and inexpensive fabrication, the disclosed modular concept permits a user at a location remote from the place at which fabrication of the modules occurs, to design his own work platform to meet his own particular requirements, and to order the necessary modules from the module fabricator. Shipment of the modules, unassembled, is relatively inexpensive because the modules can be nested to increase the volume-to-weight ratio as compared to the shipment of a fully assembled configuration. Erection of the work platform is easily achieved with minimum effort by reason of the design of the modules and the expedient of using standard nuts and bolts to clamp the modules together and establish a rigid unitary structure.

The truss nature of the modules provides a sturdy structure, but it is sometimes necessary to provide extra support for the platform, particularly when many platform modules are interconnected. When this is necessary, an auxiliary support like that designated by reference numeral 40 can be used. Support 40 includes a pair of identical vertical legs 41 which preferably are tubular and of rectangular cross-section, and a plurality of rungs 42 in the form of tubes welded to the inside surfaces 43 of legs 41. Rungs are spaced apart a convenient distance so that, if necessary or desired, support 40 can serve as a ladder. Adjacent the free end of each vertical leg 41, and on the surface 43, is welded auxiliary vertical member 44 which is identical to members 16 of the previously described platform module. Each of members 44 have a pair of holes 45 spaced apart the same distance holes 19 and holes 28 are spaced part in the vertical members of the ladder and platform modules. Consequently support 40 can be interposed between a pair of platform modules as indicated at 46 in FIG. 3 or between a platform module and a ladder module as indicated at 47 in FIG. 3. It should also be noted that a step ladder can be constructed when ladder modules are attached on one or both sides of an auxiliary support. Note that the length of support 40 is modular in that the length is dependent upon the platform level at which the support is to function. Thus, support 46 to support the second level of platform as shown in FIG. 3 has longer legs than support 47 which supports only the first level.

In order to achieve a rigid connection between the auxiliary support and adjacent platform modules, right-hand vertical members 20 of module B, for example, are abutted with one side 48 of member 44 on support 40, and left-hand vertical members 21 of an adjacent platform module (not shown) are abutted with the op-

posite side 49 of member 44 (see FIG. 4). Holes 19 in vertical members 20 and 21 are aligned with holes 45 and bolts (not shown) can be inserted to permit a rigid connection between the modules to be achieved. The handrails 17 of the adjacent platform modules are then in alignment.

Sometimes a user requirement calls for a work platform with a right-angle approach, e.g., a platform in which one or the other ladder modules are to be directed at right angles to the axis of the work platform. In such case, a special right angle module like that designated by reference number 50 can be used. Module 50 has a rear rectangular frame 51 and a front frame 52. Frame 51 has a pair of identical parallel horizontal members 53 attached to the free ends 54 of a pair of identical parallel vertical members 55. The upper one of members 53 constitutes a handrail.

Frame 52 has a single lower horizontal member 56 and a pair of spaced vertical support units 57 attached to member 56 near opposite ends. Each support unit 57 is U-shaped and includes a pair of vertical support members 58 interconnected by a horizontal tie-member 59. The free ends of members 58 are welded to member 56 to define a left-hand and a right-hand support unit. The spacing between the inner one of members 58 of left-hand support unit 57 and the inner one of members 58 of the right-hand support unit 57 is the same as the spacing between the frames 23 of a ladder module, which is also the same as the spacing between the frames 13 of a platform module.

Platform 63 in the form of a reinforced frame covered with metal mesh is welded to vertical members 55, 58 so that the plane of the platform is normal to the plane of frames 51 and 52. Platform 63 is spaced from lower horizontal members of frames 51 and 52 a distance equal to the spacing between tread means 18 and lower members 14 of the platform modules. In addition, the spacing between frames 51 and 52 of module 50 is the same as the spacing between frames 13 of platform module 11 and each outer member of module 50 are provided with spaced holes 64 which match spaced holes 19 in vertical members 16 of the platform modules, and spaced holes 28 in vertical member 26 of the ladder modules. While the drawing shows a platform module rigidly attached to right-hand vertical members 55, 58 (which are the same length as members 16 by means of bolts 22, it is also possible to attach either a ladder module or an auxiliary support to members 55, 58 by reason of the spacing therebetween. Similarly, a ladder module or a platform module or an auxiliary support can be attached to the left-hand vertical member.

The two inner members 58 of support units 57 are each provided with spaced holes 65 which match spaced holes 19 in vertical members 16 of the platform modules, and spaced holes 28 in vertical members 26 of the ladder modules. While the drawing shows a ladder module rigidly attached to inner members 58 (which are the same length as members 16) by means of bolts 22, it is also possible to attach a platform module to inner members 58.

When additional support for module 50 is to be provided by auxiliary support 40, members 44 can be placed abutting right-hand vertical members 55, 58 at the right of the module, or abutting left-hand vertical

members 55, 58 at the left of the module, depending on the configuration of the platform desired. Sometimes, support 40 is used to terminate a module 50 or a platform module 11 at either the left or right hand side thereof. In such case, a tubular member like rung 42 would be mounted on top of members 44 by welding to pins 66 inserted into the top of members 44 in situ to form an end hand rail.

The flexibility of the above described fixed-level work platform is enhanced by providing a caster module designated by reference numeral 70. Module 70 includes a channel shaped base member 71 at each end of which are mounted swiveling casters 72. In the web of base member 71 are holes 73 which can be aligned with lower holes 28 in lower vertical members 26 of frames 23 of the ladder modules. Bolts 22 can then be used to rigidly attach module 70 to the ladder module. Suitable holes 74 in clips 75 welded to the inside lower ends of vertical legs 41 of auxiliary support 40 are also provided to accommodate the attachment to such support of another module 70.

What is claimed is:

1. A fixed level work platform that can be constructed in-situ comprising a plurality of identical platform modules releasably connected together for defining a fixed-level work platform, and ladder means releasably connected to a platform module at each end of said work platform for providing steps leading to and support for said work platform, and wherein the ladder means at one end of said work platform is constituted by a pair of ladder modules, each ladder module comprising a pair of separate overlying identical parallelogram ladder frames each of which has a pair of identical parallel inclined members attached to the free ends of a pair of identical parallel, vertical members; the upper one of the inclined members of each pair of ladder frames constituting a step support, and a plurality of spaced step means attached to said other members constituting steps, there being in each vertical member a pair of spaced holes, opposite vertical members of a pair of ladder frames of one module being abutted with opposite vertical members of a pair of ladder frames of an adjacent module whereby the handrails are aligned and the holes in the last mentioned vertical members are aligned, and bolt means passing through the aligned holes for rigidly attaching said one module to said adjacent module.

2. A fixed level work platform that can be constructed in-situ comprising a plurality of identical platform modules releasably connected together for defining a fixed-level work platform, and ladder means releasably connected to a platform module at each end of said work platform for providing steps leading to and support for said work platform, and wherein each platform module comprises a pair of separate overlying identical rectangular platform frames each of which has a pair of identical parallel, horizontal members attached to the free ends of a pair of identical parallel vertical members, the upper one of the horizontal members of each pair of platform frames constituting a handrail, and tread means attached to each of the vertical members constituting a platform, there being a pair of spaced holes in each vertical member, opposite vertical members of a pair of platform frames of one module being in abutment with opposite vertical mem-

bers of a pair of platform frames of an adjacent module whereby the handrails are aligned and the holes in the last mentioned vertical members are aligned, and bolt means passing through the aligned holes for rigidly attaching said one module to said adjacent module.

3. A work platform according to claim 2 wherein said ladder means at one end of said work platform includes a right-angle module comprising a rear rectangular frame having a pair of identical parallel horizontal members attached to the free ends of a pair of identical parallel vertical members, the upper horizontal member of said rear frame constituting a handrail, a front frame having a single lower horizontal member and a pair of spaced vertical support units attached to the free ends of the last mentioned horizontal member, and tread means attached to the vertical members of said rear frame and said support units, there being a pair of spaced holes in the vertical member of said rear frame at the other end thereof and in the other support unit, the last mentioned vertical member and support unit being spaced apart a distance equal to the distance between said pair of platform frames and being in abutment with opposite vertical members of a pair of platform frames of a platform module at one end of said work platform whereby the handrail of said right-angle module is aligned with one of the handrails of the last mentioned platform module and the holes in the vertical member and support unit of the right-angle module are aligned with the holes in vertical members of said last mentioned platform module, and bolt means passing through the aligned holes for rigidly attaching the right angle module to said last mentioned platform module.

4. A work platform according to claim 2 wherein the ladder means at each end of said work platform is constituted by a ladder module each of which comprises a pair of separate overlying identical parallelogram ladder frames each of which has a pair of identical parallel, inclined members attached to the free ends of a pair of identical parallel, vertical members, one of the inclined members of each pair of ladder frames constituting a handrail, and the other of the incline members constituting a step support, and a plurality of spaced step means attached to said other members constituting steps, there being in each vertical member a pair of spaced holes, the spacing between the ladder frames being the same as the spacing between the platform frames, opposite vertical members of a pair of ladder frames the respective ladder modules being in abutment with opposite vertical members of a pair of platform frames of the respective platform modules at each end of the work platform whereby the handrails of said ladder modules are contiguous to the handrails of said one platform module and the holes in the last mentioned vertical members are aligned, and bolt means passing through the aligned holes for rigidly attaching together the abutted modules.

5. A work platform according to claim 4 wherein each of said members is tubular.

6. A work platform according to claim 5 wherein there is a step means on each ladder module attached to the ladder frames thereof at the upper corners of the overlying parallelograms.

7. A fixed level work platform that can be constructed in-situ comprising a plurality of identical platform modules releasably connected together for defining a fixed-level work platform, and ladder means releasably connected to a platform module at each end of said work platform for providing steps leading to and support for said work platform, and wherein each platform module comprises a pair of separate overlying identical rectangular platform frames each of which has a pair of identical parallel, horizontal members attached to the free ends of a pair of identical parallel and vertical members, one of the horizontal members of each pair of platform frames constituting a handrail, and tread means attached to each of the vertical members constituting a platform, there being a pair of spaced holes in each vertical member, and an auxiliary support for supporting said work platform, said support having a pair of vertical legs to the inside of each of which is rigidly attached a vertical member having a pair of spaced holes, opposite vertical members of a pair of platform frames of one module being in abutment with one side of the vertical members on the legs, and the opposite vertical members of a pair of platform frames of an adjacent module being in abutment with the opposite side of the vertical members on the legs whereby the handrails are aligned and the holes in the last mentioned vertical members are aligned, and bolt means passing through the aligned holes for rigidly attaching the platform modules to said auxiliary support.

8. A work platform according to claim 7 wherein caster wheels are releasably attached to the free ends of said auxiliary support.

9. A work platform according to claim 8 wherein said ladder means at one end of said work platform also includes a ladder module which comprises a pair of separate overlying identical parallelogram frames each of which has a pair of identical parallel inclined members attached to the free ends of a pair of identical parallel vertical members, the upper one of the inclined members of each pair of frames constituting a handrail, and the other of the inclined members constituting a step support, and a plurality of spaced step means attached to said other members constituting steps, there being a pair of spaced holes in the vertical members of said frame and in said support units, the last mentioned vertical members and support units being spaced apart the same distance and being in abutment whereby the spaced holes are aligned, and bolt means passing through the aligned holes for rigidly attaching the right angle module to said ladder module.

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