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(54) MOVABLE MODULAR SCAFFOLD SYSTEM FOR BUILDING WORKS AND METHOD TO FORM IT

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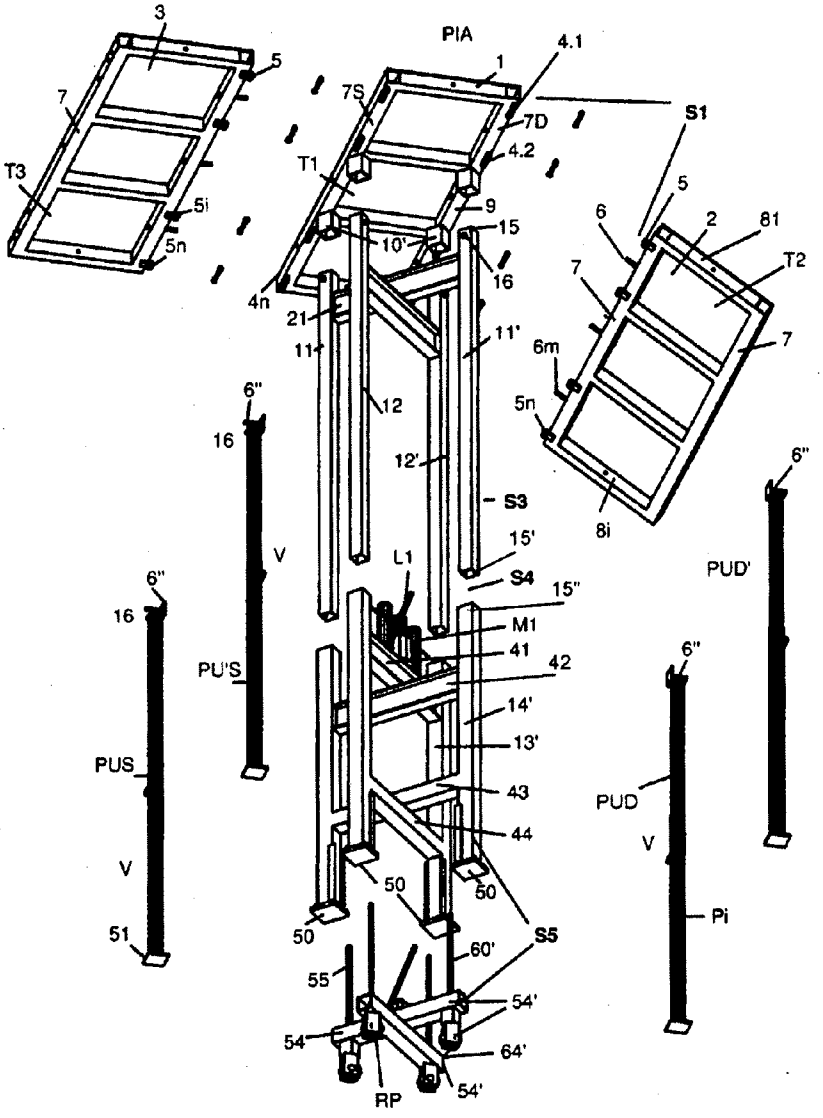
(52) **U.S. Cl.** **182/141**

(57) **ABSTRACT**

A platform scaffold system for building work, which typically is self-moving as a sole integrally body without needing disassembling and re-assembly its sub-systems, whereby the working times are shortened, pieces and components thereof do not go lost, and the maximal flexibility and safety will be reached. The platform is extensible in width and/or length and adjustable, in length, its support comprises two sub-systems (S3-S5) which are telescopically coupled to each other and to the platform (S1) by means of "overturned glasses" associated to the frame (T1) of the platform central element (1). One or several mechanisms act on the telescopically coupled support components also to make them pass from a work static state to a dynamic state on twirling wheels.



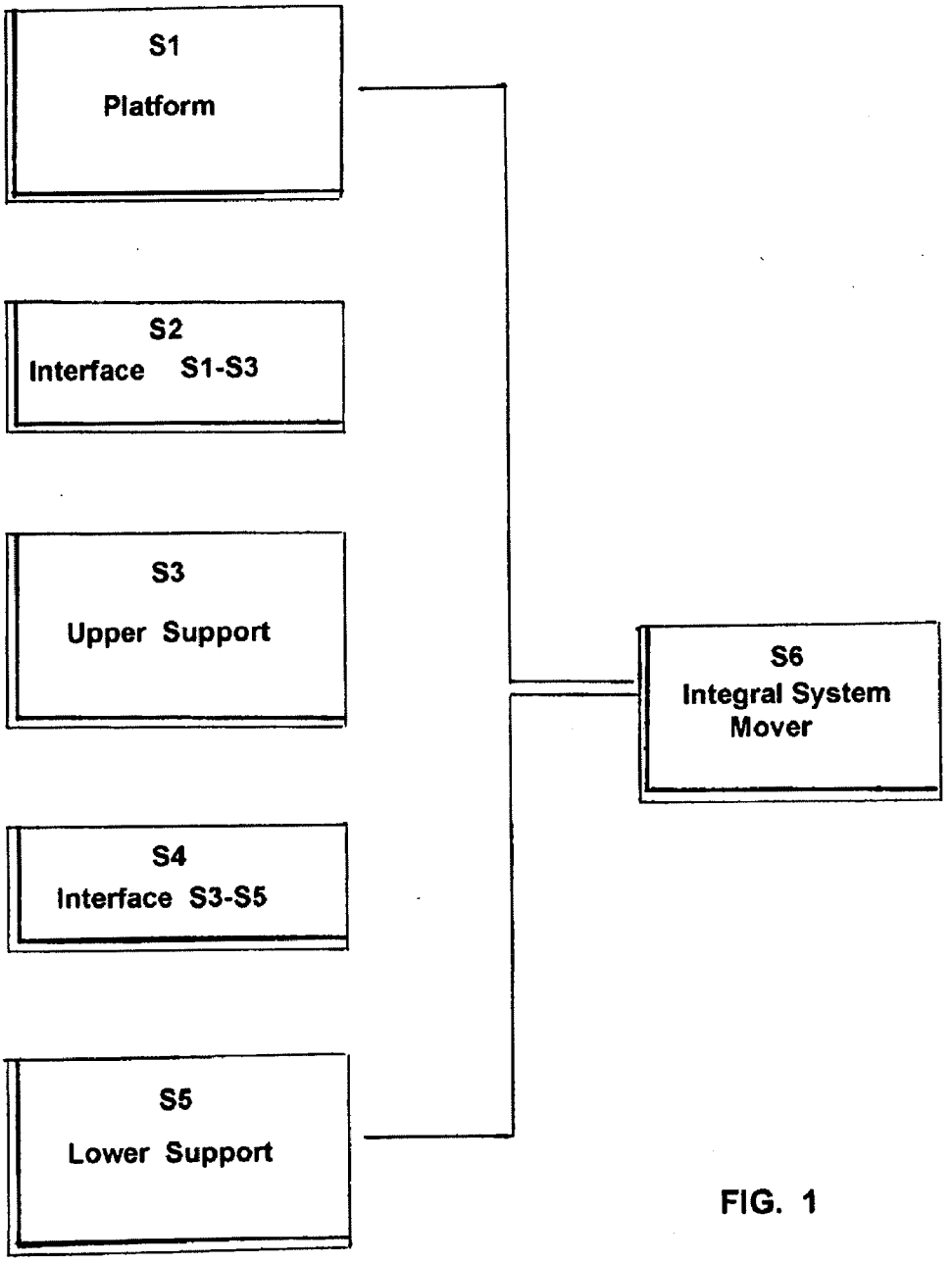

S1
Platform
S2
Interface S1-S3
S3
Upper Support
S4
Interface S3-S5
S5
Lower Support
S6
Integral System
Mover

FIG. 1

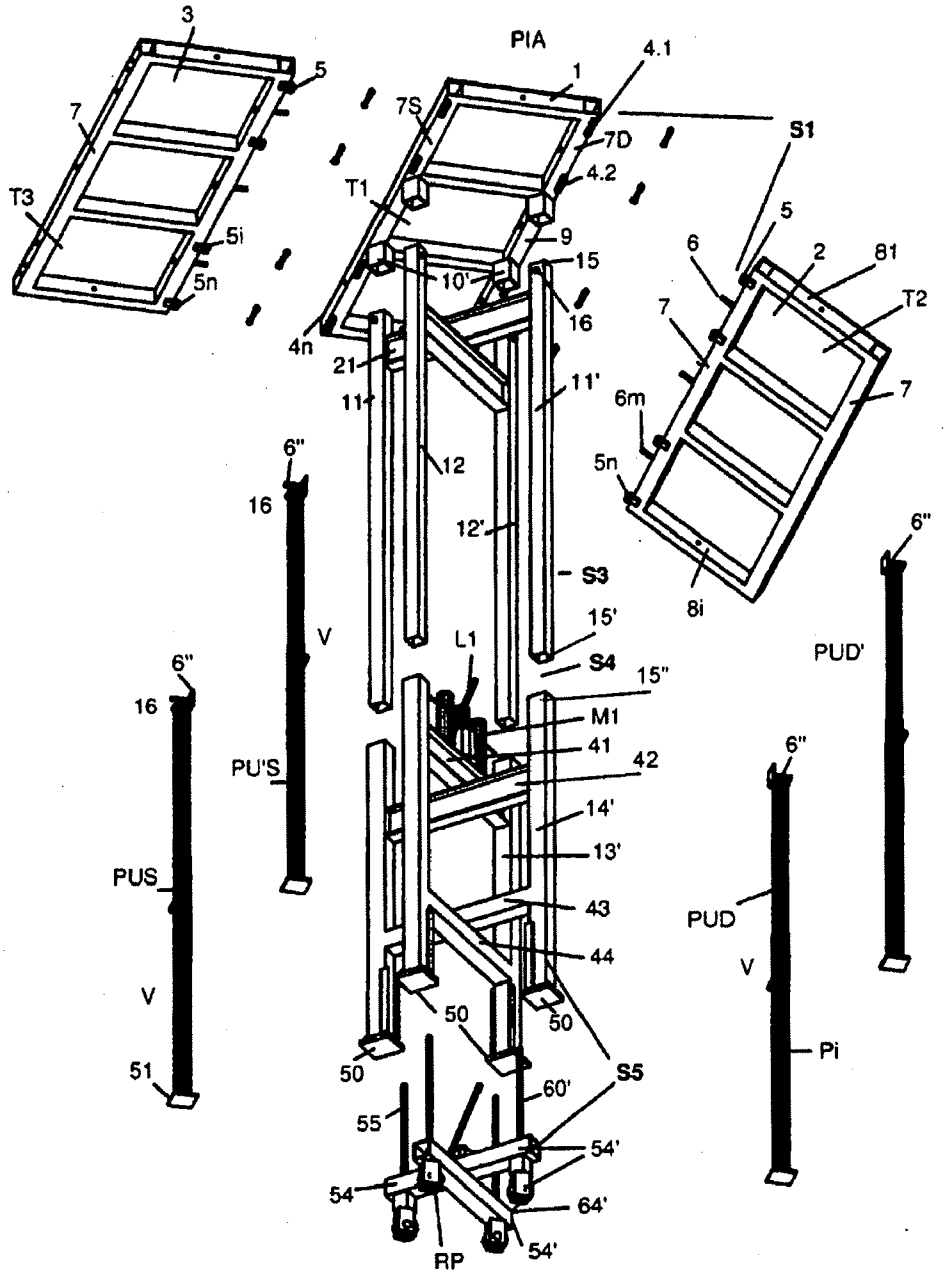

3
5
7
T3
5i
5n
PIA
4.1
1
7S
7D
S1
4.2
T1
9
15
10'
16
4n
21
11
11'
12
12'
S3
15'
S4
15"
M1
41
42
14'
13'
43
44
50
50
50
S5
60'
55
54'
54
64'
54'
RP
L1
V
6"
16
PU'S
PUS
V
51
6
2
81
T2
7
6m
5n
8i
PUD'
PUD
V
Pi

FIG. 2

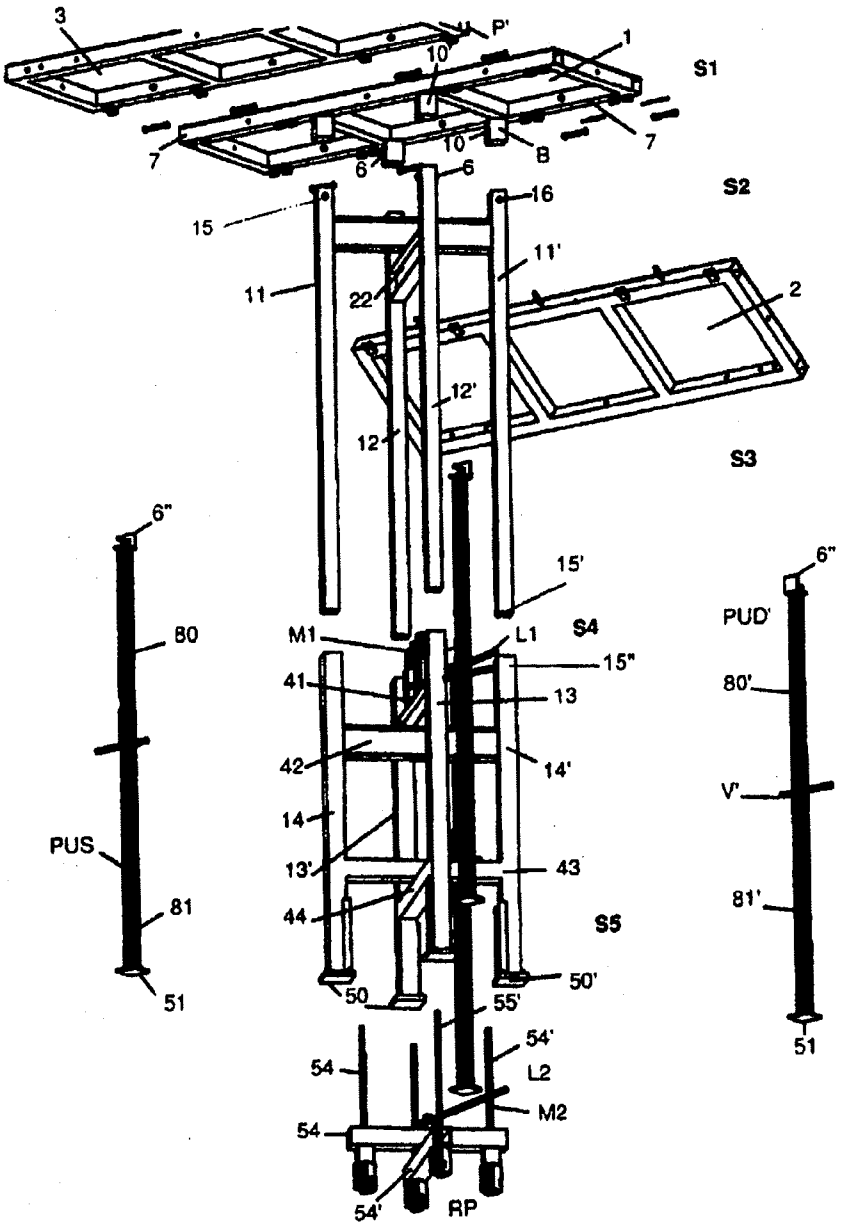

3
P'
1
10
S1
7
10
B
7
6
6
S2
16
15
11'
11
22
2
12'
12
S3
6"
15'
6"
PUD'
80
M1
L1
S4
15"
41
13
80'
42
14'
V'
14
PUS
13'
43
81'
44
S5
81
50
50'
55'
51
54'
54
L2
M2
54
54'
RP
51

FIG. 3

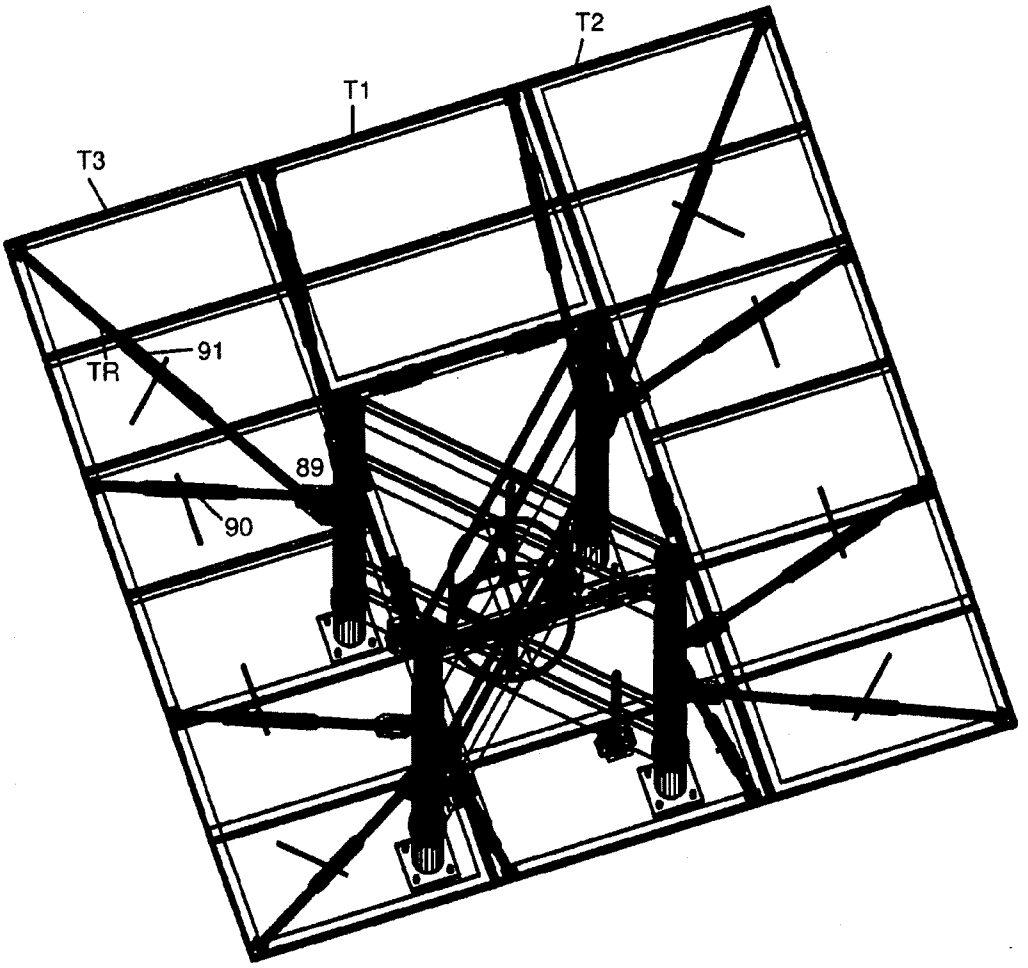


FIG. 4

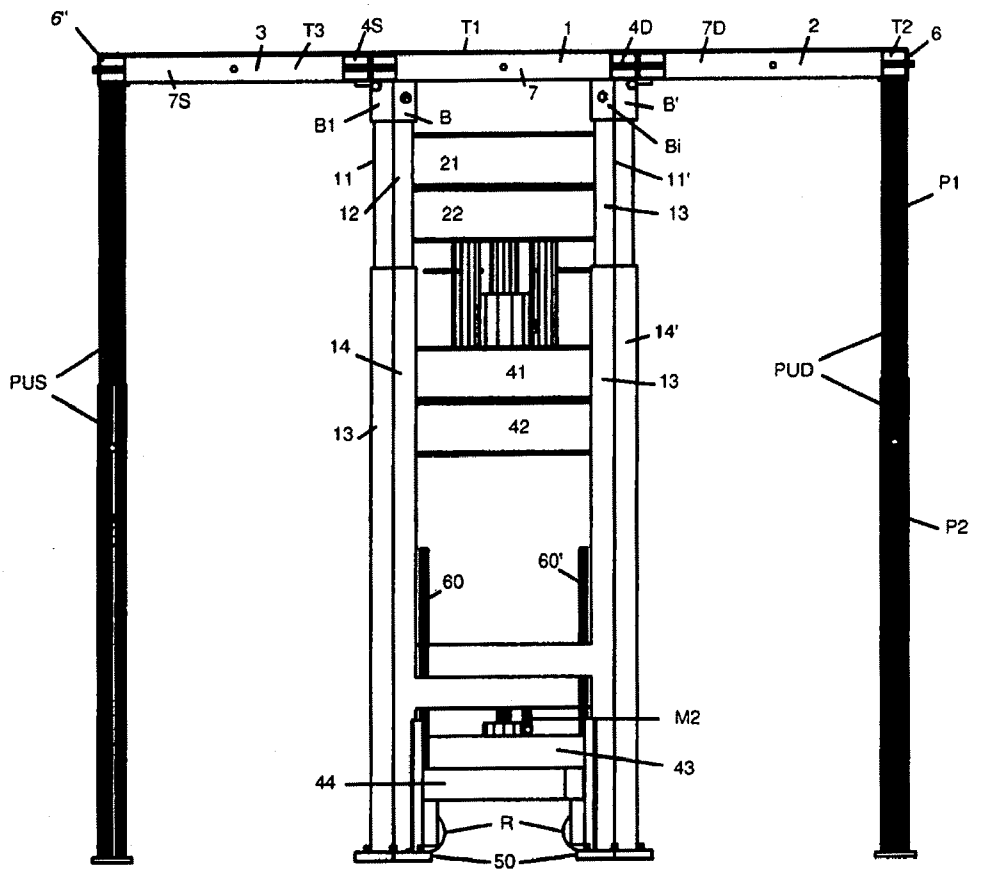

6'
3
T3
4S
T1
1
4D
7D
2
T2
6
7S
7
B1
B
B'
Bi
11
21
11'
12
22
13
P1
PUS
14
14'
41
13
PUD
13
42
P2
60
60'
M2
43
44
R
50

FIG. 5

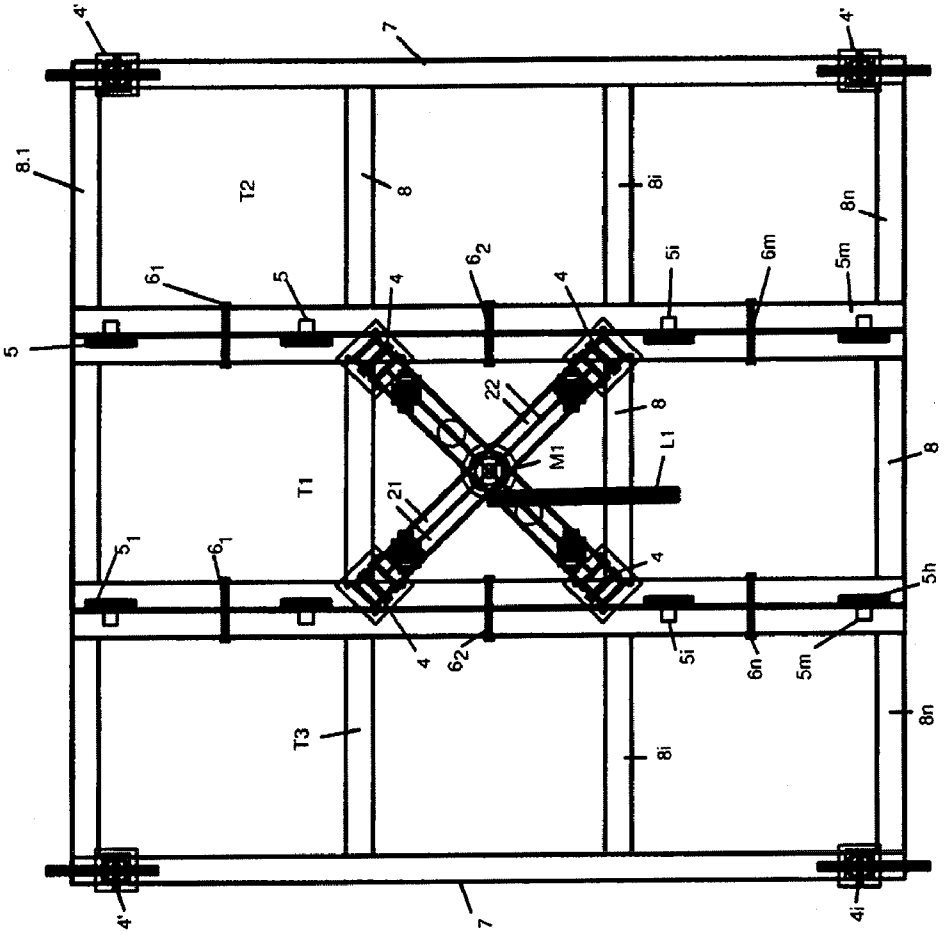

4'
7
4'
8.1
T2
8
8i
8n
5i
6m
5m
6_1
5
4
6_2
4
5
22
8
M1
L1
8
T1
21
5_1
6_1
4
5h
4
6_2
5i
6n
5m
T3
8i
8n
4'
7
4i

FIG. 6

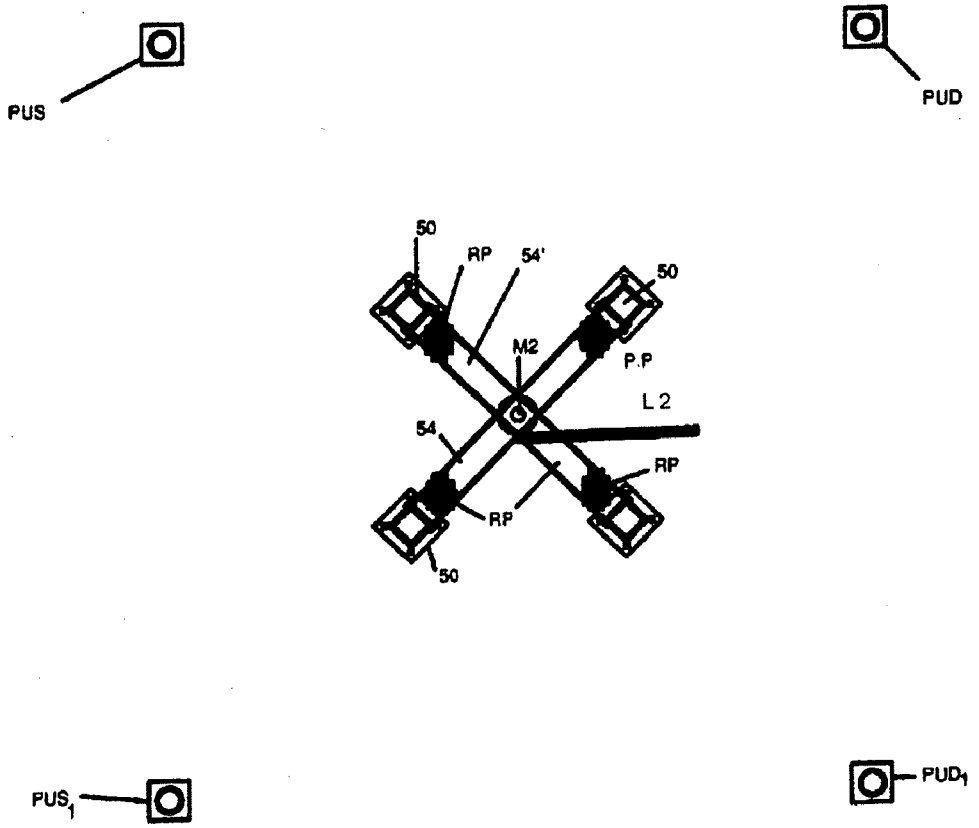


FIG. 7

MOVABLE MODULAR SCAFFOLD SYSTEM FOR BUILDING WORKS AND METHOD TO FORM IT

[0001] This is a continuation-in-part of International Application No. PCT/EP2009/002280, filed Mar. 27, 2009, the disclosure of which is herein incorporated by reference.

BACKGROUND AND FIELD OF THE INVENTION

[0002] The present invention concerns movable, modular scaffold systems for building works, comprising at least one platform adjustable in length, height and width, said scaffold system being integrally displaceable without de-mounting and re-mounting of its sub-systems.

[0003] In a preferred embodiment of the invention the system comprises at least 5 sub-systems, a sixth sub-system being optional.

PRIOR ART

[0004] Presently the building activity, in particular the residential building enterprise knows a rather paradoxical situation in the sense that, especially in the big towns the buildings have taken a quite intensive characteristic, e.g., in form of skyscrapers with height from 30-40 up to 600 meters. In this frame, scaffoldings for the erection of big height buildings have been currently developed, said buildings being tamponed with the aid of large panels pre-fabricated outside erecting yard.

[0005] The scaffolding for such big buildings is of the industrial type and comprises vertical supports (mainly hollow tubes), which can be interconnected by means of horizontal bars. Plates which extend on a horizontal plane can be hooked into the bars to create an accessible working surface. Some prior Art documents are mentioned hereinafter to give an idea on said situation.

[0006] Spanish Patent Publication ES 2307797 is concerned with a demountable, multi-stage scaffolding comprising walk-on floor levels supported by vertical struts with railings fitted on through an adaptor attachable to rosette supports above floor at distance not restricted by the spacing between rosettes.

[0007] DE **102004060653** describes a framework having a guide system connected to a supporting system.

[0008] In the PCT Patent Application Published as WO2008/000654 a lifting platform is described which comprises a base (that can be set up on a ground and converted into a console), and a platform which can be lifted in relation to said base. The lifting system consists of two lateral columns.

[0009] EP 1398432 is concerned with formwork based on a support consisting of four tubular elements, and of an adaptor for said formwork.

[0010] Summarizing the panorama of the construction scaffolds can therefore be divided in a field of big buildings in which are needed big scaffoldings and a current field of small, middle buildings; in the first field of big scaffoldings there is an intensive search work to develop continuously improved systems, whereas in the small and middle building field the search of advantageous lifting platforms is rather limited. Indeed the minor costs of small-middle buildings do not allow the search and commercial expansion of sophisticated scaffoldings. There is also the other aspect that in the second field of the small-middle building there is a very high number of small contractors which have their own traditional building techniques wherein use is made of conventional scaffoldings.

[0011] Accordingly, at the best knowledge of the Applicant, it seems absent on the market an appropriate scaffold system which is modular, has a platform adjustable in the three directions X, Y, Z, is easily hand traversed without de-mountings and re-mountings, the system itself is safe, has not high costs, allows a sensitive reduction of the working times, and avoids loss or breaks of components.

SUMMARY OF THE INVENTION

[0012] First object of the present invention is to provide a compact, easy to set up, integrally displaceable, safe and highly performance scaffold system.

[0013] A second object is to provide a method to easily set-up, to adjust in height and length the platform, and to integrally displace said system.

[0014] The main features of the scaffold system according to the invention are recited in the claims, at the end of this description, said system substantially consisting of at least five sub-systems and optionally of a sixth sub-system.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[0015] The various features and advantages of the system according to the invention will more clearly appear from the following description of the preferred (illustrative but not limitative) embodiments represented in the accompanying drawings in which:

[0016] FIG. **1** is a block diagram showing the components (sub-systems) of the system according to the invention, and their inter-related functions;

[0017] FIGS. **2** and **3** are exploded perspective views from the bottom, of an advantageous and therefore preferred embodiment of the invention, FIG. **3** being a view on the scaffold of FIG. **2**, turned of 90°;

[0018] FIG. **4** is a top view of an embodiment using tension rods instead of poles to support the extension element of the platform;

[0019] FIG. **5** is a front view of the system with an extended platform supported by end poles; and

[0020] FIGS. **6** and **7** are a top view respectively a bottom view of FIGS. **2**, **3** and **5**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

[0021] In the block scheme of FIG. **1**, the efficacious system according to the invention which is typically movable as an integral body, without the need of demountings and re-mountings, highly safe and with a platform controllable in height, length and width, comprises several sub-systems. In particular the following five ones:

[0022] S**1**—a first sub-system involving at least one work platform which is extensible in width and length and adjustable in height;

[0023] S**2**—sub-system of first interface comprising means to couple S**1** and S**3**;

[0024] S**3**—sub-system of upper adjustable supporting structure;

[0025] S**4**—sub-system of second interface for the adjustable coupling of S**3** and S**5**; and

[0026] S5—sub-system of lower supporting structure to determine the work stationary conditions, and the movement non-stationary conditions.

[0027] As it can be seem from the preferred embodiment shown in FIGS. **2** to **6**, in particular from the exploded, perspective views (front view in FIG. **2** and lateral view in FIG. **3**) a platform PIA comprises a central principal element or footboard **1** which is advantageously extensible with the aid of at least two lateral and overturnable elements **2** (on the right hand) and **3** (on the left hand) which can be generally assembled on site and overturned with the aid of coupling means of temporally constraint, e.g. with n hinges $\mathbf{4}_1$-$\mathbf{4}_n$, n bolts **5**-$\mathbf{5}_n$ and m rods $\mathbf{6}_1$-$\mathbf{6}_m$. The platform forming elements **1**, **2** and **3** comprise a main frame T**1** and several extension frames T**2**, T**3** obtained with the aid of pairs of longitudinal bars or rods **7**-**7'** stiffened by transversal bars $\mathbf{8}_1$-$\mathbf{8}_n$. The coupling of elements **1**, **2** and **3** can also be of the male-female types, or of the clip type even if, obviously, other coupling elements (preferably as available on the market) can be used. In other words, the structures of the three (or more) extensible platform elements and of the related association and overturning means **4**, **5** and **6** can also be different from those shown in the drawings, on condition that they guarantee always an extremely strong platform both in the form of a mono-element platform (T**1**) or in the form of multi-element platform (T**1**, T**2**, T**3**). Also their articulation by hinges **4**D, **4**S must be safe and reliable.

[0028] According to a first feature of the invention, two pairs of overturned "glasses" **10**-**10'** project downwards from the lower (or proximal) faces of the longitudinal bars of the central frame T**1**, the number of said "glasses" **10**-**10'** is to be equal to the number of the uprights **11**-**11'**, **12**-**12'** of the support sub-system S**3**.

[0029] Typically the proximal opening or mouth **9** of said glasses B-B', B**1**-B**1'** is to be slightly wider than those of the heads or tops **15** of said uprights **11**-**11'**, **12**-**12'**, of the support sub-system S**3** so to facilitate the insertion of said mouths (associated to platform central element **1**) within the terminal ends **15** of said uprights which are provided of holes **16** for the passage of bolts and/or stiffeners.

[0030] As it will be better seen in the following, a certain stiffening between these elements is needed as the height of the uprights **11**-**11'**, **12**-**12'** is adjusted for instance by jackscrews M**1** (motorized or not), winches or similar devices, which push upwards the shafts or pistons **18** to have each time the platform at a work optimal height according to the building structure under construction.

[0031] According to an other aspect of the invention the inner longitudinal bars **7**, 7D and **7**S of frames T**1**, T**2**, T**3** are provided with the means for the coupling, through said hinges, bolts and rods and the like, with the extension elements **2** and **3** so to bring about also a good inter-system modularity, i.e. the union (with form constraint and, additionally, with stiffening of said coupling means like hinges, bolts, bars, rods) of one or more integral system SI, one SID at the right side of the platform **2** and one SIS to the left side of element **3**.

[0032] In other words the integral (mono-body) SI of FIGS. **2**, **3** and **5** is conceived in such a way to get united to one or more other similar integral system SI' identical to SID or SIS, in order to form multiple combined super-system to cover EL any building extension. Those unions are brought about with the aid of sub-system **6** which is a mover (f.i elevator, skiphoist) to hoist and/or push said additional integral systems S**1'** (practically a copy of SI).

[0033] This chain of single integrated systems £SID, SI, SIS or SI', SI, SI") according to the invention is not shown as it is per se strongly intuitive. By returning to the single system of FIGS. **2** and **3**, the four superior uprights **11**-**11'**, **12**-**12'** and the inferior uprights **13**-**13'**, **14**-**14'** of sub-system S**3** are reinforced (stiffened) by beans (cross-bars) pairs **21**-**22**, **41**-**42**, **43**-**44**; preferably the two beans of each pair are perpendicular to each other. Said reinforcements by crossed couples assure the possibility to charge the platform with the maximum charges of workers and materials as well as to place the system in static work (resting on the plates **50** at the lower end of lower uprights **13**-**13'**, **14**-**14'**) and to make the passage of the whole integral system from this static position to the movement dynamic one obtained by disconnecting (with the aid of a second vertical movement organ like jackscrew M**2**) the system from plates **50** (resting, on their turn, on possible ground plates) and by inserting the twirling (pirouetting) wheels RP which allow the planar displacement of the whole integrated system according to the invention. Thanks to the wheels said displacement can take place even by a manually pushing of the people working in the building yard.

[0034] In said figures L**1** and L**2** indicate the lever of the hydraulic jacks M**1** and M**2**, whereas **64**-**64'** indicate the pistons (shafts or bars) to hoist S**5** and to rotate the twirling (pirouetting) wheels. The telescopic run of the glasses **10**-**10'** on the superior uprights **11**-**11'**, **12**-**12'** to finely adjust the platform height is generally rather short and at most equal to the depth of same glasses. On the contrary the telescopic stroke of the inferior uprights **11**-**11'**, **12**-**12'** (less wide) is longer as it is depending on the hoisting from ground and insertion of the wheels RP.

[0035] The poles PUD-PUD', PUS-PUS' which bear the outer or intermediate ends of the extension elements **2** and **3** of the platform PIA in extended configuration, are provided with ribs to insert the bolts **6'**, with bearing plates to ground **51** and with flywheels V-V' to adjust the extension, i.e. to adapt them to the different platform height over the ground. Similarly to the uprights **11**-**11'**, **12**-**12'** and **14**-**14'**, said poles are also constituted of two telescopically coupled bodies **80**-**80'**, **81**-**81'**.

[0036] As shown in FIG. **4**, said two pairs poles PUD-PUD', PUS-PUS' of FIGS. **2** and **3** can be substituted by adjustable tie rods TR. Said tie rods can advantageously be pre-fixed, even before hand, to the knots of frames T**1**, T**2**, T**3** and later request the anchorage on site through hooks **89**, to the upper uprights **11**-**11'**, **12**-**12'**. The adjustment is made with the aid of elements **91** like spring or compressed fluid shock absorbers, activated by levers or flywheels **92**.

[0037] FIG. **6** is a plan view of the extendable platform formed of three assembled elements **1**, **2** and **3**. FIG. **7** is a plan view (from below) of the wheel carrier device RP and plates **50**, fixed to the inferior transverses **54**-**54'**.

[0038] In these last figures have been used the same references of FIGS. **2**-**5** whereby it seems not necessary to make a redundant description thereof. In FIG. **5** the hinges **4**D and **4**S bridging the two frames T**2** and T**3** indicate that the two platform extending pieces **2** and **3** can overturn and take a position along uprights **13** and **14'**.

[0039] The preferred method to embody the system according to the present invention comprises at least the steps wherein:

[0040] the platform width and/or length are extended by applying to its central element (**1**) at least one extension element (**2**, **3**) using fixation means pre-disposed on such elements which are already provided with connection means to at least an other platform (PIA') of a second SID and/or third integral SIS system thanks to their modularity;

[0041] the uprights of the two supporting sub-systems (S**3**) and (S**5**) are telescopically combined by inserting those of (S**3**) within those of (S**5**);

[0042] the glass mouths (B-B') protruding from the lower face of the platform central element (**1**) are set over the upper ends of the sub-system (S**3**) uprights preferably already assembled with the (S**5**) wider uprights;

[0043] the platform height is adjusted according to the under-work building height by acting on a mechanism preferably a jackscrew (M) associated to (S**3**);

[0044] the (S**1**), (S**2**), (S**3**) combined ensemble is placed on static plates associated at the feet of the sub-system (S**5**);

[0045] the displacement movement of the whole system to an other work zone is carried out by lifting the integral combined body (S**1**+S**3**+S**5**) from said immovable plates to the twirling wheel mechanism;

[0046] since the scaffold is resistant to high loads, it is possible to carry out the building construction is several zones, e.g., on an upper floor, even if the pillars on the lower floor are not yet fully constructed; and

[0047] the whole integral system is lifted by a lifting apparatus, in particular by the sub-system (S**6**) elevator, in a new work place different from the ended initial work place.

[0048] For scruple of illustrative clarity and simplicity, the invention has been described with particular reference to the embodiments shown in the accompanying drawings; said invention cannot however be considered as restricted to said embodiments but it is to be intended as comprising all changes, substitutions, additions and the like which if being in the hand reach of the field mean technical expert, fall naturally within the scope of the following claims.

What is claimed is:

1. Scaffolding or staging systems for the construction of building of any type, in particular of residential buildings and houses, and for the related components like plasters, roofings and the like, said systems comprising a platform extensible in the height, superior uprights supporting said platform, inferior uprights coupled with the heads of said superior uprights and with ground wheels, characterized in that, to be adjustable in several directions, to be movable as integral bodies, to avoid disassembling and re-assembling operations, to hold their components in good and long conditions, to shorten the working times and to guarantee a maximal safety, they comprise following sub-systems:

a first sub-system (S**1**) involving a "composable" platform which is extensible also in width and length, and consists at least of a central platform element (**1**) and of lateral elements (**2**, **3**) even in situ assemblable to the edges of said central element (**1**) with the aid of coupling means, pre-incorporated in said element edges;

a second sub-system (S**2**) consisting of superior uprights (**11-11'**, **12-12'**) to selectively support only said platform central element (**1**), and of "overturned glasses" (**10**) downwardly projecting from the bottom of only said platform central element, stiffening means (**22**) being provided at the top of said superior uprights;

a third sub-system (S**3**) consisting of means (**15-15'**) associated to the lower ends of said superior uprights (**11-12**) and means associated to the upper heads of inferior uprights (**14-14'**) whereby said lower ends (**15-15'**) telescopically penetrate within said upper heads;

a fourth sub-system (S**4**) consisting of means (**50-50'**) associated to the lower ends of said inferior uprights, and of means (**54-54'**) associated to a low wheel carrier, said inferior uprights (**14-15**) being stiffened by transversal beans (**42-44**); and

a fifth sub-system (S**5**) comprising a carriage (RP) of a structure of immovable plates, and twirling wheels.

2. System according to claim **1**, characterized by a sixth sub-system (S**6**) for the planar and even aerial movement of said S**1**-S**5** sub-systems assembled in only one integral body, said further sub-system (S**6**) being preferably selected among elevators and hoisters (M**1**, M**2**)

3. System according to claim **1**, wherein said elements (**1**, **2**, **3**) comprise a frame, the frame (T**1**) of said platform central element (**1**) being provided with said "overturned glasses" (**10-10'**) having mouths (B-B') opened at their distal ends for the telescoping engagement with the upper ends of said superior support structure (S**3**), said mouths being wider than the top openings (**15**) of said (S**3**) uprights (**11-11'**, **12-12'**).

4. System according to claim **1**, characterized in that said uprights of sub-system (S**3**) are hollow and, besides their upper penetration in said downwards projecting mouths of the platform central element (**1**), their lower opened ends (**15'**) penetrate telescopically also into the upper end openings (**15"**) of the lower uprights (**13-13'**, **14-14'**) and have transversal cross-section (**15"**) higher than that of the lower ends (**15'**) of the superior uprights of (S**3**).

5. System according to claim **1**, characterized in that the platform extending quadrangular, rectangular, trapezoidal elements (**2** and **3**), are provided at their four apex with anchorage means (**6"**) to block the free higher ends (**16**) of poles (PUS-PUS', PIM-PUD') which are also telescopic and extend down to the ground from said apex.

6. System according to claim **1**, wherein adjustable tie bars (TR) are anchored between the apex of the platform extending lateral elements and the outer surface of the (S**3**) superior uprights (FIG. **4**).

7. System according to claim **1**, characterized in that said (S**3**) uprights (**11-11'**, **12-12'**) make short up-down runs within said (S**2**) glasses under the action of a lifting first organ preferably a jackscrews, in order to finely adjust the platform height over that of the building work.

8. System according to claim **1**, characterized in that the (S**5**) upright lower ends are provided as well with immovable plates whereupon said uprights rest during the work stationary conditions, as with twirling wheel mechanisms on which the whole integral system is transferred for the movement step, the transfer from the immovable plates to said movable pirouette wheels being carried out under the action of a second lifting organ preferably a second jackscrew which makes the wider uprights of (S**5**) to telescopically slide on the less wide uprights of (S**3**).

9. Method to embody the system according to claim **1**, wherein:

the platform width and/or length are extended by applying to its central element (**1**) at least one extension element (**2**, **3**) using fixation means pre-disposed on such elements which are already provided with connection means to at least an other platform (PIA') of a second

and/or third integral (SI') system thanks to their modularity;

the uprights of the two supporting sub-systems (S**3**) and (S**5**) are telescopically combined by inserting those of (S**3**) within those of (S**5**);

the glass mouths (B-B') protruding from the lower face of the platform central element (**1**) are set over the upper ends of the sub-system (S**3**) upright preferably already assembled with the (S**5**) wider uprights;

the platform height is adjusted according to the under-work building height by acting on a mechanism preferably a jackscrew (M) associated to (S**3**);

the (S**1**), (S**2**), (S**3**) combined ensemble is placed on static plates associated at the feet of the sub-system (S**5**);

the displacement movement of the whole system to an other work zone is carried out by lifting the integral combined body (S**1**+S**3**+S**5**) from said immovable plates to the twirling wheel mechanism; and

the whole integral system is lifted by a lifting apparatus in particular by the sub-system (S**6**) elevator in a new work place different from the ended initial work place.

* * * * *