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(54) Raisable and lowerable vertical platform system.

(57) A raisable and lowerable vertical platform system, wherein two or more platforms (20,30,50) at different levels are required for servicing of or access to different levels of a structure, has twist-resistant platform-to-platform connections The connections are braced arms (32,34; 52,54) pivoted together and to respective platforms (20,30,50) to move from a shallow-V (extended) to very narrow-V or adjacent (retracted) relative position viewed from a side. Interconnecting rigid guide means (41) are provided for the mutual pivots (33) of the connections.

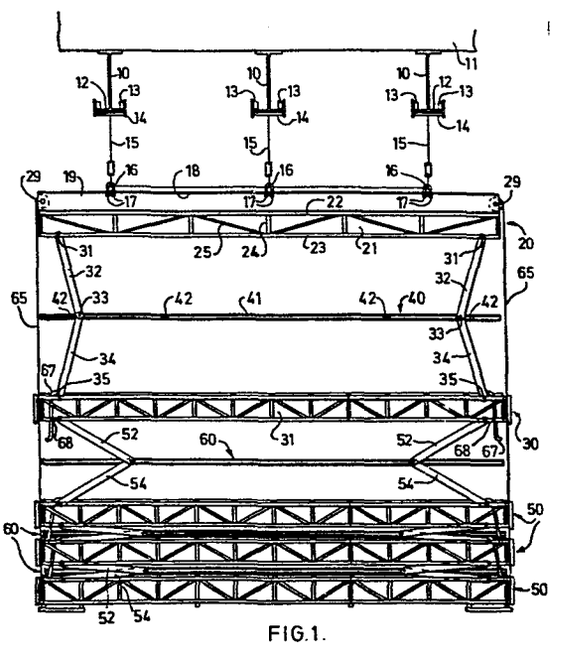

FIG.1.

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Title: Raisable and Lowerable Vertical Platform System

DESCRIPTION

The invention relates to raisable and lowerable vertical platform systems wherein two or (usually) more platforms at different levels are required for servicing of or access to different levels of a structure, for example supports of an off-shore oil rig platform.

Particular problems arise in relation to off-shore oil rig platforms and maintenance, access and inspection of their support legs. If permanent scaffolding is used secured to and about those support legs, there is a high risk that the scaffolding cannot be dismantled in time to prevent storm damage. The latter can leave the scaffolding completely wrecked, in fact wrapped about and intertwining the legs in a manner requiring much time, effort and expense to remove what by that time is scrap.

An improvement, at least from the point of view of likelihood of total loss, will result from systems as proposed herein where a platform system can be

lowered downwards from a safe height under the platform to desired lower heights alongside support legs. It is particularly desirable for such a platform system to have several working levels, or individual platforms, to serve a substantial portion, if not virtually all, of the required height of a support leg at the same time.

If that portion is not to be limited by the minimum safe storn clearance below the actual deck of the oil rig, it is further advantageous for the individual platforms of a system hereof selectively to approach each other closely (raised or retracted) and to be spaced from each other at desired intervals (lowered or extended). This can be achieved simply by using chains for raising, lowering and spacing purposes, but that is found to be unsatisfactory in practice as the overall extended, i.e. lowered, platform system can swing and twist one platform relative to another.

Accordingly, a specific aspect hereof concerns a twist-resistant platform-to-platform connection, preferably using braced arms or frames pivotted together and to respective platforms to move from shallow-V (extended) to very narrow -V or adjacent (retracted) relative positions viewed from a side, preferably with interconnecting rigid guide means for their mutual pivots. Such

a relatively rigid overall structure is highly advantageous, at least by way of reducing securement requirements between each individual platform and stanchions of the support legs.

Also, when fitted with suitable catches between platforms the whole platform structure is readily retained in its raised and retracted state, and capable of sequential extension and lowering of its platforms. Preferred catches release only when engaged by a said frame at its maximum open (shallowest V) position. Then, in effect the platforms extend sequentially, top-most first, under gravity as cables, belts or chains are released or unwound.

We believe that such twist resistant vertically extensible and retractable platforms will be secured in a readily releasable manner relative to stanchions or the like, say using a caliper-like arrangement of arms hinged to a platform or to each other at that platform for selectively engaging about a stanchion or the like. Thus, such caliper-like arms should be readily pinned together and unpinned quickly for raising of the platform system with the arms folded back towards, against or within the

the platforms.

It is, of course, at least desirable, if not necessary for personnel to be able to move from platform to platform, but ladders for that purpose could require release and stowing before the platform system could begin to be raised.

A further aspect hereof concerns a self-stowing ladder or ladders from platform to platform that will not obstruct raising of the platform system, and may conveniently comprise, or each comprise, a ladder pivotted to an upper platform and constrained at a lower platform to be slidable in guides along the platform.

The aspects and features thus far mentioned, are applicable to platform systems at or near the position of each support leg. However, we have ourselves developed systems for servicing overhead structures by way of platforms suspended from rails or runway beams by couplers capable of traversing such rails or runway beams thereby to translate a platform therealong.

Accordingly, another aspect hereof concerns providing rails or runway beams to support our vertical platform system and allowed its movement between support legs or the like or at least for adjusting its position relative to a particular support leg. In particular,

we prefer that the rails or runway beams themselves, and as for other systems we have proposed previously, shall be traversable in couplings, preferably automatic couplings as in our copending application no. 8033682, relative to members of or affixed to the oil rig platform itself, i.e. between support legs.

It will be appreciated that vertical platform systems hereof can find application to servicing structures other than oil rigs, for example bridges and at least other structures having discrete vertical supports.

However, in relation to oil-rig platforms, we do foresee substantial advantages arising from the speed with which our scaffold systems can be retracted, probably in as little as one half-hour, especially as off-shore locations, such as the North Sea, are susceptible to notoriously fast-developing storm conditions.

Wind and/or wave tolerance is assisted by utilising a mesh or otherwise open-work or perforate individual platform decking.

Also, especial advantage is seen in the ability quickly to decouple our platform systems from support legs being serviced; move them away therefrom and

still, at that stage, have a structure of sufficient rigidity to be safe for personnel to climb up and leave; and finally retract from the top and otherwise unattended.

Specific implementation of the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

Figures 1 and 2 are overall side and end views of a particular platform system hereof.

Figures 3, 4 and 5 are side section, transverse section and part plan views of part of a platform system hereof generally similar to that of Figures 1 and 2; and

Figures 6A and 6B, 7A and 7B, and 8A and 8B show details at X, Y and Z of Figures 3, 4 and 5;

In Figures 1 and 2, I-section beams 10 are shown secured below or constituting structural components of a deck structure 11. Bottom flanges 12 of the beams 10 are engaged by rollers 13 of trolleys 14 capable of traversing movement along the beams 10. Twist-tolerant suspensions 15 from the trolleys 14 support further roller-trolleys 16 of generally C-shape with

rollers 17 under top flanges 18 of I-section rails or runway beams 19.

The rails or runway beams 19 can traverse through the roller-trolleys 16 and are shown as upper parts of a first platform 20 comprising side beams 21 having upper and lower rails 22, 23 and vertical and diagonal ties and braces 24, 25. Transverse ties 26, 27 and diagonal bracings 28 are provided at ends of the beams 21 and, as required or desired, at intermediate positions defined by verticals 24 of the side beams 21. Overall, the preferred platform construction 20 is light-weight and of an open work nature that is rigid but does not present high wind/wave resistance, especially when its framework is covered by a mesh or lattice type working surface or decking. Apart from the latter, the preferred platform construction is similar to that of our co-pending application no. 8032991.

The platform 20 has winches 29 for purposes that will become apparent.

Near each end of each side of the platform 20 are pivot joints 31 for upper ends of arms 32 capable of extending downwardly from the platform 20. The other, lower, ends of the arms 32 are pivotted at 33 to upper

ends of arms 34 whose other lower ends are pivotted at 35 to sides of a second platform 30.

The second platform 30 has side beams 31 and end/intermediate cross coupling 36, 37, 38 similar to the platform 20, and is shown as being of the construction of our aforementioned application no. 8032991 by way of saddle brackets 39.

The arms 32 and 34 are shown interconnected by a generally rectangular frame 40 along side members 41 of which the arm-to-arm pivots 33 are movable between maximum and minimum spacings corresponding to shallow and sharp acute angle V-relationships of the arms 32 and 34 in turn corresponding to extension and retraction of the second platform 30 below the first platform 20. Cross connections 42 of the side members 41 usefully define the maximum and minimum spacings of the arm pivots 33.

Further platforms 50 are shown successively below the second platform 30 and are of generally similar construction to the latter with generally similar suspensions by arms 52, 54 and frames 60.

It will be noted in Figures 1 and 2 that the platform system is shown part way between its fully raised or retracted and fully lowered or extended states.

Raising and lowering is achieved by the winches 29 and chains, ropes or wires 65 to anchorages 66 on the bottom platform. Lowering will occur progressively by gravity as the winches are unwound and catches 67 are operated. The catches 67 are of generally shallow S-type pivotted medially at 68 and cooperate with arms 34, 54 for disengagement purposes.

The interconnection arrangements 31 to 42 and 51 to 60 are twist-resistant by virtue of their overall frame-like structure, but it is preferred, see Figure 4 for the sets of arms 32, 34 and 52, 54 to be sides of individual frames cross tied together (37, 58) and braced diagonally (59).

Where appropriate in Figures 3, 4 and 5 and subsequent drawing figures, the same reference numerals are used for the same or similar parts.

Turning to Figures 3, 4 and 5, more detail is shown of three successive platforms 20, 30, 50. The platform side beams 21' are shown without diagonal braces at least in the interests of clarity for other features. However, couplings 71 are shown for a cross-bracing system of ties 72 at intervals between beams 21' in their verticals.

Those ties 72A-D are below the tops of the beams

21' and usefully serve to support spaced parallel members 73 spanning three such intermediate tird 72B-D to define supporting guides for rollers or wheels 74 on lower ends of ladders 75 pivotted 76 at their upper ends to the next of the ties 72A in the next upper platform. At the same level as the ties 72, edge supports are shown at 77, 78 for open mesh flooring, the upper rails of the beams 21' and end connections acting as a toe rail.

Betweens ends of the edge supports 77, 78 at corners of the platform, are the pivots for the frames of arms 32, 34, 52, 54, see Figure 6 for detail X of Figure 5. Those pivots are shown as sharing a common axis defined by a pin 80 through an edge-adjacent side beam vertical 81 and a support 82 for its otherwise free end. On the pin 80 are two journal bushes 83, 84 one for each arm and a spacer tube 85.

Preferred latches from platform to platform are shown only at the right hand side of Figure 3 (detail Y) and in Figure 7. There, a bracket 86 on the end vertical of the platform side beam carries pivotally at 87 a catch lever 88 counterweighted 89 at lower extension 90 to pivot its end hook 91 onto a catch pin 92 of the next lower platform. At its upper

end the catch lever has an adjustable projection 93 as afforded by a lock nutted bolt or the like that will be engaged by an upwardly extending arm (34 or 54) as the latter reaches its limit position for platform spacing. That will disengage the catch end hook 91 and allow the next lower platform to be extended. The counter-weight 89 may conveniently act as a stop limiting movement of the catch lever 89 by engagement with a downwardly extending arm (32, 52).

Details of mutual pivotting of arms 32, 34 or 52, 54 appear in Figures 8A and 8B where a side member of the frame 40' or 60' is shown at 101 as a channel section with its web slotted 102 to accommodate slidingly a pivot pin 103 captive by head parts 104 and a journal bush 104 for the upwardly extending arm 32, 52. The pivot pin 103 also carries a journal bush 105 for the lower arm 34, 54. Between the slotted web of side member 101 and the bush 104 is plate 106 of drop-over latch 107 pivoted at 108 to the side member 101. The latches 107 serve to lock the successive platforms hereof in their lowered or extended positions, but are readily releasable, preferably via short ladders 110 shown only at one side of Figure 3 for convenience.

CLAIMS

1. A raisable and lowerable vertical platform system comprising two or more platforms at different levels characterised by twist-resistant platform-to-platform connections.

2. A system as claimed in claim 1 characterised in that said connections comprise braced arms or frames pivotted together and to respective platforms to move from shallow-V (extended) to very narrow-V or adjacent (retracted) relative position viewed from a side.

3. A system as claimed in claim 2 characterised in that the connections include interconnecting rigid guide means for their mutual pivots.

4. A system as claimed in claim 1, 2 or 3 characterised by catches between platforms for retaining the system in its raised and retracted state or permitting sequential extension and lowering of the platforms.

5. A system as claimed in any one of claims 1 to 4 characterized in that platforms are lowered under gravity by release of chains, cables or ropes.

6. A system as claimed in any one of claims 1 to 5 characterized by means for securing thereof to stanchions or the like.

7. A system as claimed in claim 6 characterized in that said securing means comprises a caliper-like arm arrangement of arms hinged to a platform or to each other at that platform for selectively engaging about a stanchion or the like.

8. A system as claimed in claim 7 characterised in that said caliper-like arms are readily pinned together and unpinned quickly for raising of the platform with the arms folded backwards towards, against or within the platforms.

9. A system as claimed in any one of claims 1 to 8 characterized by one or more self-stowing ladders from platform to platform.

10. A system as claimed in claim 9 characterized in that the or each ladder is pivotted to an upper platform and constrained at a lower platform to be slidable in guides along the platform.

11. A system as claimed in any one of claims 1 to 10 characterized by rails or runway beams to support the system and allow lateral movement thereof.

12. A system as claimed in any one of claims 1 to 11 characterized in that the platforms have open-work or perforate decking.

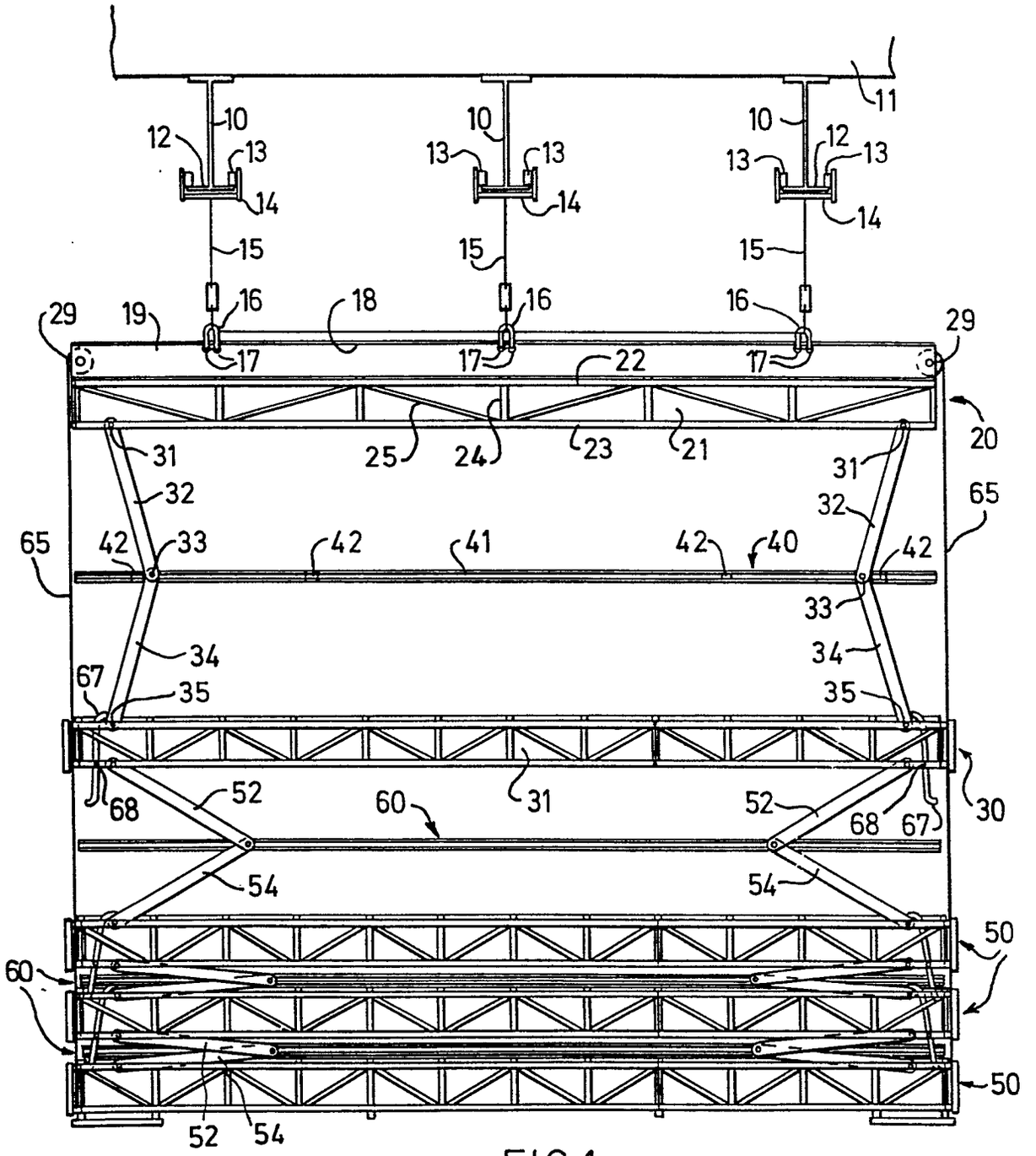
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FIG.1.

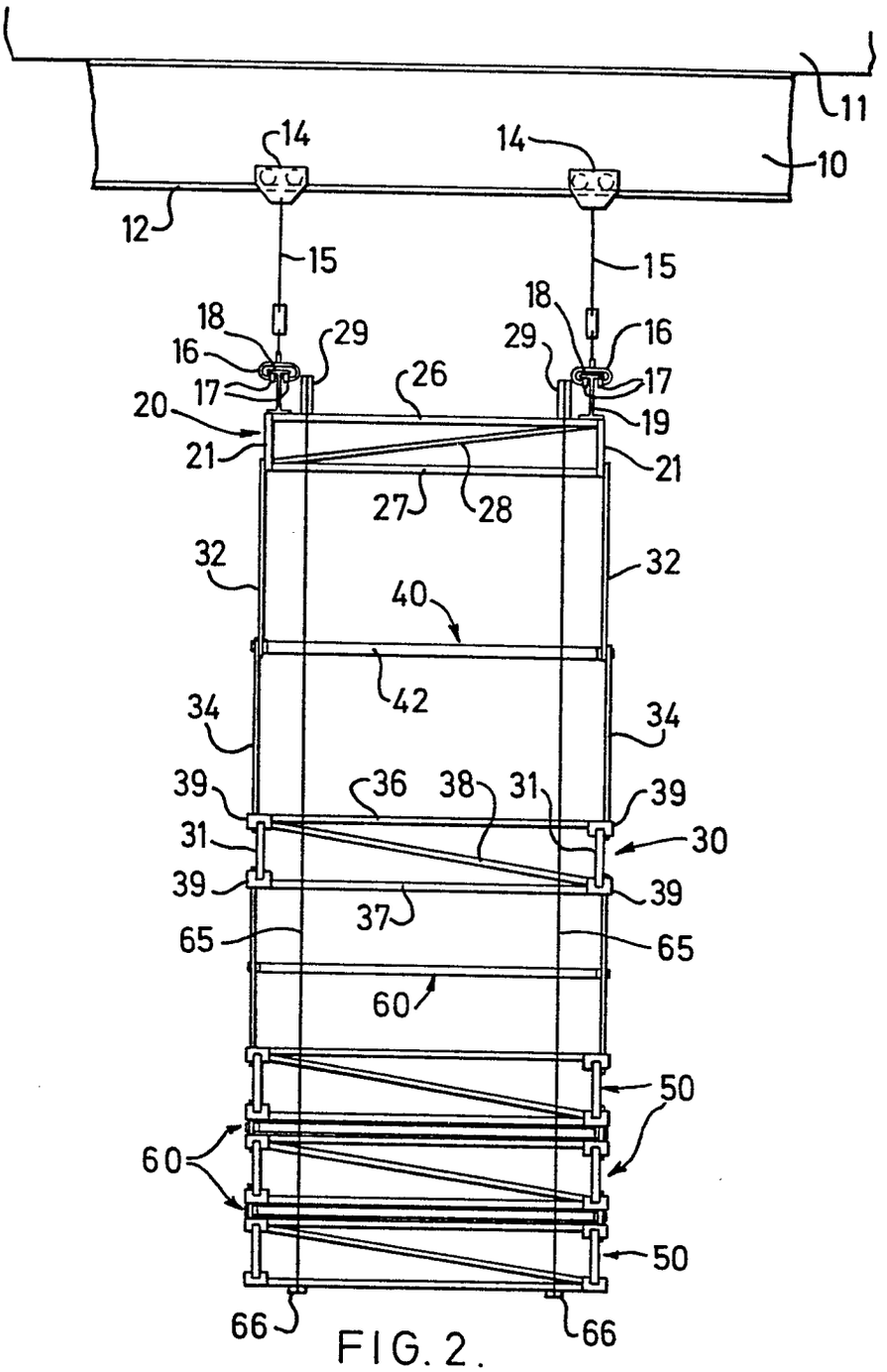
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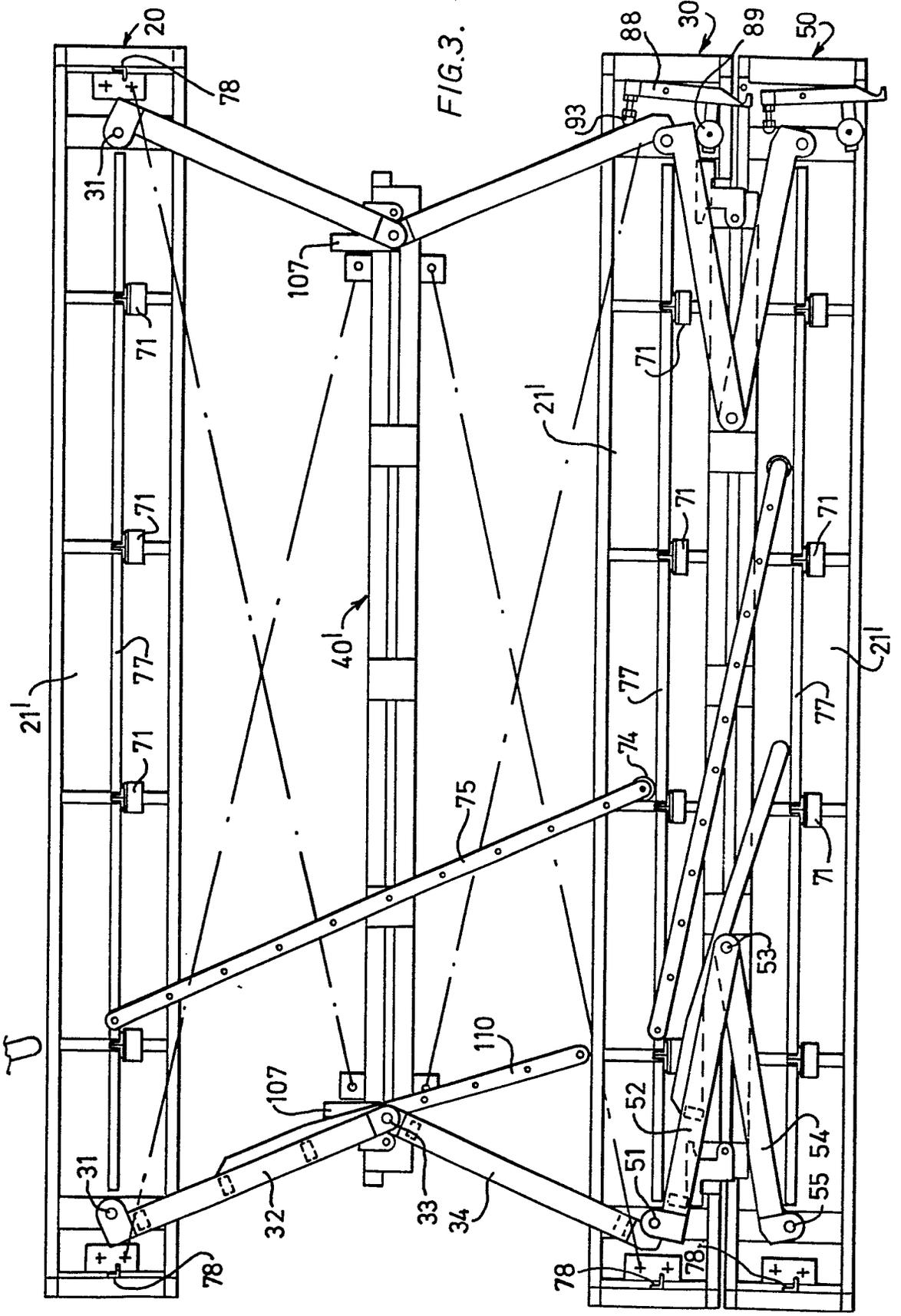
FIG. 2.

FIG.3.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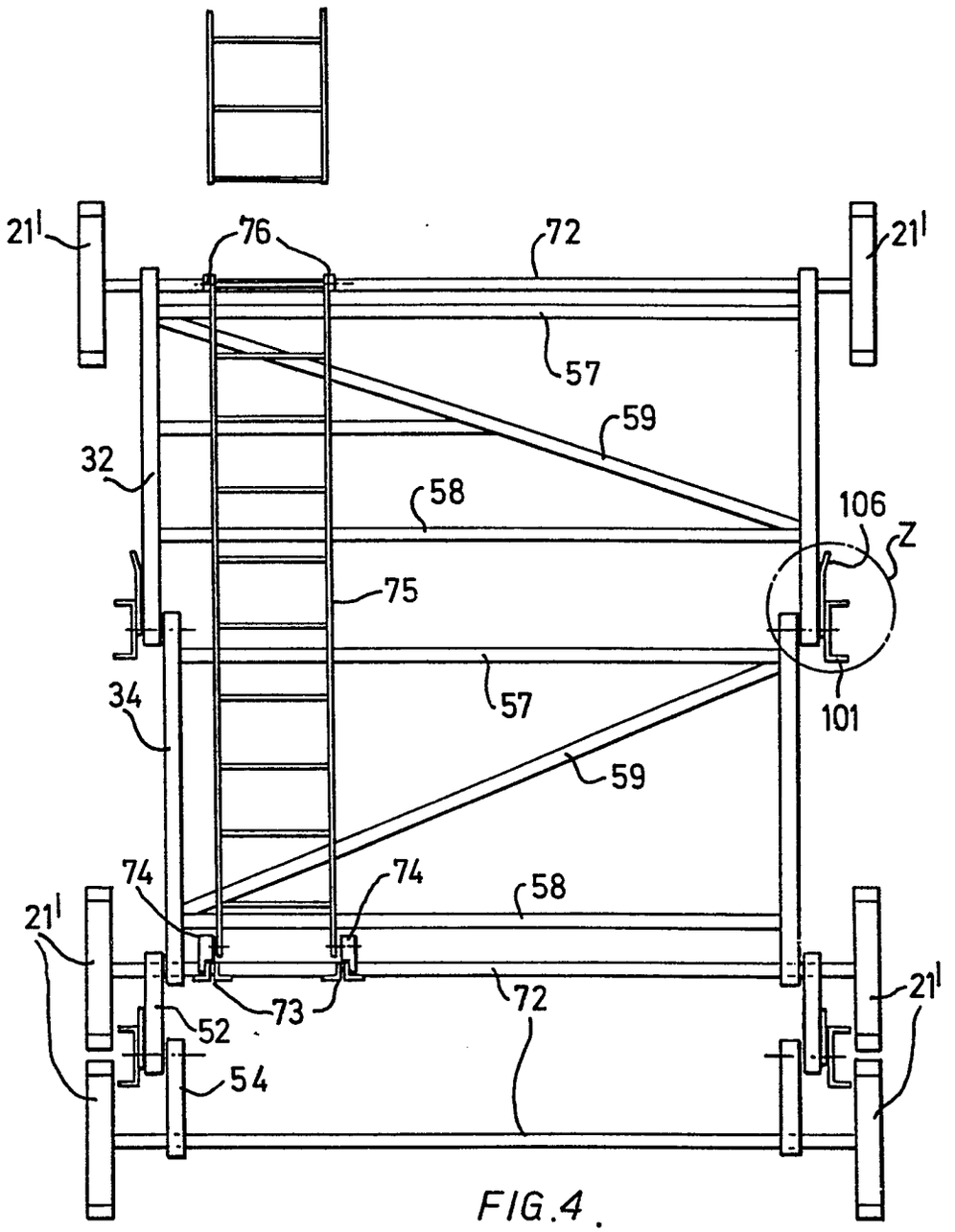

FIG.4.

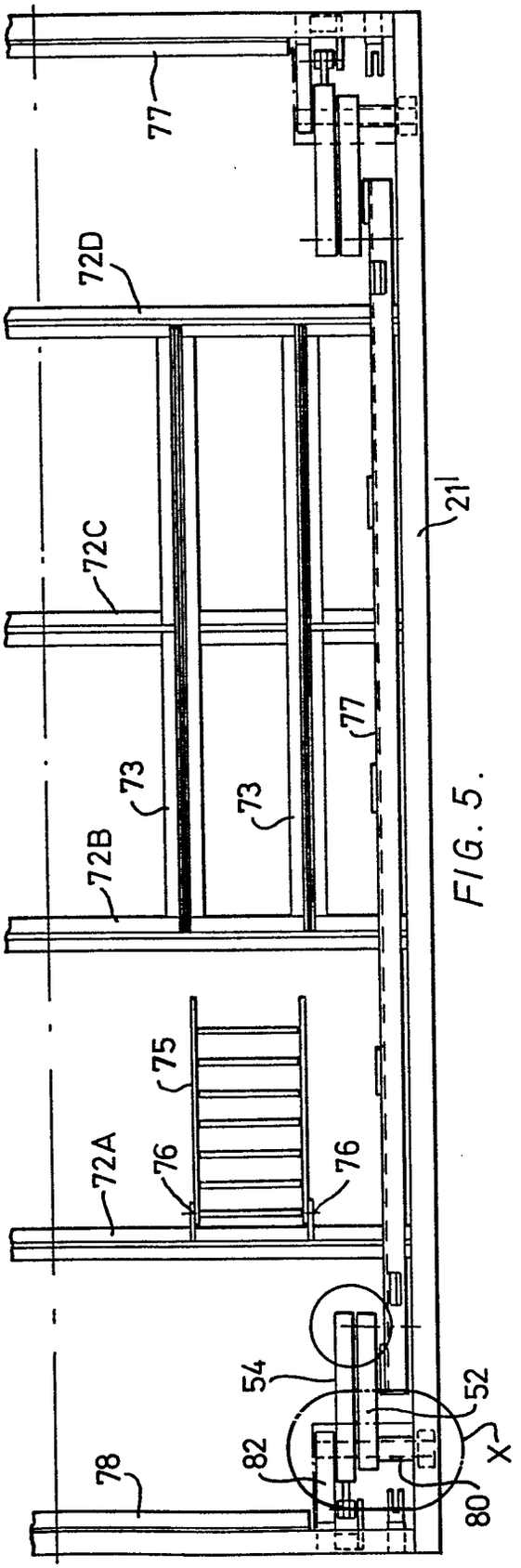

FIG. 5.

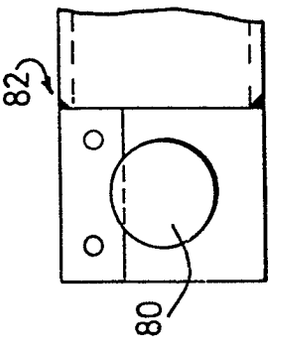

FIG.6B.

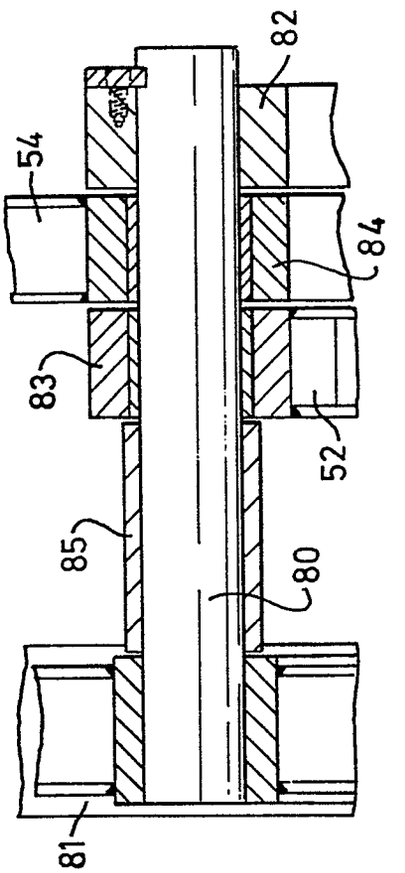

FIG.6A.

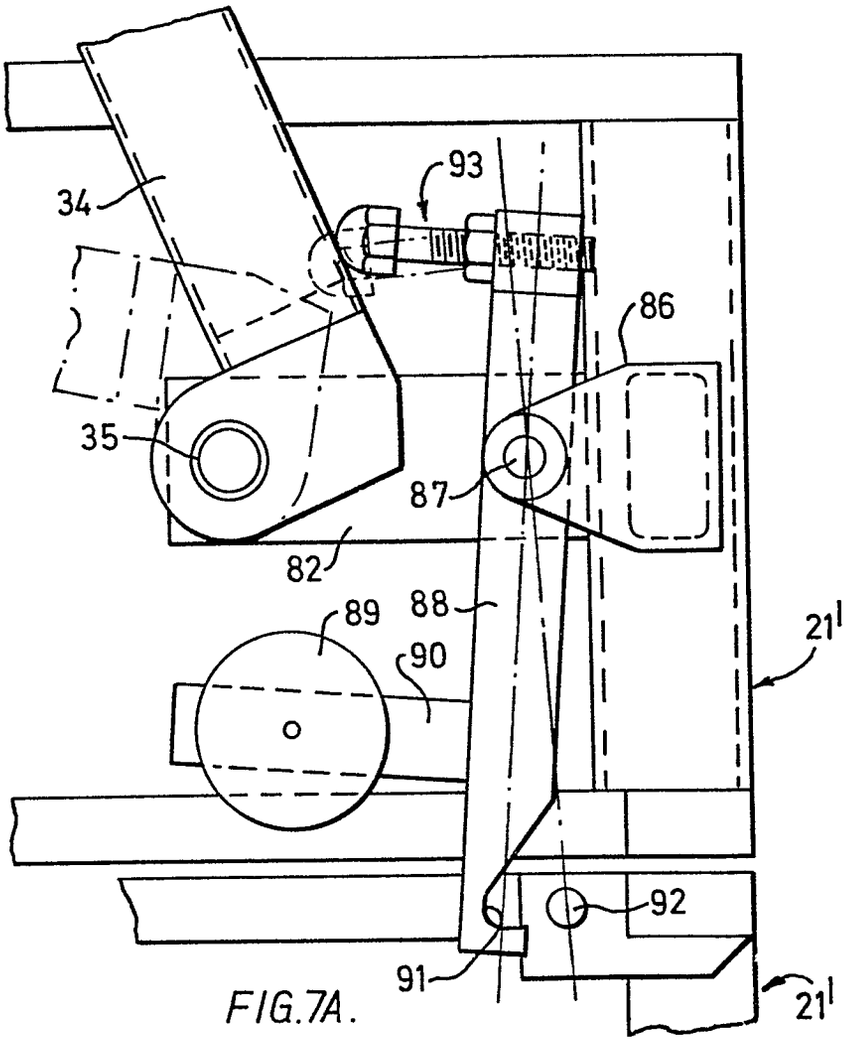

FIG.7A.

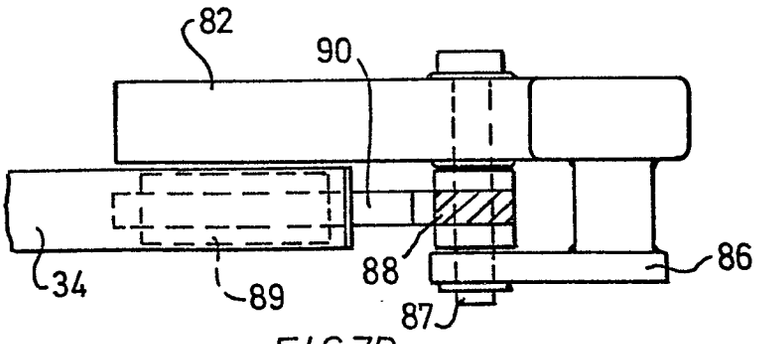

FIG.7B.

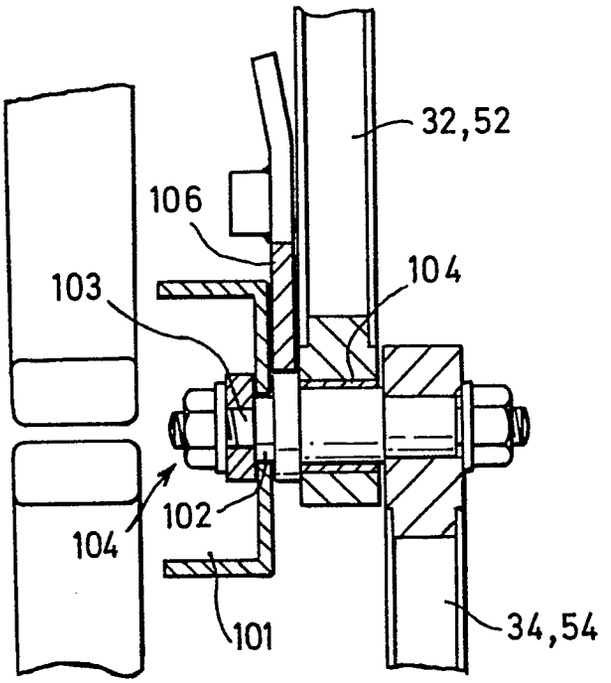

FIG.8A.

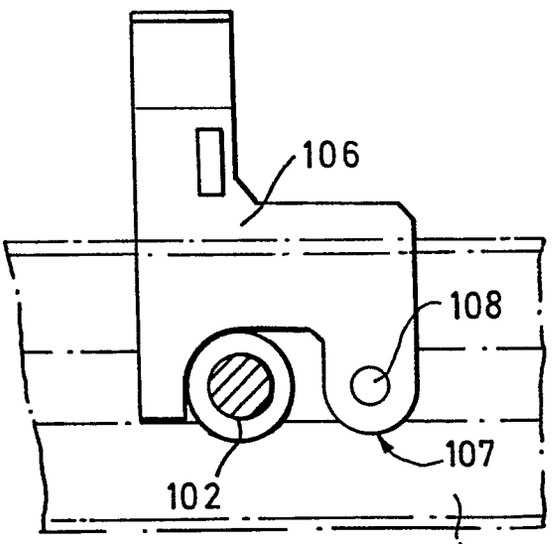

FIG.8B.

European Patent Office

EUROPEAN SEARCH REPORT

0079146
Application number

EP 82 30 5572.8

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	US - A - 3 951 232 (S. OKADA) * fig. 1, 2, 11 to 13, 17 * --	1,2,5, 9,10
X	US - A - 4 253 548 (G.L. BEECHE) * complete document * --	1,2,5
X	DE - U - 6 910 177 (MANNESMANN-LEICHTBAU GMBH) * claims 5, 6; page 4, paragraph 2; fig. 5 * --	1
A	GB - A - 2 009 830 (R.A.M. PETREN) * fig. 3 * --	12
A	GB - A - 2 022 533 (RIGGERS LTD.) * fig. 1 * --	11
D,A	GB - A - 2 066 870 (A. MONK & CO. LTD.) * complete document * ----	

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

E 04 G 3/10

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

B 66 F 7/00
E 02 D 21/00
E 04 G 3/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same category
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	16-12-1982	KRABEL

EPO Form 1503.1 06.78