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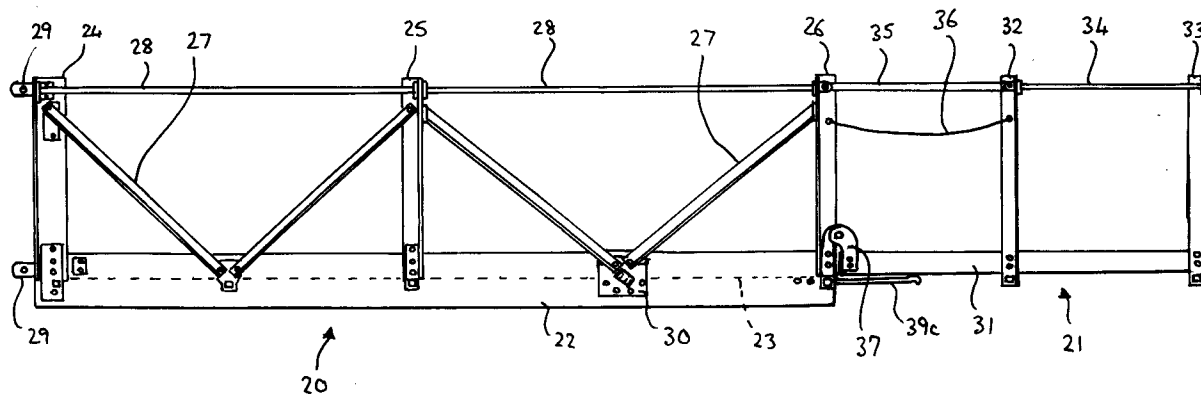
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(54) **Suspended platform.**

(57) A suspended platform, for example for use as an access/working platform in performing maintenance work on the attachment of conductors and insulators to an electricity transmission tower or pylon, comprises a main portion (20) and an extension portion (21) hingedly connected thereto so as to pivot to a closed position, which may be generally at right angles to the main portion or may involve pivoting the extension portion through an angle greater than

90° so that it lies substantially within the structure of the main portion. This latter configuration further diminishes the space taken up by the platform during hoisting to position and ensures that all parts of the platform are safely spaced from the conductors under all conditions, including under high winds which might tend to sway the platform towards the conductors.

**Fig 2****EP 0 547 792 A1**

Field of the Invention

This invention relates to a suspended platform, for example for use as an access/working platform in performing maintenance work on the attachment of conductors and insulators to an electricity transmission tower or pylon.

Background to the Invention

Typically, such platforms consist of a narrow elongated base provided with safety rails upstanding from each side, suspension points for connection of the cables to the lifting block to which the platform is suspended from the tower, and connections for stay cables by which the platform is manoeuvred and stabilised from the ground. To enable access to be gained to the conductors and insulators on both sides of the tower, it is desirable to maximise the length of the platform, and this is typically achieved by connecting together two or more shorter platforms. For some installations, an overall length of platform of eighteen metres is now required, and even longer platforms are being considered, since there is a requirement that, for safety, all work should be carried out from a secure platform providing safety rails all round, and not from, for example, a simple ladder projecting from such a platform.

It is a usual practice to disconnect the power from only those conductors on the side of the tower where the work is to be carried out, leaving the conductors on the opposite side of the tower live. Because of the very high voltages involved, for example 275 000 volts or even 40 0000 volts, a minimum distance must be maintained at all times between the platform and the closest live conductor. In the UK, this is at present 2.2 metres. In manoeuvring very long platforms, particularly on a tower at which the direction of the transmission line changes, that is to say where there is an obtuse angle between the cables on one side of the tower and those on the other side of the tower, when viewed in plan, there is a risk that the distance between the platform and a live conductor can be reduced below the safety minimum distance. This limits the length of platform which can be used in such circumstances and therefore limits ease of access in working.

It has been proposed to use telescopically extensible platforms, but the additional weight involved in creating a telescopic structure renders such platforms more difficult to hoist into position on the tower, while the telescoping action would be very difficult to operate when suspended at the working height. Typically it would involve more than one man to perform the operation, and would therefore increase the size of the crew needed,

increasing both the overall weight of the platform and the cost of the maintenance operation.

Summary of the Invention

The present invention overcomes these difficulties by providing a platform which has a hinged extension portion which can be hinged up to reduce the overall length of the platform when the extension length is not required.

Thus, one embodiment of the invention provides a suspended platform, comprising a main portion and an extension portion hingedly connected thereto so as to pivot to a closed position, which may be generally at right angles to the main portion or may involve pivoting the extension portion through an angle greater than 90° so that it lies substantially within the structure of the main portion. This latter configuration further diminishes the space taken up by the platform during hoisting to position and ensures that all parts of the platform are safely spaced from the conductors under all conditions, including under high winds which might tend to sway the platform towards the conductors.

Preferably, spring means are provided between the portions to apply a force to the extension portion to assist pivoting of the portion towards the closed position. The spring means may comprise a spring assister in the form of a coil spring having opposed arms extending generally perpendicular to the longitudinal axis of the spring and rotatable around the axis of the spring to apply tension thereto, one arm slidably engaging the underside of the extension portion, and the other arm being held within the main portion.

The platform will preferably have safety rails therealong mounted on vertical supports, and preferably at least a portion of the safety rail of the extension portion is detachably connected to the main portion and pivotally connected to the extension portion whereby, when the rails are detached from the main portion, pulling on the rails causes pivoting of the extension portion relative to the main portion.

Preferably the construction of the platform is generally of the type formed with an aluminium channel section base with a floor member secured to the side walls of the channel. Preferably the extension section is formed of a shallower channel member without the additional floor member, the base of the channel being aligned with the floor of the main section in use. This provides a lighter construction for the extension section, minimising overall weight and rendering the hinging action of the extension section easier. The main body of the spring assister may then be mounted within the channel member of the main section, but beneath the floor member, with its free arm engaging the

underside of the channel member of the extension section. The force of the spring will be selected such that the initial lifting force to commence the hinging action of the extension section is minimised, but the spring is not sufficiently powerful to overcome the weight of the extension section on its own.

Typically, a complete eighteen metre platform will thus consist of a conventional six metre platform at its centre, with a platform in accordance with the present invention attached at each end. Each platform in accordance with the invention will conveniently consist of a four metre main section and a two metre extension section. It is envisaged that in certain circumstances the overall length of the platform may be greater than eighteen metres.

While the platform has been described with reference to its use on electricity distribution towers, it will be appreciated that many other applications for such platforms exist. For example maintenance work on bridges and other high structures may require a continuous working surface of extended length where the ability temporarily to reduce the overall length, for example during lifting or manoeuvring into position, may be useful. The platform of the invention is such that lowering and raising the extension portion may be carried out by one person when the platform is in its operative position. The reduction in weight as compared with telescopically extending systems permits its use by a smaller number of people, thus reducing costs.

Brief Description of the Drawings

Reference is made to the drawings, in which:
 Figure 1 is diagrammatic plan view of a conventional platform suspended from an electricity transmission tower;
 Figure 2 is a side elevation of a platform in accordance with a preferred embodiment to the invention;
 Figure 3 is an enlarged, partially sectioned view of the hinge portion of the platform shown in Figure 2; and
 Figures 4, 5 and 6 are diagrammatic side views of a platform according to another embodiment of the invention, showing successive stages between the open and closed positions.

Detailed Description of the Drawings

Referring first to Figure 1, the transmission tower 1 is provided with at least one cross arm 2 carrying adjacent to each end insulators 3 from which the conductors 4 are suspended. A platform 5 is also suspended from the cross arm 2, and the conductor 4a on the same side of the tower as the platform 5 is disconnected from the electricity sup-

ply. However, it is usual practice to leave the other conductor 4b live, to minimise the interference to the electricity supply system, and it will be seen that, at one end thereof, the platform 5 approaches the live conductor 4b, the tower being, in this instance at a point in the transmission line where the direction is changed. It is important that the distance between the platform 5 and the live conductor 4b should at all times be above the minimum safety distance of 2.2 metres. As can be seen from Figure 1, even if the closest distance is outside the safety margin, any rotational movement of the platform 5 might cause the safety margin to be entered. While the use of a shorter platform would avoid this problem, this would not provide an adequate access length for the platform, making some maintenance tasks difficult.

As the tower is depicted in Figure 1, the platform is arranged for access to the transmission line 4a to the left of the tower. To permit access to the line at the right of the tower, the platform will need to be rotated clockwise, thus bringing its left hand end closer to the left hand live transmission line 4b. The eighteen metre length platform (for example) shown in Figure 1 is formed of three six metre sections, a centre platform 5a and two end platforms 5b.

One end platform suitable for use in the configuration shown in Figure 1, but in accordance with the invention, is shown in Figure 2. The platform consists of a main section 20 and an extension section 21.

The main section is constructed with a channel section base 22 in which a floor, whose position is illustrated by dotted line 23, is secured. Uprights 24, 25 and 26 are bolted to the base section 22 with diagonal bracing struts 27 therebetween, and with horizontal safety rails 28 fixed between them adjacent the uppermost ends. The upright 24 carries projecting members 29 to permit connection to the central platform (for example 5a in Figure 1). Anchorage point 30 are provided for the supporting cable from the lifting block from which the platform is suspended from the cross arm of the tower, and each consists of a plate to which is welded a cast eye through which the respective cable can pass.

The extension section 21 has a base portion 31 consisting of a channel formed from sheet aluminium to which pairs of uprights 32 and 33 are bolted. A fixed safety rail 34 extends between the uprights 32 and 33 on each side and an end rail (not shown) extends between the uprights 33. A second pair of safety rails 35 extend between the uprights 32 of the extension section 21 and the end upright 26 of the main section 20. Each safety rail 35 is pivotally mounted to the upright 32 and is detachably connected to the uprights 26 by means of a pin and retaining clip passing through aligned

eyes. A safety wire bond 36 extends permanently between the upright 26 and the upright 32 on each side of the platform.

The channel section 31 is connected to the channel section 22 through a hinge 37 on each side of the platform. As may be seen from Figure 3, each hinge provides a pivot point 38 above the level of the channel members 22 and 31 to provide for their slight separation in the hinging action.

A spring assister 39 is mounted by bolts beneath the floor 23. The spring assister consists of a coil spring 39a with arms 39b and 39c extending from each end of the spring perpendicularly to the axis thereof. One arm 39b engages the underside of the floor 23 while the other arm 39c engages the underside of the channel member 31. The arms are rotated in opposite directions around the axis of the spring 39a to place them under tension before installation. Thus, the arm 39c applies an upward force to the extension section 21 sufficient substantially to counterbalance its weight.

To raise the extension portion 21 to its closed position, the pins securing the pivotable rails 35 to the upright 26 are removed and the ends of the rails 35 are then lifted clear of the upright 26. Pulling on the rails 35 simultaneously exerts a rotational moment on the extension section 21 causing it to rotate upwardly around the pivot point 38 of the hinge 37 with the assistance of the spring arm 39c. The extension portion may be secured in a position in which its base channel 31 extends substantially perpendicularly to the floor 23 of the main section.

Thus, referring to Figure 1, the platform 5b closest to the live conductor 4b can be reduced in length, in accordance with the invention, by about one third whilst still permitting the full access length to be afforded by the platform on the left hand side of the tower adjacent to the conductor being worked upon. Before the platform is swung into position to permit the right hand side of the conductor to be worked upon, the opposite extension section is raised as hereinbefore described, so as to ensure adequate clearance from the live conductor. After the rotation, the right hand end extension section can then be lowered in the reverse of the operation hereinbefore described, to extend the working length, while retaining an all round safety rail and an adequately supported working floor.

When the extension section 21 is raised to its closed position, the end of the main section can be closed off above the floor to prevent, for example, tools from sliding along the floor and out of the end of the platform main section, by inserting a closing plate 40 into opposed slots formed in the sides of the channel by blocks 41 attached thereto.

It will be appreciated that the combined platform consisting of three shorter platforms (for example 5a and 5b in Figure 1), may more readily be hoisted into position on the transmission tower with both extension sections in their closed positions, particularly since in the final manoeuvring of the platform into its working position, there is a risk that the clearance from the live conductors may be momentarily reduced below the safety margin for a very long platform. The construction of the extension portions is such that the weight of the platform can be kept to a minimum, which also gives advantages in hoisting and manoeuvring. The reduction in weight is achieved without any reduction in the load carrying capacity of the platform.

Referring to Figures 4, 5 and 6, the main section 20 of the platform is essentially the same as that illustrated in Figure 2. The extension section 50 consists, as in the embodiment of Figure 2, of a simple channel of, for example, aluminium, hinged to the main section 20. However, the channel is slightly narrower than the main section so as to be able to fit within its side walls. The hinges 51 linking the two sections together are located within the channel to facilitate this.

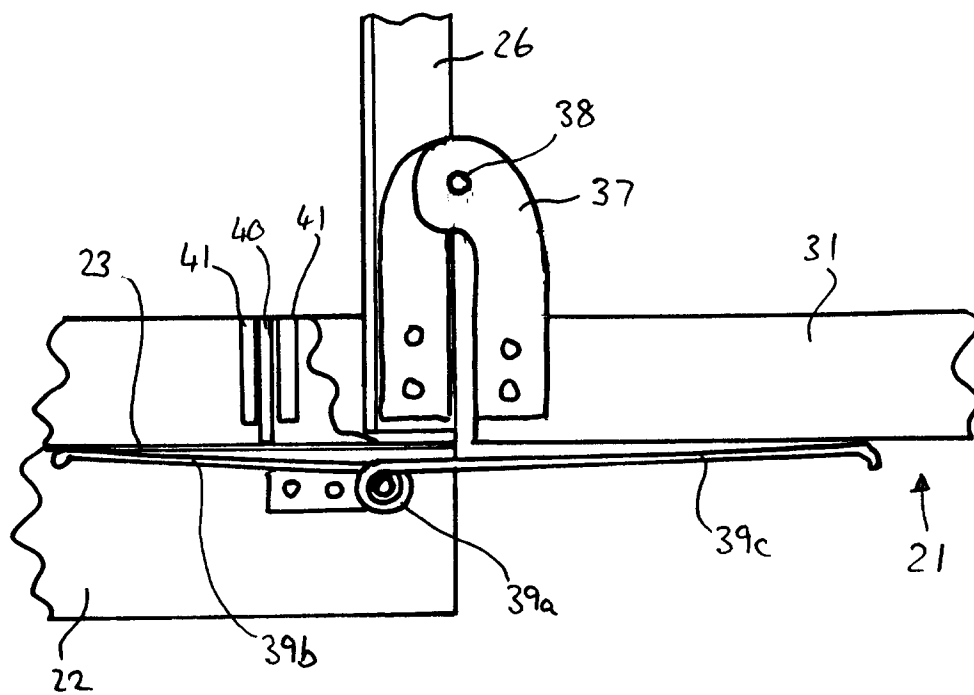
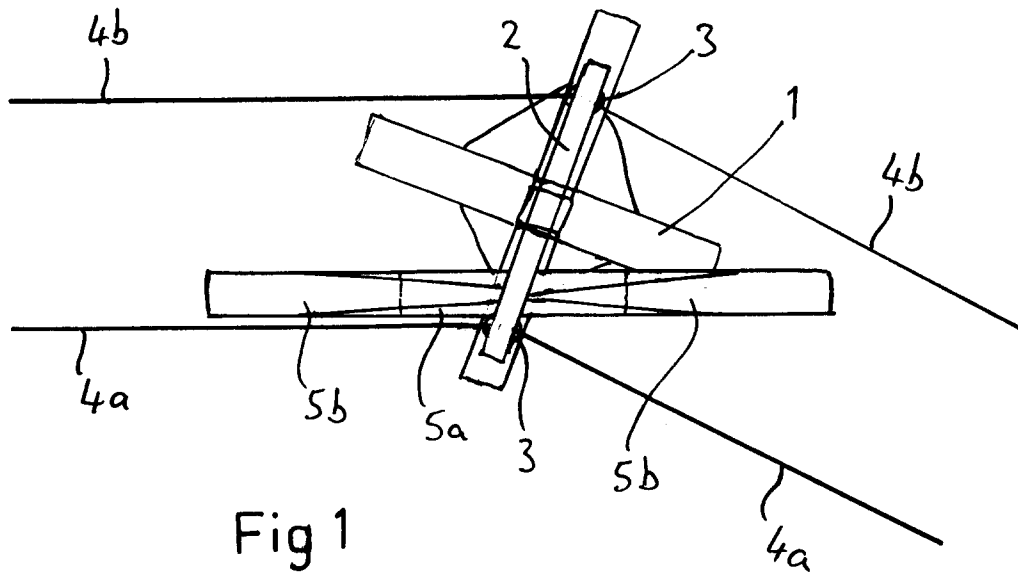
At the free end of the extension section 50 are fixed a pair of uprights 52 which may be joined across the end of the section by a safety rail. Side rails 53 are hinged to the tops of the uprights and each is provided with an eye at its free end permitting it to be attached by a pin to lugs extending from the end of the main section 20. Each side rail also has a handle 54 to facilitate pulling of the rails to raise the extension section as hereinbefore described with reference to Figure 2. A spring assister is also provided, as with the embodiment shown in Figure 2.

Figure 4 shows the extension section 50 in its operative position, Figure 5 shows the side rails 53 disengaged from the main section and being pulled to raise the extension section with the help of the spring assister, and Figure 6 shows the extension section 50 in its closed or inoperative position, with the upper parts of the uprights 52 resting on the floor of the main section 20 and the channel of the extension section 50 inverted over a portion of the floor. The side rails 53 extend along the sides of the floor of the main section away from the extension portion, and thus do not interfere with the continued use of that part of the platform. The side rails may be temporarily secured in this position to prevent their swinging free during vertical manoeuvring of the platform.

The configuration of the platform shown in Figures 4, 5 and 6 ensures that it occupies the smallest possible volume when the full extended length is not being used.

Claims

1. A suspended platform comprising a narrow elongate base (22) provided with suspension points (30) for connection of cables by which the platform is suspended in use, characterised in that the base comprises a main portion (20) and an extension portion (21) hingedly connected thereto so as to be pivotable to a closed position. 5 10
2. A suspended platform according to Claim 1, wherein the extension portion is pivotable to a position generally at right angles to the main portion. 15
3. A suspended platform according to Claim 1, wherein the extension portion is pivotable through an angle greater than 90° so that it lies substantially within the structure of the main portion. 20
4. A suspended platform according to Claim 1, 2 or 3, wherein spring means (39) are provided between the portions to apply a force to the extension portion to assist pivoting of the portion towards the closed position. 25
5. A suspended platform according to Claim 4, wherein the spring means comprise a spring assister (39) in the form of a coil spring (39a) having opposed arms (39b and 39c) extending generally perpendicular to the longitudinal axis of the spring and rotatable around the axis of the spring to apply tension thereto, one arm (39c) slidably engaging the underside of the extension portion, and the other arm (39b) being held within the main portion. 30 35
6. A suspended platform according to any preceding claim, comprising safety rails (28) therealong mounted on vertical supports (24, 25 and 26). 40
7. A suspended platform according to Claim 6, wherein at least a portion (35) of the safety rail of the extension portion is detachably connected to the main portion and pivotally connected to the extension portion whereby, when the rails are detached from the main portion, pulling on the rails (35) causes pivoting of the extension portion relative to the main portion. 45 50
8. A suspended platform according to any preceding claim, wherein the platform is formed with an aluminium channel section base (22) with a floor member (23) secured to the side walls of the channel. 55
9. A suspended platform according to Claim 8, wherein the extension section is formed of a shallower channel member (31) without the additional floor member, the base of the channel being aligned with the floor of the main section in use.



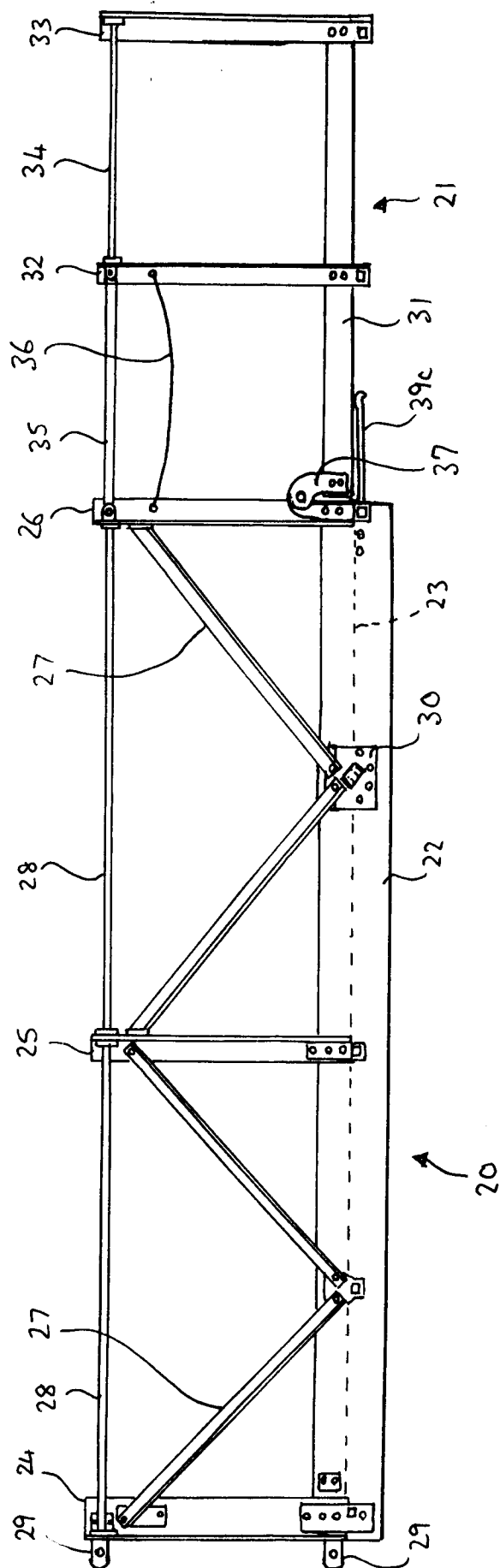


Fig 2

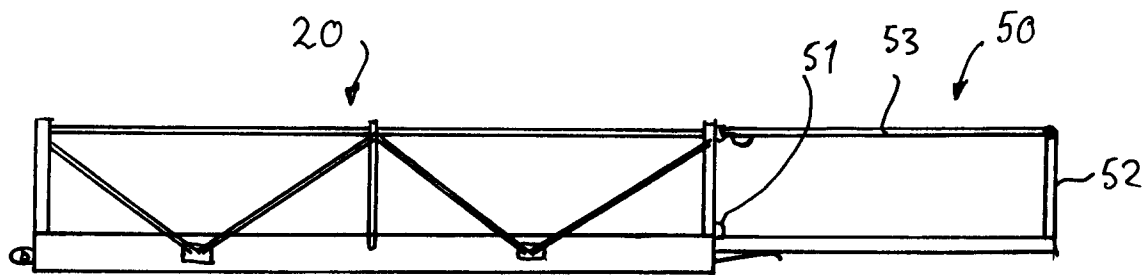


Fig 4

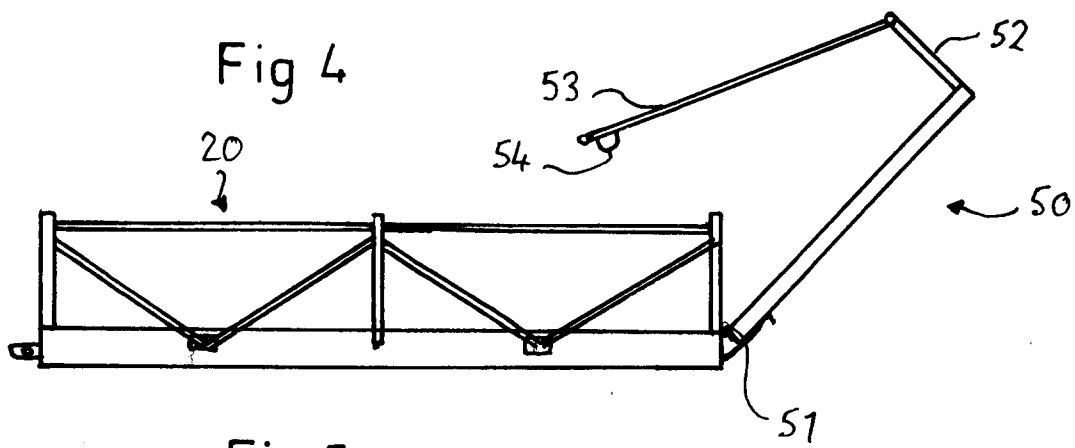


Fig 5

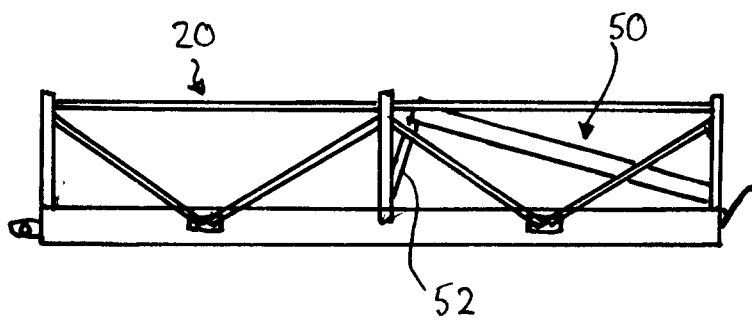


Fig 6



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EUROPEAN SEARCH REPORT

Application Number

EP 92 31 0837

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-3 907 066 (NEWTON) * column 2, line 43 - column 6, line 6; claims; figures * ---	1,2,6	E04G3/00
X	US-A-2 916 102 (REINHARDT) * column 2, line 26 - column 6; figures * ---	1,3,6	
A	US-A-4 620 612 (ENOKI) * claims; figures * ---	8,9	
A	GB-A-1 123 841 (FOSTER WHEELER LTD.) ---		
A	DE-A-3 920 806 (DICKERTMANN AG) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E04G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 09 MARCH 1993	Examiner VIJVERMAN W.C.
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 I : document cited for other reasons & : member of the same patent family, corresponding document	