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(54) **Mobile mast and telecommunications apparatus**

(57) A mobile mast (2) supported on a base (1) and capable of being raised from a stowed position lying substantially horizontal relative to the base (1) to an erected position. At least two outriggers (3,4) are attached to the base (1) at spaced positions which have guy ropes (8) of the mast (2) attached thereto and are movable between a stowed position lying substantially lengthways of the stowed mast (2) and an in-use position where the outriggers (3,4) extend outwards from the base (1), substantially radially of the erected mast (2), and outer ends thereof remote from the base (1) are able to contact the ground around the base (1) to support the erected mast (2) by the guy ropes (8). Each outrigger (3,4) comprises a leg (20) articulately connected at an inner end to the base (1) or to the mast (2), and a strut (21) articulately connected at an inner end to the base (1) at a distance below the inner end of the leg (20). Each strut (21) is adjustable in length such that shortening it urges a leg (20) downwards relative to the base (1) to force the outer end into contact with the ground.

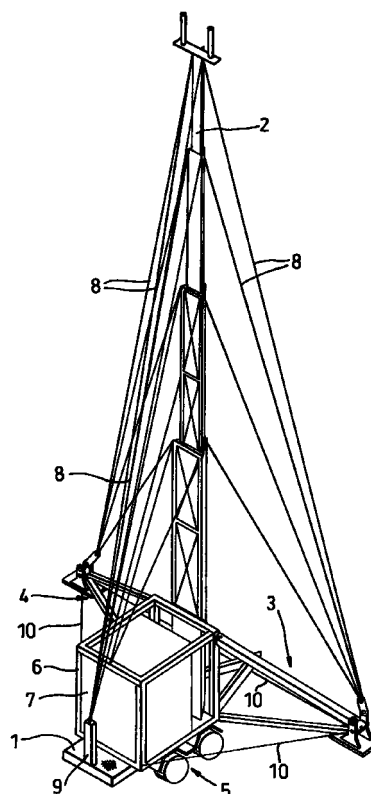


Fig. 1

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Description

[0001] This invention relates to a mobile mast and telecommunications apparatus incorporating such a mast.

[0002] For various telecommunication applications, for example mobile phones, antenna and/or dishes for sending/receiving signals are usually provided on masts. Fixed masts are well known and mobile masts are also known which can be moved between operating sites. There are increasing needs for mobile masts for telecommunications to be set up readily, perhaps only temporarily, at sites where a fixed mast may be difficult to establish or may be unnecessary.

[0003] It is desirable that a mast, whether fixed or mobile, is securely held erect by its guy ropes. This has been difficult to achieve with a mobile mast, particularly the taller it is, unless the guy ropes are firmly anchored to the ground, for example to concrete blocks.

[0004] The present invention seeks to facilitate the support of an erected mobile mast, and also to provide telecommunications apparatus having a mast the support of which when erected is facilitated.

[0005] According to the present invention a mobile mast is provided supported on a base and capable of being raised from a stowed position lying substantially horizontal relative to the base to an erected position, there being at least two outriggers attached to the base at spaced positions which have guy ropes of the mast attached thereto and are movable between a stowed position lying substantially lengthways of the stowed mast and an in-use position where the outriggers extend outwards from the base, substantially radially of the erected mast, and outer ends thereof remote from the base are able to contact the ground around the base to support the erected mast by the guy ropes, each outrigger comprising a leg articulately connected at an inner end to the base or to the mast, and a strut articulately connected at an inner end to the base at a distance below the inner end of the leg, and being adjustable in length such that by shortening it urges the leg downwards relative to the base to force the outer end into contact with the ground.

[0006] The base, mast or outriggers are not attached to the ground, and the mast can therefore be readily moved from place to place. This is particularly so if the base is, or is mounted on, a carriage, such as a trailer.

[0007] The guy ropes may be tensioned once the outriggers are in the in-use position. The guy ropes may be tensioned to some extent by the downwards urging of the legs of the outriggers at the in-use position.

[0008] The base may comprise or be provided with a frame to which the mast and outriggers are attached. The outriggers may be hingedly connected to the base, the frame or the mast.

[0009] As the guy ropes are attached to the outriggers and not to the ground the mobile mast can be read-

ily moved between different sites of use. The outriggers may be connected to each other e.g. by tension ropes or chains, or rigid stays which may be braced to the frame.

[0010] There may be just two of the outriggers at opposite sides of the base each having one or more guy rope attached to it. At least one further guy rope may be attached to a portion or portions of, or part or parts fixed to, or relative to, the base. There may be more than two of the outriggers. More than one guy rope may be attached to each outrigger and the mast.

[0011] Similarly more than one guy rope may be attached to the or each above-mentioned portion of, or part fixed to, or relative to, the base.

[0012] To move an outrigger into its in-use position, it is preferably first rotated to extend outwards from the base above ground level substantially radially of the mast, and then moved downwards by shortening of the strut so as to lower the outer end of the outrigger into ground engagement. Preferably the strut is arranged to operate to be shortened by application of a downwards force on the outer end of the outrigger.

[0013] The strut of each outrigger may be provided with support means which holds the outrigger above ground level. Preferably the support means holds the outrigger just above ground level, such that only a relatively small downwards force is required to lower the outrigger. The support means may comprise, for example, a gas strut or struts, or a winch or a compressed air/hydraulic power assisted device.

[0014] The strut of each outrigger may be telescopic to allow its length to be adjusted. The relative positions of telescopic sections of each outrigger may be maintained by holding means such as a pin. The holding means is preferably in place as the outrigger is rotated radially outwardly of the base, and then removed to allow the outrigger to be lowered. An upwards force may be applied to the outrigger to allow removal of the pin. When the outrigger is in its in-use position the holding means may be replaced to hold the sections of the strut in their new relative positions.

[0015] The or each portion of, or part fixed to, or relative to, the base to which the or each further guy rope is attached may be adjustable to vary the distance from the mast of the anchorage of the guy rope. The portion or part may be of variable length, for example by being telescopic, to enable the adjustment to be made.

[0016] The strut of each outrigger may be provided with a turnbuckle for use in shortening, and increasing, the length of the strut. The turnbuckle may be provided with locking means, e.g. a lock nut, to retain it in a desired position. In a preferred embodiment the strut includes a gas strut which allows variation of the length of the strut independently of the turnbuckle. The holding means referred to above may hold the gas strut solid when it is not required for variation of the length of the strut. When the holding means is released the gas strut takes the weight of the outrigger and it allows the length of the strut to be varied - shortened as the outrigger is

moved from the stowed to the in-use position and increased as the outrigger is moved from the latter position to the stowed position. By virtue of the provision of the gas strut the variation in the length of the strut between the positions is readily effected by one person manipulating the outrigger. The holding means is applied to fix the gas strut when the outrigger is in either position. The turnbuckle may then be operated to adjust the length of the strut to set the outrigger as required in either position.

[0017] A foot may be provided at the end of the leg of each outrigger, which foot contacts the ground when the outrigger is in the in-use position. The foot may be made suitable for digging into the ground, if desirable, and may be adjustable relative to the leg.

[0018] The length of the leg of each outrigger may also be adjustable, e.g. by being telescopic. Thus the lengths of the outriggers may be adjusted depending on, for example, the height of the mast, loading of the mast head, loading of the mast by wind conditions, and the space available around the mast.

[0019] Each outrigger may alternatively be moved into its in-use position by telescopically extending the leg and strut thereof.

[0020] The mast may be telescopic. It may be provided with an antenna and/or a microwave dish or such like.

[0021] The mast now provided may have various applications of use. It has particular, though not exclusive, application to telecommunications. It may be provided in combination with telecommunications apparatus. Such apparatus may comprise an equipment enclosure housing, for example, telecommunications equipment and an electrical power generator. The mast and telecommunications apparatus may conveniently be provided as a unit on a trailer.

[0022] An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic view of a telecommunications unit including a mobile mast in accordance with the present invention;

Figure 2 is a side view of an outrigger of the mast shown in position above ground level, and

Figure 3 is a side view of the outrigger of Figure 2, shown lowered closer to the ground.

[0023] Figure 1 shows a telecommunications unit comprising base 1, a mast 2, a first outrigger 3 and a second outrigger 4. The base is mounted on a trailer 5. The mast 2 is supported on a front end of the base 1, and is telescopic and can be extended and retracted as required relative to the base. The base has a frame 6 fixed on it. The outriggers 3, 4 are attached to the frame 6 and arranged to extend to opposite sides of the base

when the unit is set up for use, as shown in Figure 1. The mast can be moved relative to the base between a stowed, out of use position in which it extends horizontally on top of the frame 6, lengthways of the base, and an erected position as shown in Figure 1. It is moved between the two positions by a winch, not shown. An equipment enclosure 7 is located within the frame 6. Guy ropes 8 are attached between the mast 2 and the outriggers 3, 4, and between the mast and an attachment pole 9 secured to the base. Tension ropes 10 are connected between the outer ends of the two outriggers, and between the outriggers and the frame 6.

[0024] Each outrigger 3, 4 comprises a leg 20 and a strut 21 (Figures 2 and 3). Each leg 20 and strut 21 is attached at an inner end thereof to the frame 6 by hinges 22, the strut being positioned below the leg with its inner end spaced below that of the leg. The leg and strut of each outrigger are connected together at their outer ends by a hinge (not shown). There is thus a triangular structure formed at each outrigger by the leg, strut and frame. A foot 23 is adjustably attached to the outer end of the leg 20 of each outrigger. The leg comprises a hollow steel section 24. The strut 21 comprises a first hollow section 25 and a second hollow section 26. The second section 26 slides in the first section 25, allowing the length of the second leg to be adjusted. A gas strut 27 is contained within the first section 25 and is connected to the second section 26. The gas strut 27 operates to allow variation of, and to maintain, the relative longitudinal positions of the first and second sections. It enables the outrigger to be readily held in a raised position above ground level, as shown in Figure 2. A pin 28 is inserted through a transverse hole in the first section and a registering one of a row of transverse holes in the second section. This fixes the relative positions of the sections when inserted in the registering holes and also holds the gas strut solid. A turnbuckle 29 is included in the strut 21 between the second section 26 and the hinge 22. The turnbuckle is used to adjust the length of the strut, and to tension the strut to provide downward force to resist the upward force from the guy ropes.

[0025] The attachment pole 9 may be adjustably positioned on the base, or have a relatively movable part, for varying the position of anchorage of the guy ropes attached thereto away from the mast. It may, as a further option, take the form of a rear telescopic outrigger extending outwards from the rear of the base 1. This rear outrigger may be of a similar form to the first and second, side, outriggers 3, 4 described, having outwardly swinging top and bottom components similar to the leg and strut of each of those side outriggers and a tensioning device such as a gas strut, as in the side outriggers. There may be two of the rear outriggers if the expected loads on the erected mast require additional stability of the unit against overturning.

[0026] When the telecommunications unit is in transit, the mast 2 is fully retracted and placed in the stowed position. Each outrigger is also placed in a stowed posi-

tion where it lies adjacent a side of the frame, lengthways of the stowed mast. When the unit reaches a desired location, each outrigger is swung by an operator outwards of the base into the position shown in Figures 1 and 2, and the pin 28 removed from the strut of each outrigger. The outriggers are then held above ground level by the gas struts alone. To lower the outriggers a downwards force is applied to their outer ends by the operator to bring the feet 23 into contact with the ground. During this operation the second section 26 of the strut 21 of each outrigger is telescoped into the first section 25 thereof, and the struts are thereby shortened, which urges the leg downwards relative to the base. When the feet contact the ground the pins 28 are inserted back through the holes in the first sections of the outriggers and the registering holes in the second sections. The operator then sets the turnbuckles 29 to adjust the lengths of the struts as necessary to force the feet firmly onto the ground. They may dig into the ground.

[0027] If necessary load spreading devices, for example metal plates, concrete slabs or timber members, may be positioned under the feet of the outriggers. This may be required, for example, when there are soft ground conditions or there is undulating or rough ground which otherwise presents difficulties in adjusting the heights of the outriggers and feet to cope with the varying heights of the ground.

[0028] Once the outriggers are securely in place, tension ropes 10 are secured between the two outriggers and between the outriggers and the frame 6. The mast 2 is then raised by the winch and the guy ropes 8 are tensioned so that the mast is securely held erected.

[0029] The procedure is reversed when the mast 2 is subsequently lowered and stowed and the outriggers are returned to their stowed positions.

[0030] In the embodiment described the outriggers are manually positioned by an operator, with the aid of the gas struts, for use. As an option the outriggers including the or each rear outrigger if provided, may be arranged to be hydraulically or electrically powered (e.g. through a screw) and controlled. Similarly hydraulically or electrically powered stabilising jacks may be provided at the outriggers.

[0031] The mast may be designed to be of variable operating height when erected.

[0032] If desired the mast may provide support and use as a CCTV station, either in addition to the telecommunications system or as a stand alone CCTV station.

[0033] A further option is for the trailer to be a variable load vehicle including a ballast system to assist in ensuring that the required stability of the frame 6 and outriggers is provided when the unit is in use.

Claims

1. A mobile mast (2) supported on a base (1) and capable of being raised from a stowed position sub-

stantially horizontal relative to the base to an erected position, characterised in there being at least two outriggers (3, 4) attached to the base (1) at spaced positions which have guy ropes (8) of the mast attached thereto and are movable between a stowed position lying substantially lengthways of the stowed mast and an in-use position where the outriggers (3, 4) extend outwards from the base, substantially radially of the erected mast (21), and outer ends thereof remote from the base are able to contact the ground around the base to support the erected mast by the guy ropes, each outrigger (3, 4) comprising a leg (20) articulately connected at an inner end to the base (1) or to the mast (2), and a strut (21) articulately connected at an inner end to the base at a distance below the inner end of the leg (20), and being adjustable in length such that by shortening it urges the leg (20) downwards relative to the base to force the outer end into contact with the ground.

2. A mobile mast according to claim 1 characterised in that the base (1) is provided with a frame (6) to which the mast (7) and outriggers (3, 4) are attached.
3. A mobile mast according to claim 2 characterised in that the outriggers (3, 4) are hingedly connected to the frame (6).
4. A mobile mast according to any preceding claim characterised in that the outriggers (3, 4) are connected to each other.
5. A mobile mast according to any preceding claim characterised in that there are at least two outriggers (3, 4) at opposite sides of the base (1) each having one or more guy ropes (8) attached thereto.
6. A mobile mast according to any preceding claim characterised in that one or more guy ropes (8) are attached to a part or parts fixed to the base (1).
7. A mobile mast according to claim 6 characterised in that the or each part fixed to the base (1) is adjustable to vary the distance from the mast (1) of the anchorage of the or each guy rope (8).
8. A mobile mast according to any preceding claim characterised in that to move an outrigger (3, 4) into its in-use position, it is first rotated to extend outwards from the base (1) above ground level substantially radially of the mast (2), and then moved downwards by shortening of the strut (21) thereof so as to lower the outer end of the outrigger into ground engagement.
9. A mobile mast according to claim 8 characterised in

that the strut (21) is arranged to operate to be shortened by application of a downwards force on the outer end of the outrigger (3, 4).

10. A mobile mast according to any preceding claim characterised in that the strut (21) of each outrigger (3, 4) is provided with support means (27) which holds the outrigger above ground level. 5
11. A mobile mast according to claim 10 characterised in that the support means (27) holds the outrigger just above ground level, such that only a relatively small downwards force is required to lower the outrigger (3, 4). 10
12. A mobile mast according to claim 10 or claim 11 characterised in that the support means (27) comprise one or more gas struts. 15
13. A mobile mast according to any preceding claim characterised in that the strut (21) of each outrigger (3, 4) is telescopic to allow its length to be adjusted. 20
14. A mobile mast according to claim 13 characterised in that the relative positions of telescopic sections (25, 26) of the strut (21) are maintained by holding means (28). 25
15. A mobile mast according to claim 14 as dependent from claim 8 characterised in that the holding means (28) is in place as the outrigger (3, 4) is rotated radially outwardly of the base (1), and then removed to allow the outrigger to be lowered. 30
16. A mobile mast according to any preceding claim characterised in that the strut (21) of each outrigger (3, 4) is provided with a turnbuckle (29) for use in shortening, and increasing, the length of the strut. 35
17. A mobile mast according to claim 16 characterised in that the turnbuckle (29) is provided with locking means. 40
18. A mobile mast according to any preceding claim characterised in that a foot (23) is provided at the end of the leg (20) of each outrigger (3, 4). 45
19. a mobile mast according to any preceding claim characterised in that the length of the leg(20) of each outrigger (3, 4) is adjustable. 50
20. A mobile mast according to any preceding claim characterised in that the mast (2) is telescopic. 55

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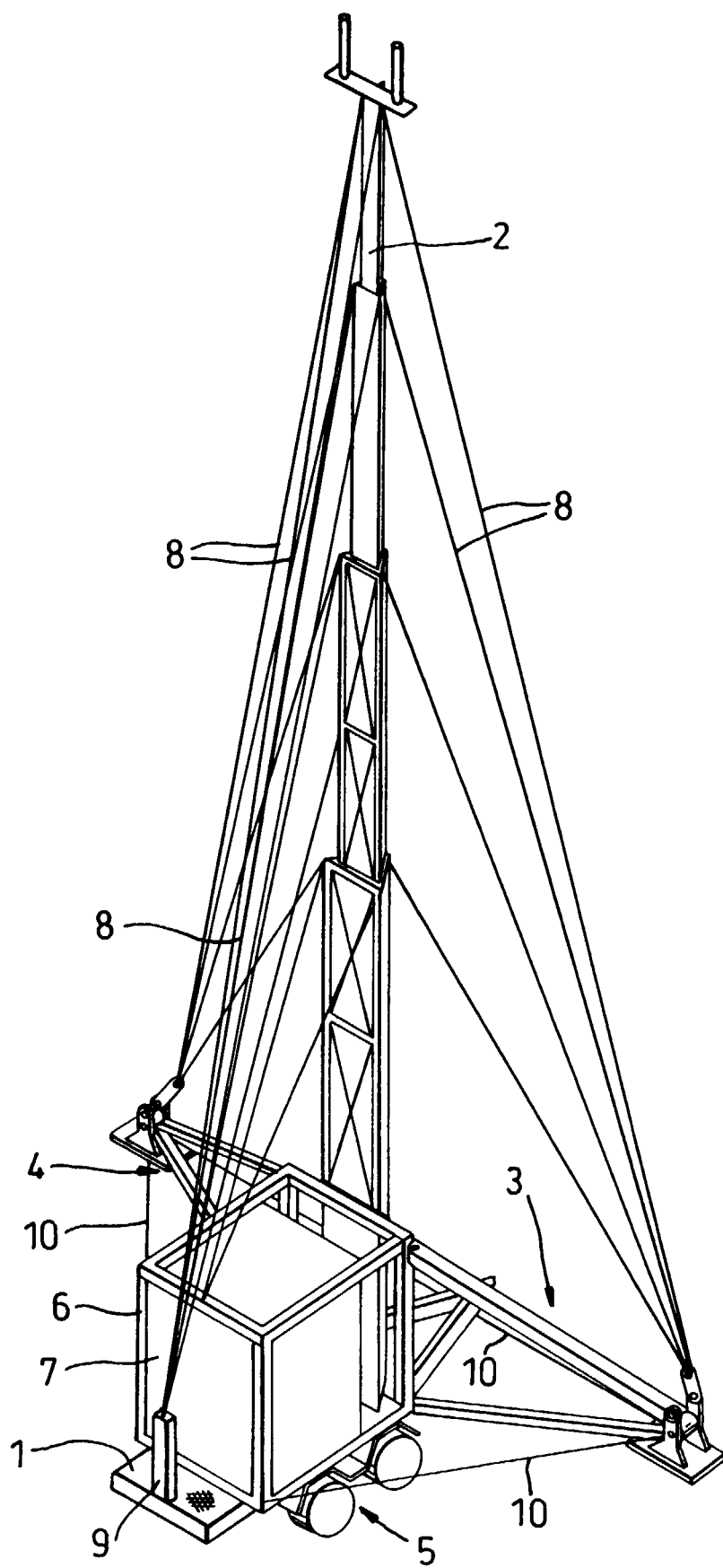


Fig. 1

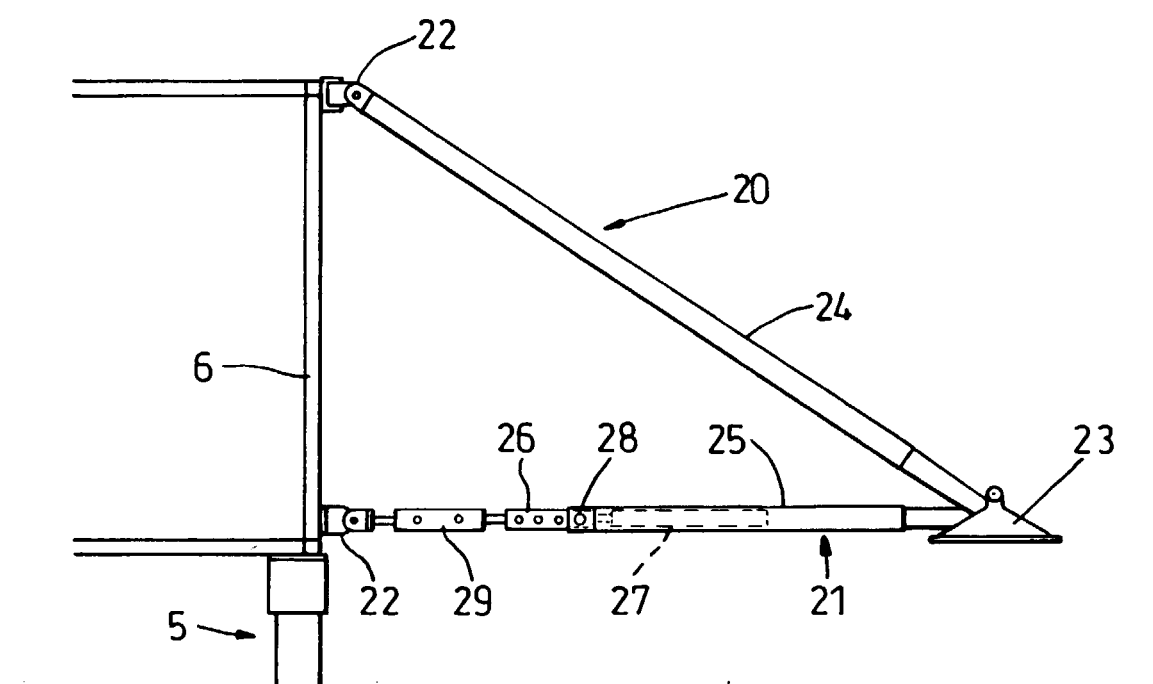


Fig. 2

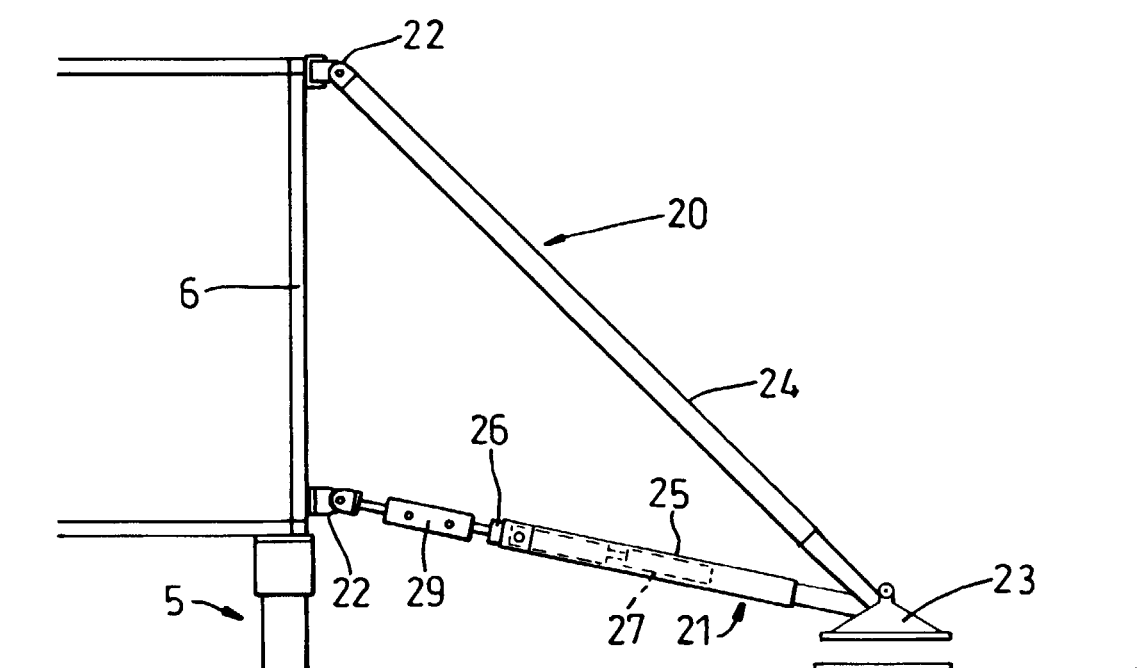


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 8980

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.7)
X	EP 0 057 002 A (SALZGITTER MASCHINEN AG) 4 August 1982 (1982-08-04) * abstract; figures 1-4 * ---	1-3,5-7, 13,14, 18-20	H01Q1/12 E04H12/18
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01Q E04H
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 5 January 2000	Examiner Felgel-Farnholz, W-D
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p> <p>& : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 30 8980

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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05-01-2000

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