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US 6606075 A **US 5760751 A**
US 4649675 A **US 20040233120 A**

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UK CL (Edition X) **E1D**
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Other: **WPI & EPODOC**

(54) Abstract Title: **Mast supported by ballast filled base**

(57) An equipment mounting tower includes a base 20 adapted to receive ballast and a column 30. The base may be accessible via a hinged or removable portion. It may comprise lifting means such as an aperture, handle or channel. It may have ground anchoring means i.e. a bolt or stake. The tower may be made up of short sub-units which may fit inside the base during transport. The tower units preferably are triangular in profile with end caps of mesh metal or steel, which have a central access aperture and three fastening apertures. An equipment mount may be provided at the top of the tower, it preferably comprises a circular plate 74 with apertures arranged concentrically around a central access aperture. Anti-climbing means 80 may be provided in the form of downwardly projecting spikes. A control box may be provided in the base. Additional equipment may be attached to the column via an adaptor unit 90. In use, the tower is simply and quickly erected, it is portable to allow it to be moved to a desired location easily.

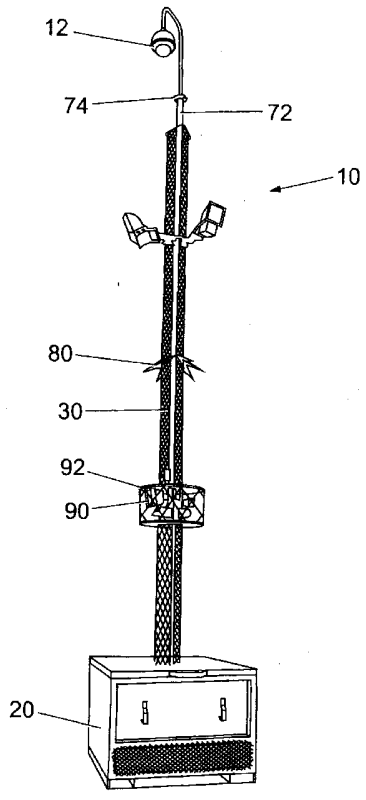

Fig. 1

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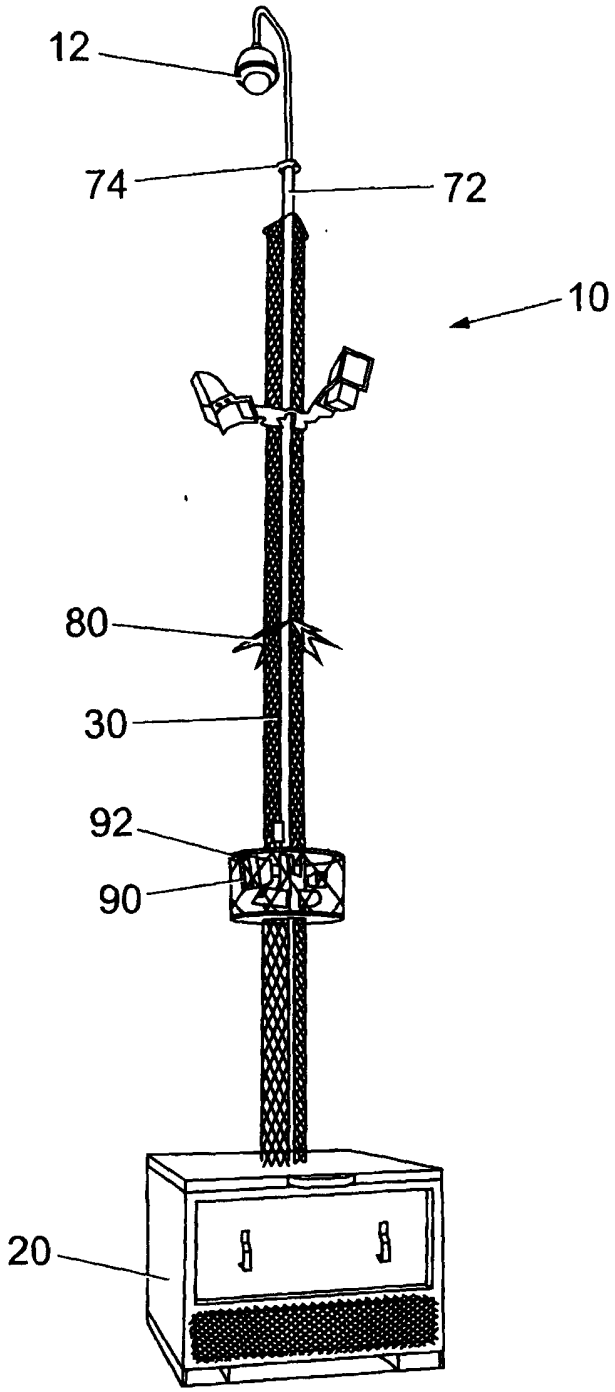

Fig. 1

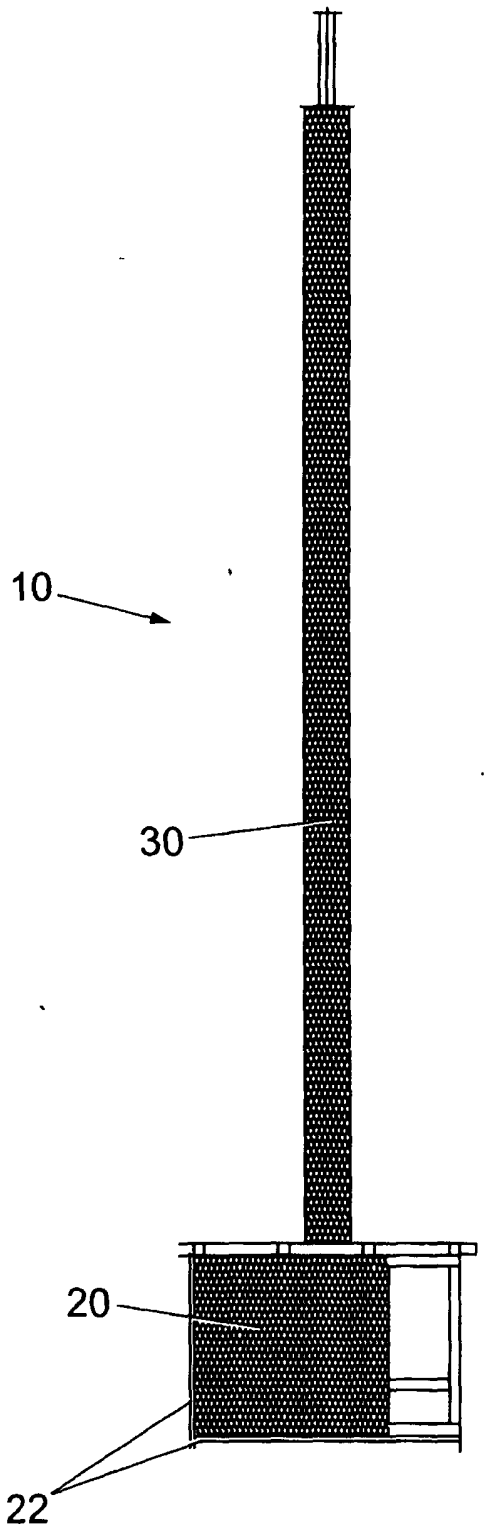

Fig. 2

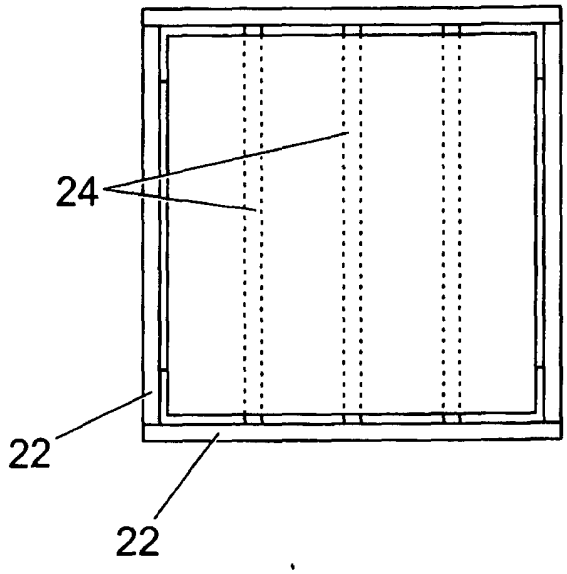

Fig. 3a

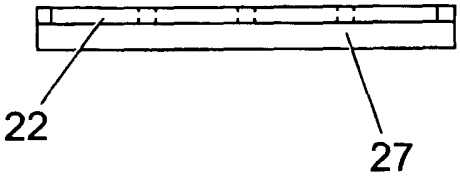

Fig. 3b

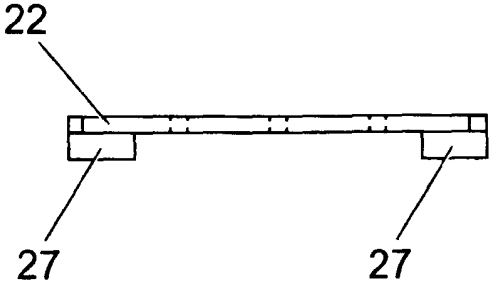

Fig. 3c

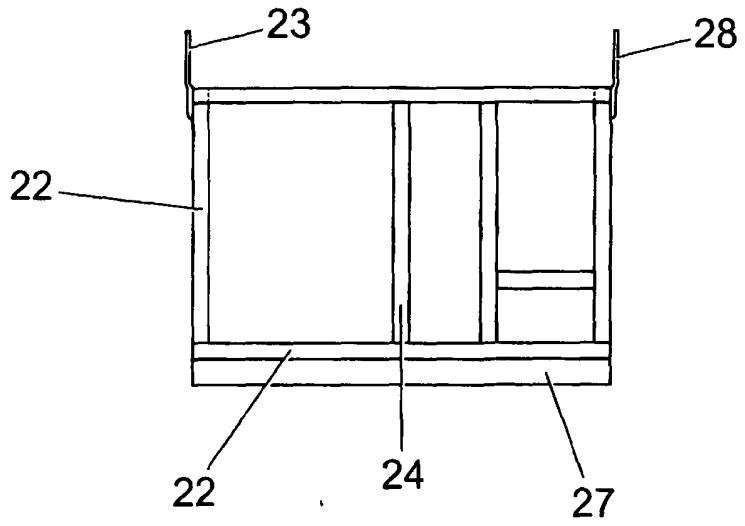

Fig. 4a

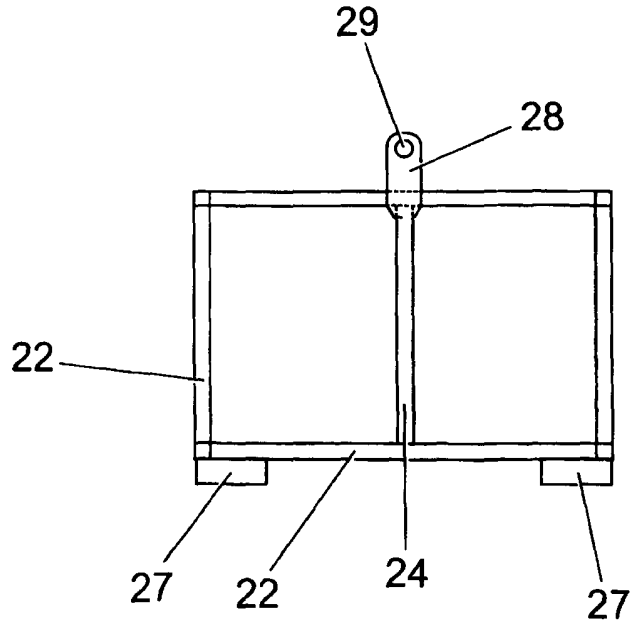

Fig. 4b

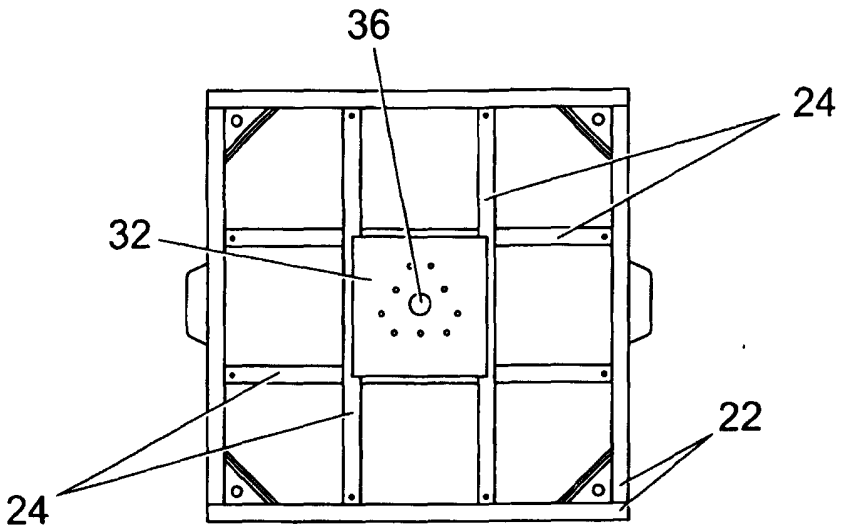

Fig. 5a

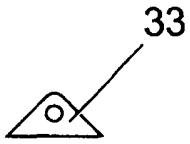

Fig. 5b

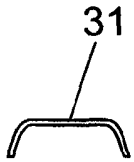

Fig. 5c

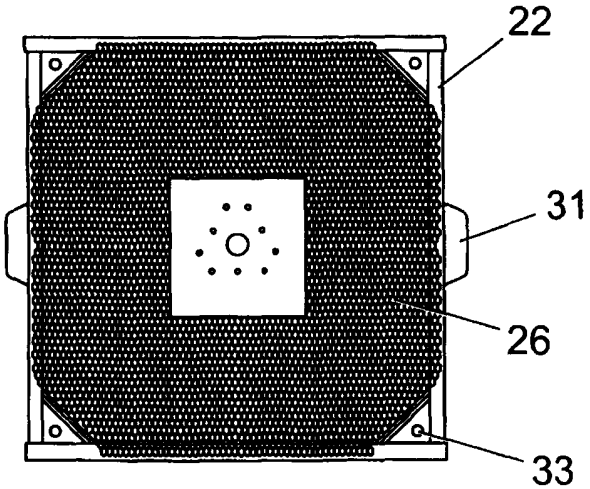

Fig. 5d

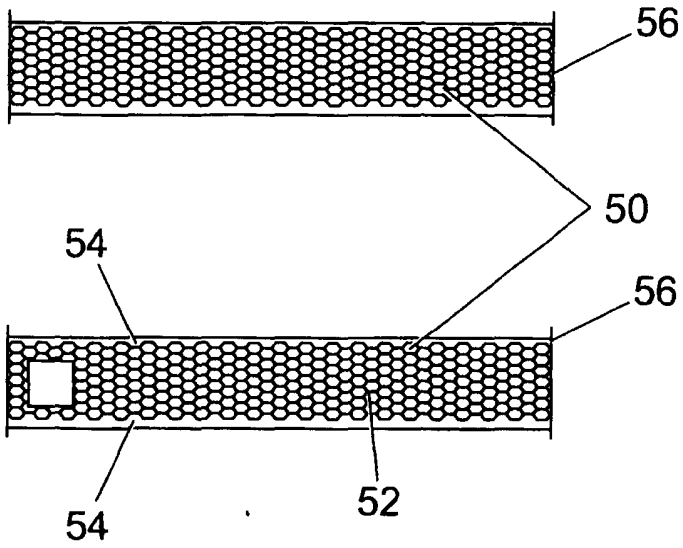

Fig. 6

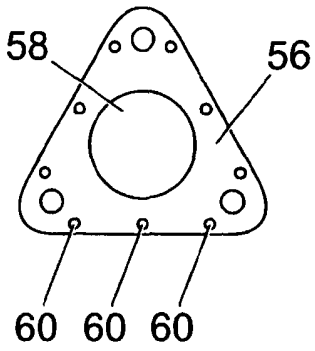

Fig. 7

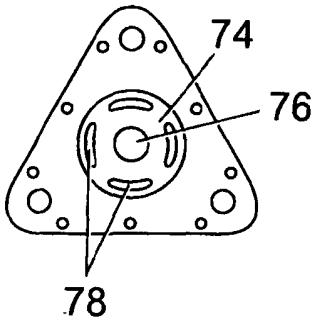

Fig. 8

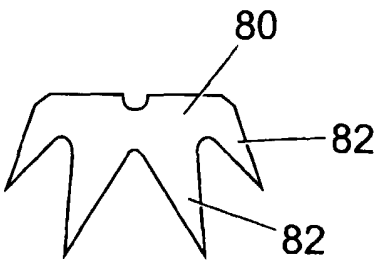

Fig. 9

Tower

The present invention relates to an equipment mounting tower, in particular a mounting tower suitable for mounting security, safety or communications equipment.

Typical security, safety or communications devices which may be used in a private or commercial context include cameras (for example CCTV), lighting, motion detectors, speakers, alarms, antennas, microphones, parabolic dishes or heat detectors. It is often necessary to mount such equipment above ground level, for example to allow a desired field of vision/illumination, to raise it out of reach or to achieve a satisfactory signal for communications.

Typically, where elevation of security, safety or communications equipment is required this is achieved by either mounting the equipment on the wall or roof an existing fixed structure, or by erecting a purpose built tower or mast. Such towers

are well known and are typically made of steel and may be formed in a lattice type structure, or a tubular based structure. Both these types of structures provide a strong mounting structure which is relatively simple to manufacture. Other forms of towers are known, such as those formed from reinforced concrete. All these types of towers are typically mounted by the use of concrete base or plinth into which the tower, or a structural foundation unit thereof, is inserted and supported until the concrete has set. The base or plinth must have a significant mass, sufficient to hold the tower in position and prevent it moving or falling over if subject to, for example, strong winds or assault by vandals or the like.

There remains a requirement for means for mounting elevated security, safety or communications equipment which can be erected without the need for pre-existing structures or the need to provide a concrete base or the like. It would also be desirable that such a means is simple and rapid to erect, and that it is portable to allow it to be moved to a desired location relatively easily.

According to the present invention there is provided a tower for mounting security, safety or communications equipment, the tower comprising a base and a column, wherein at least a portion of the base is adapted to receive ballast.

Suitably the base is adapted to receive sufficient balance to stabilize the tower, e.g. prevent it from being toppled by strong winds or vandals or the like. Suitably the base comprises securable means to prevent the ballast being removed when left in place. For example, the base may comprise an operable chamber or cavity to receive ballast, which can be secured, e.g. with a lock, to prevent unauthorised people accessing the chamber or cavity.

An advantage of a tower in which ballast can be added and removed is that the tower, without ballast, can be moved easily.

An advantage of using a tower stabilized with ballast, which does not require to be set in concrete or require a more permanent foundation, is that it can be erected at any location, with little or no site preparation. This is envisaged as being particularly useful in providing security e.g. at a campsite, festival or fairground. Alternatively it may be useful in increasing security or communications at a site which does not normally require such equipment except for rare occasions, e.g. a race course or the like.

Preferably the base and the column are separable, such that the base and column can be transported separated, and then connected in situ. This provides significant advantages in terms of transporting and positioning the tower. In particular it means that the base can be positioned

as required manually, or with the use of a forklift truck or crane, without the difficulties associated in manoeuvring a tall tower. The column can then connected to the base in position.

Preferably the base is hollow, the cavity within the base being adapted to receive the ballast. More preferably, substantially the entire space within the hollow base is adapted to receive ballast.

The hollow base suitably comprises an openable portion to allow access to the cavity of the base. This may be achieved using a hinged portion or a removable portion. This openable portion allows the introduction or removal of ballast and access to a control box which may optionally be fitted within the hollow base. Suitably the openable portion can be securely closed to prevent access to the cavity of the hollow base. This may be achieved for example by bolting the portion down, though a locking mechanism is preferred as it would be more difficult for a malicious party to open. In one embodiment the hollow base is generally cuboid. In this case it is convenient if at least a portion of one of the faces of the base is openable.

In one embodiment, the top (e.g. the top face of a cuboid base) of the hollow base is removable such that ballast can be lowered into the base and the top replaced. The top can then be bolted in place, and if necessary locked, e.g. with a padlock.

Preferably the base portion is provided with at least one lifting means. Suitable lifting means include apertures, handles or channels. Preferred lifting means include lifting lugs suitable for lifting with a crane, handles adapted for manual lifting, and/or channels for cooperation with the forks of a fork lift truck. These lifting means provide advantages in terms of portability of the base.

The base may also comprise secondary anchoring means to anchor the base to the ground. For example the bottom face of the base may be provided with one or more apertures through which a bolt, stake or peg may be passed into the ground beneath the base. This anchoring means may be provided to allow additional anchoring over that achieved using the ballast.

The column of the tower may suitably comprise a plurality of column sub-units which can be attached together to form the column. The column sub-units can be modular, i.e. each unit is essentially identical, such that the column length is determined by the number of sub-units present. Typically such column sub-unit may be approximately 1 to 2 m in length. It should be noted that the column of the tower need not be parallel sided, and indeed in some embodiments may taper along its length. However, a preferred embodiment is a parallel sided column, as this is more convenient for use in a variable length modular structure.

Significant advantages in portability of the column are achieved as a result of the column being formed from sub-units. For example, it allows the column to be transported in a relatively short vehicle, and the sub-units to be moved without the need for lifting equipment. Advantages are also achieved in construction of the tower, where a number of small, comparatively light sub-units can be manoeuvred and connected together and form the column, rather than manoeuvring one single, larger and unwieldy structure.

Suitably each column sub-unit comprises two end plates with a conduit therebetween. The conduit provides a rigid structure with a lumen along its central axis. Suitably the conduit is polygonal in cross-section, preferably triangular.

Suitably the end plates are shaped as a corresponding polygon to the conduit. This allows the plates to match the conduit, although they could in practice be effectively any shape. The end plates comprise an aperture near the centre which means that when two upright units are joined together end to end, a continuous lumen through both units is formed. This continuous lumen allows cables or the like to pass down the length of the column to the base. The end plates are suitably also provided with a number of apertures to allow one end plate to be attached, e.g. with nuts and bolts, the end plate of an adjacent sub-unit.

The conduit of the column sub-unit suitably comprises a number of elongate members (e.g. rods or pipes) equal to the number of corners of the polygonal conduit. The elongate members are attached at one end to each of the corners of a first end plate (such that one elongate number occupies each corner of the polygonal end plate) and at the other to each of the corners of the second end plate. Thus the elongate members run in parallel and define an outer frame of the conduit. In a preferred embodiment there are three pipes and the end plates are triangular, and thus a frame in the general form of a triangular prism is formed. The frame is suitably covered with a suitable sheet material, such as metal sheet or metal mesh. A mesh material is generally preferred as it will allow at least a portion of wind hitting the column to pass through it, thus reducing the force imparted on the tower by high winds.

Suitably the tower comprises an equipment mount attached at the top of the column. Preferably the equipment mount comprises attachment means for attaching the equipment mount to the column, preferably at the top of the column, and a mounting means for attaching equipment to the equipment mount. Suitably the attachment means comprises a plate essentially identical to the end plate of the column sub-unit, thus allowing simple attachment thereto. Suitably the mounting means comprises a circular plate provided with a plurality of

apertures arranged concentrically on the plate. Suitably the apertures are equally spaced in the plate. In one embodiment the apertures are slots which extend in an arc, preferably the arc extends for around 30 to 60°. Suitably there are 4 slots.

The equipment mount conveniently comprises a conduit separating the mounting means and the attachment means. Conveniently, the conduit may be a tube of circular cross section, although other conduits may be suitable. Preferably the mounting plate and the attachment plate having apertures provided such that a lumen extends through the equipment mount, thus allowing cables and the like to pass through it.

The tower can be provided with anti-climbing means to prevent or deter climbing of the tower. Suitably the anti-climbing means comprises at least one spike projecting outwardly and downwardly from the column. Preferably the anti-climbing means comprises a plurality of spikes projecting outwardly and downwardly from the column, the spikes substantially forming a ring around the circumference of the column. Suitably the anti-climbing means is adapted to be attached to the tower at the join of two adjacent column sun-units. In one embodiment, the anti-climbing means comprises a plurality of spike units, each spike unit providing spikes on one face of the polygonal column.

Suitably the tower comprises at least one item of security, safety or communications equipment. This

equipment may be attached at any point on the base or column of the tower. It is preferred that the equipment is attached to the column, and above the anti-climbing means, if present. Suitably the equipment is attached to an equipment mount attached to the top of the column. Alternatively or additionally, equipment may be attached at any point on the column; this may be conveniently achieved at the joint between two adjacent column sub-units, optionally through the use of an equipment mount adapted to interact with the means of connecting the sub-units together.

Suitable security, safety or communications equipment for mounting on the tower includes, for example, cameras (e.g. CCTV cameras), lights (e.g. floodlights), motion detectors, heat detectors, antenna, sirens, loud speakers or microphones.

In a preferred embodiment of the present invention the column sub-units are shaped and sized to fit within the correspondingly shaped and sized cavity of the hollow base. In other word the hollow base and column sub units are designed to cooperate such the column sub-units can be conveniently accommodated within the hollow base. This has an advantage in terms of portability as it means the tower can be conveniently transported as one unit, with all structural elements contained in a single, easily portable package. Suitably four or more column sub-units can be accommodated within the hollow base portion. In a further aspect of the

invention, the hollow base portion is also adapted to accommodate one or more of an equipment mount, an anti-climb means, security equipment, safety equipment or communications equipment.

According to a further aspect, the present invention provides a kit for construction of a tower, the kit comprising a base unit adapted to receive ballast, and at least one column sub-unit adapted to be connected to the base unit.

Suitably the kit further comprises one or more of anti-climb means, equipment mount means, security equipment, safety equipment, communications equipment, ballast and a control box.

In a preferred embodiment all components of the kit are provided within the hollow base.

According to another aspect, the present invention provides a method of erecting a tower, the method comprising the steps of;

(a) providing a base adapted to receive ballast;
(b) at least partially filling the base with ballast; and
(c) attaching a column to the base.

Suitably step (c) comprises the step of constructing the column from column sub-units.

Suitably the method further comprises the step of attaching to the tower one or more of anti-climb

means, equipment mount means, security equipment, safety equipment, communications equipment and a control box.

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig 1 is a picture showing a tower in accordance with an embodiment of the present invention.
Fig 2 is a schematic representation of a tower in accordance with an embodiment of the present invention.
Figs 3a, 3b and 3c show the bottom face of the hollow base in plan (a) and side views (b and c).
Fig 4a shows a side face of the hollow base.
Fig 4b shows another side face of the hollow base, adjacent to that of the face of Fig 4a.
Fig 5a shows the top face of the hollow base.
Fig 5b shows a corner bracket.
Fig 5c shows a lifting handle.
Fig 5d shows the top face of the hollow base covered in metal mesh.
Fig 6 shows a side view of an column sub-unit.
Fig 7 shown an end plate of the column sub-unit.
Fig 8 shows a plan view of the equipment mount.
Fig 9 shows an anti-climb device.

A tower 10 for mounting security, safety or communications equipment 12 comprises a hollow base 20 adapted to receive ballast and a column 30 extending upwards from the base 20.

Suitably the hollow base 20 is a cuboid, the edges 22 of which are formed from box section steel tube to form a perimeter frame. Cross-members 24 formed from box section steel tube are provided extending across the faces between the edges 22 of the perimeter frame of the cuboid, thus providing additional support to the frame. In one embodiment the cuboid has a square bottom face and top face, each having sides of approximately 1.25 m, and rectangular side faces, each having sides of approximately 1.25 by 0.8 m.

The faces of the base 20 are covered with a sheet of material 26 to prevent access to the inside of the base 20 between the tubes defining the frame. Suitable materials include sheet steel or metal mesh. The sheet material 20 is suitably attached by tack welding onto the frame.

One face of the hollow base 20, suitably a side face or the top face, may be opened to allow access to the space within the base 20. This allows ballast to be placed in the base 20 as required, and the amount of ballast altered as required by the specific role. In a preferred embodiment the top face of the base 20 is removable. The face is secured in place through the use of brackets 33 located at the corners of the face, which are bolted to corresponding brackets or apertures located on the base (not shown). Handles 31 provided on the top face allow it to be removed and handled simply.

Alternatively the face of the hollow base 20 is hinged at one edge with the opposite side being secured when closed by a locking mechanism such as a padlock. Alternatively a portion of the face may be opened, thus providing access through a smaller aperture than if the entire face is openable.

The side faces of the base 20 have at least one vertical reinforcing cross-member 24. Cross-members 24 provide additional strength to the frame to bear the weight of the tower 10. Two of the side faces are provided with lifting lugs 28 to enable the base 20, or the entire tower 10, to be lifted by a crane. Such lifting lugs 28 are well known in the art, being essentially flat plates with an aperture 29 for a hook or strap from a crane to be inserted. The lifting lugs 28 are attached to the centre of the top edge of the side face, suitably by welding to the perimeter frame and cross-member 24. The lugs 28 extend vertically upwards above the top face of the base 20 such that the apertures 29 are available for connection to the lifting mechanism of a crane.

The bottom face is reinforced with three cross-members 24. It is provided with two parallel channels 27 of rectangular cross section, which are adapted to receive the forks of a forklift truck. These provide a means of moving the base 20 simply and conveniently, even when it is loaded with ballast. The corners of the frame of the bottom face may be provided with a corner bracket 33 formed

from a plate piece of steel extending from the one edge of the perimeter frame to the adjacent edge (not shown). The corner bracket is provided with an aperture through which a bolt, peg or spike can be passed to secure the base 20 to the ground beneath the base, if required.

The top face of the hollow base 20 has two cross-members 24 running between each pair of opposite edges of the face 22, thus defining a grid of support members. The grid of cross-members 24 define a square in the centre of the top face onto which a column mounting plate 32 for fixing the column 30 of the tower 10 can be attached. The column mounting plate 32 has a number of apertures 34 positioned to align with corresponding apertures 34 on the end plate of the column 30 of the tower 10, for attachment thereto. A central aperture 26 is also provided in the column mounting plate 32 to allow cables and the like to pass from the hollow base 20 to into the column 30.

The top face is also provided with carrying handles 31 to assist carrying of the base 20 or removal of the top face to allow addition or removal of ballast. The corners of the perimeter frame of the top face are provided with brackets 33 to allow the top face to be secured to the side faces of the base 20. Corresponding brackets 33 are provided on the side faces of the base 20 to allow the top face to attach via nuts and bolts.

The column 30 of the tower 10 refers to the portion of the tower extending above the hollow base 20. The column 30 consists of a number of modular column sub-units 50. Each column sub-unit 50 comprises a conduit 52, which is triangular in cross-section. The conduit 52 is formed from three steel tubes 54 (of approximate length 1.20 m), which are mounted at each end onto a end plate 56 shaped essentially as an equilateral triangle. The tubes 54 are attached at each corner of the end plate 56 and are thus arranged to form the edges of the triangular conduit 52. The faces of the triangular conduit 52 are covered with sheet material (i.e. metal mesh) to prevent access and protect the contents of the conduit 52. The end plates 56 have an aperture 58 in their centre to allow cables or the like to pass from one sub-unit 50 to the next. The end plates 56 of the column sub-units 50 are further provided with three of apertures 60 along each edge the plate 56 to allow the sun-units 50 to be attached together or to the hollow base 20, suitably with bolts. Typically three apertures 60 are provided on each of the three edges of the end plate 56, though more or less could of course be used.

The number of column sub-units 50 can be varied to alter the height of the tower 10 as required, and this is an advantage of the modular system as described. A tower 10 in accordance with the present invention will typically be between 3 and 7 meters tall. Although it will be appreciated that

effectively any height of tower, within reason, could be constructed.

The shape and size of the column sub-units 50 is such that they will fit within the hollow base 20, i.e. they are slightly shorter than the greatest dimension of the hollow bas 20. This conveniently allows the column sub-units to be accommodated within the base 20 during transportation.

At the top of the column 30, an equipment mount 70 is provided. The equipment mount 70 may generally be any member which allows the attachment of the desired item of security, safety or communications equipment 12 to the uppermost end plate 56 of the column sub-unit 50. A suitable equipment mount 70 comprises a tubular section 71 having a diameter similar to that of the aperture 58 through the centre of the end plate 56. At one end of the tubular section 72 there is provided an attachment plate 74 essentially identical to the end plate 56 which allows the support to be attached thereto and cables and the like to pass through the plate and into the lumen of the column 30. At the other end of the tubular section 72 is a circular mounting plate 74, which includes an aperture 76 to allow cables to pass through the plate 74 and into the unit of equipment 12 to be attached thereto. The circular mounting plate 74 comprises four slots 78 which are arranged concentrically with the central aperture 76. Each slot 78 forms an arc along the circumference of the circle on which they are

arranged, the arc describing approximately 50°. The slots 78 provide suitable means for attaching the item of safety, security or communications equipment 12 on the equipment mount 70, and provide a degree of rotational adjustment to the item of equipment 12 mounted thereon.

The column section is suitably provided with anti-climbing means 80 to prevent or deter a person from ascending the tower 10. This is desirable to prevent vandalism or disablement of the tower 10 or equipment 12. The anti-climbing means 80 may suitably comprise a ring of outwardly and downwardly angled spikes 82, the ring extending substantially around the circumference of the column 30 of the tower 10. Suitably the ring of spikes 82 is positioned above head height, but below any equipment 12 mounted on the tower 10. The ring of spikes 82 may be attached to the column 30 by, e.g. welding or with bolts. These spikes 82 serve to make it difficult, or impossible, for a person to climb around the spikes 82 and gain access to the top of the tower 10. Suitably the spikes 82 may be attached to the column 30 using corresponding apertures to those provided in the end plate 56 of the column sub-unit 50. Suitably the spikes 82 are provided as three separate, identical spike units 80, each of which provides the spikes for one face of the column; thus when three spike units are fitted, to a triangular cross-section column the column is surrounded by a ring of spikes 82. In an alternative embodiment the spikes may be provided

integrally formed with the end plate of column sub-unit 52, i.e. wherein the end plate 56 is modified such that its edges extent into outwardly and downwardly angled spikes.

The tower 10 may be provided with equipment attachment means for attaching safety or security equipment to the column 30. For example, it may be desirable to attach one or more lights to the column, or to attach a number of cameras. This may be conveniently achieved through the use of adaptor unit 40, which may be inserted between two column sub-units. The adaptor unit 90 in its simplest form essentially comprises an attachment portion for the attachment of the safety, security or communications equipment and at least one connection portion which may be mounted between or in association with two adjacent upright column sub-units 50.

The adaptor unit 90 may, in a preferred embodiment, comprise a central section for the attachment of the equipment, flanked by two end plates essentially identical to the end plates 56 of the column sub-units 50. The adaptor unit 90 is positioned between two column sub-units 50, thus providing a mounting point for equipment at an intermediate point on the column 30. The central section may be provided with necessary apertures or brackets for attachment of the desired equipment.

Alternatively, in another embodiment of the adaptor unit 90 the attachment portion may be a bracket for

mounting of equipment attached to a connection portion which can be attached to the column by one or more of the bolts used to connect the column sub-units 50 together.

In one embodiment, the adaptor unit 90 comprises a guard to protect equipment attached thereto. The guard may comprise a frame 92 adapted to surround the equipment to be attached to the adaptor unit 90. This frame may be covered with a protective material, such as metal mesh or clear polycarbonate or perspex material.

The hollow base 20 may be provided with a control panel (not shown) for controlling the equipment 12 attached to the tower 10. The control panel is located within the hollow base so that it is inaccessible when the openable face of the base 20 is locked.

In use the tower 10 may either be brought to the location where it is to be erected in its complete form or in parts for assembly on site. The ability of the tower 10 to be assembled on site has significant advantages in terms of the ease of transportation.

Where the tower 10 is brought pre-assembled, erection is simple and accordingly the erection procedure for an on site assembly is described below.

The base 20 is placed in position. If the base 20 is empty of ballast this can be achieved manually. However, if ballast is present, or even if not, it may be preferable to position the base 20 using a crane or forklift truck. This is easily achieved using the various lifting means provided on the base 20.

Depending on the surface on which the tower 10 is to be erected, the base 20 may be bolted in position or stakes driven into the ground. Where the ground beneath the tower is relatively soft stakes may be preferred. Where the ground is concrete, holes can easily be drilled for use of expansion bolts. However, there are many circumstances where it may be desirable not to damage or alter the ground, and it may simply be more time efficient to avoid any attachment step. In general the step of attaching the base 20 to the ground via bolts or stakes may therefore be omitted and this is an advantage of the tower of the present invention.

The base 20 is opened and is then filled with sufficient ballast to ensure the tower 10 is adequately supported. The amount if ballast required will of course increase with the height of the column 30 and with the weight of equipment 12 to be attached. Accordingly, for certain applications a larger hollow base 20 than previously described may be required to accommodate sufficient ballast. Suitable ballast may comprise, e.g. concrete blocks, sand bags, bricks, rubble or any other generally

dense material. The material can either be transported to the site or, if sufficient dense material is available on site, this can suitably be used. One particularly preferred ballast is a large bag of sand (e.g. 500 or 1000Kg) which is typically used in the building trade, and can be lifted into the base 20 using a crane or forklift. Generally the hollow base 20 is not filled to such a degree that access to the control panel, if present, is inhibited.

The column 30 may be erected (i.e. connected to the base) prior to or after addition of the ballast. However, where the top face of the base 20 is removable to add the ballast, it is clearly desirable to add the ballast before erecting the column 30, such that the top face does not need to be removed once the column is erected. Additionally, where the column 30 is erected prior to addition of the ballast, it may be erected either while the tower 10 is upright or while the tower 10 is on its side. Erection with the tower 10 on its side has the advantage that little or no working at height is required to erect the column. However, it does involve the potentially difficult step of manoeuvring the constructed tower 10 into the upright position.

Generally the column 30 is constructed to its final form, i.e. complete with safety, security or communications equipment 12 prior to attachment to the base 20. It is generally more convenient to

attach the column 30 to the base 20 which is in an upright position, and which has at least some ballast present. The column 30 is lifted into position manually, or preferably with the assistance of a crane. It is then attached via the end plate 56 of the lowermost column sub-unit 50 to the mounting plate 32 on the top face of the base 20 this may be achieved using nuts and bolts, e.g. nine M10 nuts and bolts.

It should be noted that there will generally be cables running down the central lumen of the column 30, passing from one column sub-unit 50 to the next through the aperture 58 in the end plates 56. These cables will pass from the lumen of the column 50 into the hollow base 20 through the aperture 36 in the mounting plate 32. The cables pass into the hollow base 20 where they enter the control box (if present). If the equipment 12 or control box requires an external power supply or physical (as opposed to wireless) lines of communication, then cables can pass out of the hollow base 20, generally as an armoured cable, or enclosed within some form of protection from physical damage. However, with the advent of wireless technology, it is envisaged that cables to an external point may not be required, with communication being achieved wirelessly, and power being supplied by batteries, solar or wind power or the like.

Modifications to the described embodiments can be made without departing from the scope of the

invention. For example, the upright column could be manufacture to be telescopic or in one piece. The cross-section of the column could be other than triangular, for example round or box section. The base unit could be made any shape which is suitable to accommodate ballast. Equipment can be attached at any point on the column or base.

Claims

1. A tower for mounting security, safety or communications equipment, the tower comprising a base and a column, wherein at least a portion of the base is adapted to receive ballast.

2. The tower of claim 1 wherein said base comprises securable means to prevent the ballast being removed from the cavity.

3. The tower of claim 1 or 2 wherein said base and said column are separable.

4. The tower of any preceeding claim wherein said base is hollow to provide a cavity to receive the ballast.

5. The tower of any preceeding claim wherein said base comprises an openable portion to allow access to the cavity.

6. The tower of claim 5 wherein said openable portion is provided by a hinged portion or a removable portion.

7. The tower of any preceeding claim wherein said base is generally cuboid in shape and at least a portion of one of the faces of the base is openable

8. The tower of any preceeding claim wherein said base comprises at least one lifting means.

9. The tower of claim 8 wherein said lifting means is provided by an aperture, handle or channel.

10. The tower of any preceeding claim wherein said base comprises a secondary anchoring means.

11. The tower of claim 10 wherein the secondary anchoring means is adapted to receive a bolt, stake or peg.

12. The tower of any preceeding claim wherein said column comprises a plurality of sub-units which can be fitted together to form the column.

13. The tower of claim 12 wherein the sub-units are about 1 to 2 meters in length.

14. The tower of claim 12 or 13 wherein the sub-units are a suitable size and shape for storage inside the hollow base.

15. The tower of any one of claims 12 to 14 wherein the sub-units comprise two end plates with a conduit therebetween.

16. The tower of claim 15 wherein each of said end plates comprises an aperture near the centre of the plate.

17. The tower of claim 15 or 16 wherein said conduit provides a rigid structure with a lumen along its axis.

18. The tower of any one of claims 15 to 17 wherein said conduit is polygonal in cross-section.

19. The tower of any one of claims 1 to 18 wherein said conduit is triangular in cross-section.

20. The tower of either claim 18 or 19 wherein said conduit comprises a number of elongate members equal to the number of the corners of the polygon.

21. The tower of claim 20 wherein said elongate members are arranged in parallel and define an outer frame of the conduit.

22. The tower of either claim 20 or 21 wherein one end of said elongate members are attached to each of the corners of the first end plate and the other end of the elongate members are attached to each of the corners of the second end plate.

23. The tower oo any one of claims 15 to 22 wherein said end plates are provided with a number of apertures to allow one end plate to be attached to the end plate of an adjacent sub-unit.

24. The tower of any one of claims 15 to 23 wherein the conduit is at least partially covered with a sheet material.

25. The tower of claim 24 wherein said sheet material is a metal sheet or metal mesh.

26. The tower of any preceeding claim wherein the column comprises a continuous lumen extending from substantially the top of the column to the base.

27. The tower of any preceeding claim comprising an equipment mount.

28. The tower of claim 27 wherein said equipment mount is attached to the top of the column.

29. The tower of claim 27 or 28 wherein said equipment mount comprises attachment means for attaching the equipment mount to the column, and mounting means for attaching equipment to the equipment mount.

30. The tower of any one of claims 27 to 29 wherein said equipment mount comprises a circular plate provided with a plurality of apertures arranged concentrically on a plate.

31. The tower of claim 30 wherein said apertures are slots which extend in an arc of from around 30° to 60°.

32. The tower of any one of claims 27 to 31 wherein said equipment mount comprises a conduit separating the mounting means and the attaching means.

33. The tower of any preceeding claim comprising anti-climb means.

34. The tower of claim 33 wherein said anti-climb means comprise at least one spike projecting outwardly and downwardly from the column.

35. The tower of either claim 33 or 34 wherein said anti-climb means is adapted to attach at the join of two adjacent column sub-units.

36. The tower of any preceeding claim comprising at least one item of security, safety or communication equipment.

37. The tower of claim 36 wherein said item of equipment is attached to the equipment mount.

38. The tower of claim 36 or 37 wherein said item of equipment is a camera, light, motion detector, heat detector, antenna, siren, loud speaker or microphone.

39. The tower of any preceeding claim wherein said base is fitted with a control box.

40. The tower of any preceeding claim wherein said base is able to accommodate the at least one column sub-unit and/or one or more of the anti-climb means, equipment mount means, security equipment, safety equipment, communications equipment, ballast and a control box.

41. A kit for construction of a tower comprising a base adapted to receive ballast, and at least one column sub-unit adapted to be connected to the base.

42. The kit of claim 47 or 48 comprising one or more of anti-climb means, equipment mount means, security equipment, safety equipment, communications equipment, ballast and a control box.

43. The kit of claim 41 or 42 wherein said base is able to accommodate the at least one column sub-unit and/or one or more

anti-climb means, equipment mount means, security equipment, safety equipment, communications equipment, ballast and a control box.

44. A method of erecting a tower comprising the steps of;
(a) providing a base adapted to receive ballast;
(b) at least partially filling the base with ballast; and
(c) attaching a column to the base.

45. The method of claim 44 wherein step (c) comprises constructing said column from sub-units.

46. The method of claim 44 or 45 comprising the step of attaching to the tower one or more of anti-climb means, equipment mount means, security equipment, safety equipment, communications equipment and a control box.

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Application No: GB0704993.5 **Examiner:** Dr Hazel Thorpe

Claims searched: 1-46 **Date of search:** 31 May 2007

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 3, 4, 8, 9, 19, 26-29, 36-44 & 46	GB 2401380 A (GALLIFORD); figures 1-3, please see whole document.
X	1-5, 7, 12, 19, 26-28, 36-46	US 2004/233120 A (RYAN); figures 1-6, please see whole document.
X	1, 3-7, 12, 19, 27-29, 36-46	WO 2003/027420 A (COETZER); figures 1 & 2, please see whole document.
X	1-4, 12, 19, 27, 28, 36-38 & 40-46	US 6606075 A (CHUN); figures 1-9, please see whole document.
X	1-5, 19, 27, 28, 36-38, 41-44 & 46	US 4649675 A (MOLDOVAN); figures 1-6, please see whole document.
X	1, 2, 4, 19, 27, 28, 36-38, 40-44 & 46	US 5760751 A (GIPSON); figures 1-4, please see whole document.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[X] :

E1D

Worldwide search of patent documents classified in the following areas of the IPC

E02D

The following online and other databases have been used in the preparation of this search report

WPI & EPODOC

International Classification:

Subclass	Subgroup	Valid From
E02D	0027/42	01/01/2006
E04H	0012/08	01/01/2006