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(54) **A safety barrier system**

Sicherheitsgelandersystem

Système de barrière de sécurité

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Description

[0001] This invention relates to a safety barrier guard-rail system, and more specifically to such a system for persons working at height, utilising a vacuum anchor, which in use is to be secured to an uneven, non-uniform profiled surface of a structure.

[0002] The invention has particular applicability to situations in which safety systems need to be installed for working at height on structures such as aircraft wings in which the surface upon which the operatives are working is uneven, curve profiled, undulating, or otherwise non-uniform. The invention also has application in other situations and particularly provides a mounting that has a high degree of flexibility in terms of its range of use.

[0003] A prior art safety system for use on aircraft wings is disclosed in, for example, US6607054. In the system disclosed a series of vacuum anchor devices are secured to a structure such as an aircraft wing and arranged to support a guardrail or barrier arrangement comprising upright posts which have respective stems inserted into a receiving socket in the vacuum anchor. Vacuum anchor devices are well known in the art for anchoring safety lines, barriers or other systems to thin skinned structures such as aircraft wings. In the arrangement shown in US6607054, cross-members span between the upright posts to provide the guardrail or barrier restraint.

[0004] An example of a safety barrier system comprising an intermediate articulated mounting device for a support post is shown in FR2761096.

[0005] An improved arrangement has now been devised.

[0006] According to a first aspect of the present invention, there is provided a safety barrier guardrail system for working at height, as defined in appended claim 1.

[0007] It is preferred that the connector is mounted to be movable pivotally or rotationally with respect to the stem.

[0008] Beneficially, the connector is articulated with respect to the stem to be movable about an articulation axis, which articulation axis is transverse to the longitudinal axis of the stem.

[0009] In one embodiment, it is preferred that the connector is mounted to a pivot formation (such as a bolt for example), which extends transverse to the longitudinal axis of the stem. In an alternative embodiment a gimballed connection or ball and socket joint could be utilised to give the required articulation range of movement.

[0010] The connector preferably includes a releasable faster for releasable fastening of the support post with the connector.

[0011] The securing means comprises bolts arranged to be movable to abut against the connector.

[0012] The bolts are provided on opposed sides of the angularly adjustable articulated mounting joint. The angularly adjustable articulated mounting joint defines a pivot or hinge axis about which the connector pivots, hinges or otherwise rotatably moves.

[0013] The bolts beneficially may be adjustable in terms of their projection distance toward or away from the connector, in order to enable the connector to be secured at different specific attitude orientations.

[0014] The bolts have an end arranged to abut against the connector above the level of a pivot or hinge axis about which the connector pivots, hinges or otherwise rotatably moves.

[0015] The bolts are movable in their longitudinal direction and are arranged to extend inclined upwardly into threaded bores provided in the mounting body of the angularly adjustable articulated mounting joint.

[0016] The cylindrical stem of the mounting is preferably received in the cylindrical socket of the anchor so as to be rotatable about the longitudinal axis of the stem.

[0017] The safety system of the invention may further include a plurality of barrier guardrails arranged to extend between adjacent upright posts in the system, the barrier guardrails being adjustable in length and arranged to be secured to the upright posts in alternative height regimes.

[0018] The invention will now be further described in a specific embodiment and by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic plan view of a safety system according to the invention forming a barrier for an aircraft wing;

Figure 2 is a plan view of a vacuum anchor comprising the safety system of figure 1;

Figure 3 is a front-end view of a mounting device providing the connection between the anchor and the upright post of the system of figures 1 and 2;

Figure 4 is a side view of the mounting device of figure 3;

Figure 5 is a perspective view of a cross-member arrangement comprising the safety system of figure 1;

Figure 6 is a side view of a part of the safety system of figure 1.

[0019] Referring to the drawings, there is shown a safety barrier guardrail system 1 comprising a series of spaced vacuum anchor devices 2, each arranged to support a respective upright post 3. Adjustable length guardrail cross-members 4 interconnect the upright posts 3. The safety barrier guardrail system 1 is particularly suited for use on uneven or undulating surfaces for personnel working at height, such as for example working on the wing of an aircraft for maintenance purposes. For this reason the safety barrier guardrail system 1 as shown in figure 1 is shaped to define an aircraft wing shaped pen boundary. End vacuum anchors 2a 2b anchor on to the fuselage of the aircraft.

[0020] The vacuum anchor devices secured to the aircraft wing and fuselage are connected via vacuum lines 7. The vacuum anchor devices are generally in accordance with those known in the art and accordingly will not be described in detail herein. As shown in figure 2, the vacuum anchor devices 2 have vacuum line connectors 5, 6 for connection to a vacuum line 7. The vacuum anchor device 2 has a main body which supports a rubber flexible sucker member 2b. The vacuum is typically applied from a remote vacuum source. Appropriate check valves and control valves are typically mounted to the anchor body 2a. The pair of vacuum line connectors 5, 6 enable the series of spaced vacuum anchors to be connected in series in the vacuum circuit such that vacuum can be applied to all the vacuum anchor devices from a single vacuum generation unit 8.

[0021] Each vacuum anchor device has a central cylindrical socket for receiving one of the upright posts. This is known in the art and shown in figure 4 of US6607054 where the socket is described as 'hole 16'.

[0022] In a departure from the prior art, and in accordance with the present invention, the post 3 is not mounted to be directly received within the cylindrical socket of the vacuum anchor device 2, but rather an intermediate articulated mounting device 9 is used to secure the post 3 with respect to the vacuum anchor device.

[0023] Referring now specifically to figures 3 and 4, the intermediate articulated mounting device 9 for the posts of the safety barrier guardrail system 1 comprises a cylindrical stem portion 10, extending downwardly from an angularly adjustable articulated mounting joint 11. The angularly adjustable articulated mounting joint 11 comprises a mounting body 12 defining a recess spanned by a bolt 13 extending between spaced uprights 12b, 12c. The bolt 13 provides a rotatable, pivot or hinge mounting for the post and in the embodiment shown mounts a receiving socket 14 which receives the lower end of the upright support post 3. A fixing flange 15 extends from the underside of the socket 12 and is provided with a mounting aperture through which the bolt 13 may pass.

[0024] It will be appreciated that in other examples, not forming part of the claimed invention, the socket 14 may be dispensed with and the support post 3 may be directly mounted to the angularly adjustable mounting at the hinge bolt 13, by means of providing a special adaptation to the lower end of the support post 3, in order to provide a mounting flange and aperture similar to that provided for the socket 14. However, in the claimed invention, the socket mounting 14 is used in order to enable standard existing mounting posts to be accommodated. The socket mounting is provided with a set screw 16 threaded into a threaded through bore in the side of the socket 14 in order to enable the support post 3 to be securely held when received in the socket 14.

[0025] In certain situations it is desirable to angle the upright support post with respect to the surface to which the vacuum anchor device is secured, such that the support post is at an angle of inclination with respect to the

surface, but still orientates the support post in a 'true' upright orientation. This can occur as a result of adjacent vacuum anchor devices being mounted to differently inclined surfaces, there being a requirement for optimum performance of the system that the adjacent upright posts are orientated in a common or parallel upright orientation.

[0026] The angularly adjustable articulated mounting joint 11 for the support post 2 enables the support post 2 to be angularly adjusted to provide varying degrees of angular inclination with respect to the surface to which the vacuum anchor device is secured. This is achieved by the axis of the hinge or pivot bolt being transverse to the longitudinal axis of the upright support post. Additionally positional flexibility is achieved by means of the stem 10 being rotatable about its longitudinal axis whilst received in the socket of the vacuum anchor device 2.

[0027] As an alternative to a pivot or hinge structure mounting joint, alternative angularly adjustable articulated mounting joints may be employed to give the desired range of movement, such as for example a gimballed mount or joint or a ball and socket joint.

[0028] The angularly adjustable articulated mounting joint is further provided with a securing arrangement for securing the mounting in the selected configuration in which the support post 3 is orientated set with its longitudinal axis directed in the desired direction. In the embodiment shown, this is achieved by means of opposed directed threaded securing members 17, 18 directed through the mounting body 12 and secured in threaded bores. The ends of the threaded securing members 17, 18 can be advanced into the recess in the mounting body 12 to contact the fixing flange 15. When the ends of the threaded securing members 17, 18 are both abutting tight against the opposed sides of the fixing flange 15, the mounting is secured in the selected configuration in which the support post is orientated set with its longitudinal axis extending in the desired direction.

[0029] The heads of the threaded securing members are readily accessible in order to be actuated to effect tightening against the fixing flange. The threaded securing members are bolts. The bolts 17, 18 are angled inclined upwardly such that the ends of the bolts contact the opposed sides of the mounting flange 15 at a level above the level of the hinge bolt axis 13. This enhances the security with which the socket 14 and post 3 is held in position.

[0030] Referring to figures 5 and 6 the cross-members 4 of the safety barrier guardrail system 1 are adjustable in length and comprise an inner tube 4a mounted telescopically within respective opposed end tubes 4b and 4c. Respective securing pins 21 are tethered to the tubes 4b and 4c by tethers 22 and pass through receiving apertures in the respective tubes 4b and 4c to engage with selected ones of a series of spaced apertures provided in the inner tube 4a, dependent upon the length selected for the respective overall cross member tube 4. The ends of the cross-member tube 4 are provided with apertured flanges 25 enabling the tubes to be bolted to respective

collars 27 which are secured about the support posts 3. The collars 27 are positionally movable along the length of the support posts 3 and securable at desired selected positions by means of tightenable collar bolts (not shown) as known in the general art.

[0031] The safety barrier guardrail system 1 of the invention provides a reliable system having a set number of component parts that can be quickly and conveniently set up to provide a safe barrier or guardrail system. Because the intermediate mounting device is articulated to enable the orientation angle of the support post to be adjusted with respect to the anchor device, the support posts can be orientated 'true' upright even when adjacent support posts are mounted on uneven or differently inclined mounting surfaces.

Claims

1. A safety barrier guardrail system (1) for working at height, comprising an anchor (2) and a support post (3) to which the guardrail (4) is mounted, the support post being mounted to the anchor by an intermediate articulated mounting device (9), the intermediate articulated mounting device (9) comprising:

an angularly adjustable articulated mounting joint (11) comprising a mounting body (12), wherein the angularly adjustable articulated mounting joint (11) enables the orientation angle of the support post (3) to be adjusted with respect to the anchor (2);
a cylindrical stem (10) to be removably received in a cylindrical socket of the anchor (2);
a connector including a socket (14) for receiving an end of the support post (3), the connector socket (14) being articulated by the angularly adjustable articulated mounting joint (11) to be adjustable over a range of attitude orientations with respect to the cylindrical stem (10); and
securing means (17,18) for securing the connector socket (14) at a specific attitude orientation with respect to the cylindrical stem (10),
characterised in that:

the anchor (2) is a vacuum anchor; and
the securing means (17,18) comprises bolts provided on opposed sides of the angularly adjustable articulated mounting joint (11),

wherein the bolts (17,18) are moveable in their longitudinal direction and are arranged to extend inclined upwardly into threaded bores provided in the mounting body (12) and the bolts (17,18) have an end arranged to abut against the connector above the level of a pivot or hinge axis about which the connector pivots, hinges or otherwise rotatably moves.

2. A safety barrier guardrail system according to claim 1, wherein the connector (14) is mounted to be movable pivotally or rotationally with respect to the stem (10).
3. A safety barrier guardrail system according to claim 1 or claim 2, wherein the connector is articulated with respect to the stem (10) to be movable about an articulation axis which is transverse to the longitudinal axis of the stem.
4. A safety barrier guardrail system according to any preceding claim, wherein the connector is mounted to a pivot bolt (13), which extends transverse to the longitudinal axis of the stem (10).
5. A safety barrier guardrail system according to any preceding claim, wherein the connector includes a releasable fastener (16) for releasable fastening of the support post (3) with the connector.
6. A safety barrier guardrail system according to any preceding claim, wherein the bolts (17,18) are adjustable in terms of their projection distance toward or away from the connector, in order to enable the connector to be secured at different specific attitude orientations.
7. A safety barrier guardrail system according to any preceding claim, further including a plurality of barrier guardrails (4) arranged to extend between adjacent upright posts (3) in the system, the barrier guardrails being adjustable in length and arranged to be secured to the upright posts in alternative height regimes.

Patentansprüche

1. Sicherheitsbarrieren-Geländersystem (1) zum Arbeiten in der Höhe, umfassend einen Anker (2) und einen Stützpfeiler (3), an dem das Geländer (4) montiert ist, wobei der Stützpfeiler durch eine gelenkige Zwischenmontagevorrichtung (9) an dem Anker montiert ist, wobei die gelenkige Zwischenmontagevorrichtung (9) umfasst:

ein winkelverstellbare angelenkte Montageverbindung (11), umfassend einen Montagekörper (12), wobei die winkelverstellbare gelenkige Montageverbindung (11) das Einstellen des Ausrichtungswinkels des Stützpfeilers (3) in Bezug auf den Anker (2) ermöglicht;
einen zylindrischen Schaft (10), um abnehmbar in einer zylindrischen Fassung des Ankers (2) aufgenommen zu werden;
einen Verbinder, eine Fassung (14) zum Aufnehmen eines Endes des Stützpfeilers (3) ein-

schließend, wobei die Verbinderfassung (14) durch die winkelverstellbare angelenkte Montageverbindung (11) angelenkt ist, um über einen Bereich von Lageausrichtungen in Bezug auf den zylindrischen Schaft (10) verstellbar zu sein; und
ein Sicherungsmittel (17, 18) zum Sichern der Verbinderfassung (14) in einer bestimmten Lageausrichtung in Bezug auf den zylindrischen Schaft (10), **dadurch gekennzeichnet, dass:**

der Anker (2) ein Vakuumanker ist; und
das Sicherungsmittel (17, 18) Bolzen umfasst, die auf gegenüberliegenden Seiten der winkelverstellbaren angelenkten Montageverbindung (11) bereitgestellt sind,

wobei die Bolzen (17, 18) in ihrer Längsrichtung beweglich sind und angeordnet sind, um sich nach oben geneigt in Gewindebohrungen zu erstrecken, die in dem Montagekörper (12) bereitgestellt sind, und die Bolzen (17, 18) ein Ende aufweisen, das angeordnet ist, um an dem Verbinder oberhalb der Ebene einer Schwenk- oder Scharnierachse, um die der Verbinder schwenkt, klappt oder anders drehbar bewegt, zur Anlage zu kommen.

2. Sicherheitsbarrieren-Geländersystem nach Anspruch 1, wobei der Verbinder (14) montiert ist, um schwenkbar und drehbar in Bezug auf den Schaft (10) beweglich zu sein.
3. Sicherheitsbarrieren-Geländersystem nach Anspruch 1 oder Anspruch 2, wobei der Verbinder in Bezug auf den Schaft (10) angelenkt ist, um um eine Gelenkachse beweglich zu sein, die quer zur Längsachse des Schafts ist.
4. Sicherheitsbarrieren-Geländersystem nach einem der vorstehenden Ansprüche, wobei der Verbinder an einem Schwenkbolzen (13) montiert ist, der sich quer zur Längsachse des Schafts (10) erstreckt.
5. Sicherheitsbarrieren-Geländersystem nach einem der vorstehenden Ansprüche, wobei der Verbinder ein lösbares Befestigungselement (16) zum lösbaren Befestigen des Stützpfeilers (3) mit dem Verbinder einschließt.
6. Sicherheitsbarrieren-Geländersystem nach einem der vorstehenden Ansprüche, wobei die Bolzen (17, 18) hinsichtlich ihrer Projektionsdistanz zu dem Verbinder hin oder von ihm weg einstellbar sind, um zu ermöglichen, dass der Verbinder in verschiedenen spezifischen Lageausrichtungen gesichert werden kann.

7. Sicherheitsbarrieren-Geländersystem nach einem der vorstehenden Ansprüche, weiter eine Vielzahl von Barrieregeländern (4) einschließend, die angeordnet sind, um sich zwischen benachbarten aufrechten Pfosten (3) in dem System zu erstrecken, wobei die Barrieregeländer in der Länge verstellbar und angeordnet sind, um an den aufrechten Pfosten in alternativen Höhenregelungen gesichert zu werden.

Revendications

1. Système de garde-corps barrière de sécurité (1) pour travailler en hauteur, comprenant un ancrage (2) et un montant de support (3) auxquels est monté le garde-corps (4), le montant de support étant monté à l'ancrage par un dispositif de montage articulé intermédiaire (9), le dispositif de montage articulé intermédiaire (9) comprenant :

un joint de montage articulé ajustable de manière angulaire (11) comprenant un corps de montage (12), dans lequel le joint de montage articulé ajustable de manière angulaire (11) permet à l'angle d'orientation du montant de support (3) d'être ajusté par rapport à l'ancrage (2) ;

une tige cylindrique (10) devant être reçue de manière amovible dans une douille cylindrique de l'ancrage (2) ;

un connecteur incluant une douille (14) pour recevoir une extrémité du montant de support (3), la douille de connecteur (14) étant articulée par le joint de montage articulé ajustable de manière angulaire (11) pour être ajustable sur une plage d'orientations de disposition par rapport à la tige cylindrique (10) ; et

des moyens de fixation (17, 18) pour fixer la douille de connecteur (14) selon une orientation de disposition spécifique par rapport à la tige cylindrique (10),

caractérisé en ce que :

l'ancrage (2) est un ancrage à vide ; et
les moyens de fixation (17, 18) comprennent des boulons prévus sur les côtés opposés du joint de montage articulé ajustable de manière angulaire (11),

dans lequel les boulons (17, 18) sont mobiles dans leur direction longitudinale et sont agencés pour s'étendre de manière inclinée vers le haut dans des alésages filetés prévus dans le corps de montage (12) et les boulons (17, 18) ont une extrémité agencée pour venir en butée contre le connecteur au-dessus du niveau d'un axe de pivotement ou d'articulation autour duquel le connecteur pivote, s'articule ou bien se déplace

de manière rotative.

2. Système de garde-corps barrière de sécurité selon la revendication 1, dans lequel le connecteur (14) est monté de sorte à pouvoir être déplacé par pivotement ou rotation par rapport à la tige (10). 5

3. Système de garde-corps barrière de sécurité selon la revendication 1 ou la revendication 2, dans lequel le connecteur est articulé par rapport à la tige (10) de sorte à pouvoir être déplacé autour d'un axe d'articulation qui est transversal à l'axe longitudinal de la tige. 10

4. Système de garde-corps barrière de sécurité selon l'une quelconque des revendications précédentes, dans lequel le connecteur est monté sur un boulon d'articulation (13), qui s'étend transversalement à l'axe longitudinal de la tige (10). 15
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5. Système de garde-corps barrière de sécurité selon l'une quelconque des revendications précédentes, dans lequel le connecteur inclut une attache détachable (16) pour attacher de manière détachable le montant de support (3) avec le connecteur. 25

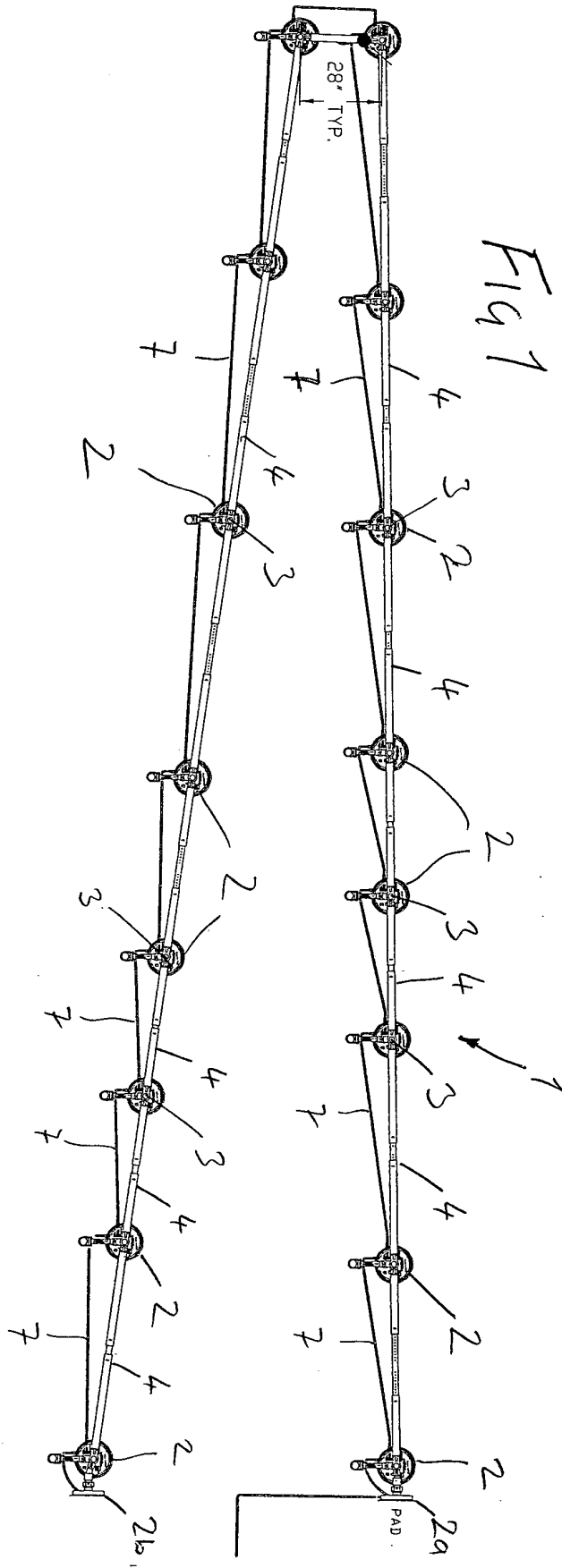
6. Système de garde-corps barrière de sécurité selon l'une quelconque des revendications précédentes, dans lequel les boulons (17, 18) peuvent être ajustés en termes de leur distance de projection vers ou à l'opposé du connecteur, afin de permettre au connecteur d'être fixé selon différentes orientations de disposition spécifiques. 30

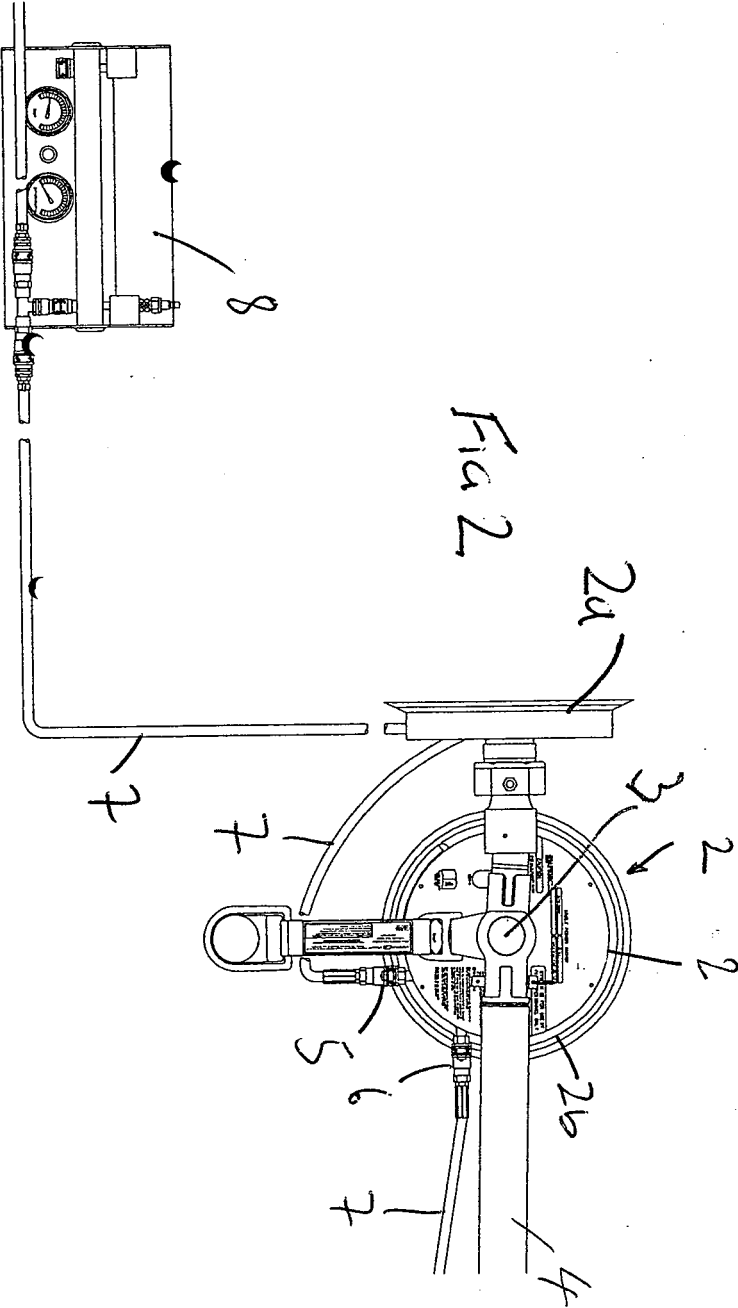
7. Système de garde-corps barrière de sécurité selon l'une quelconque des revendications précédentes, incluant en outre une pluralité de garde-corps barrières (4) agencés pour s'étendre entre des montants verticaux adjacents (3) dans le système, les garde-corps barrières pouvant être ajustées en longueur et agencés pour être fixés sur les montants verticaux selon des régimes de hauteur alternatifs. 35
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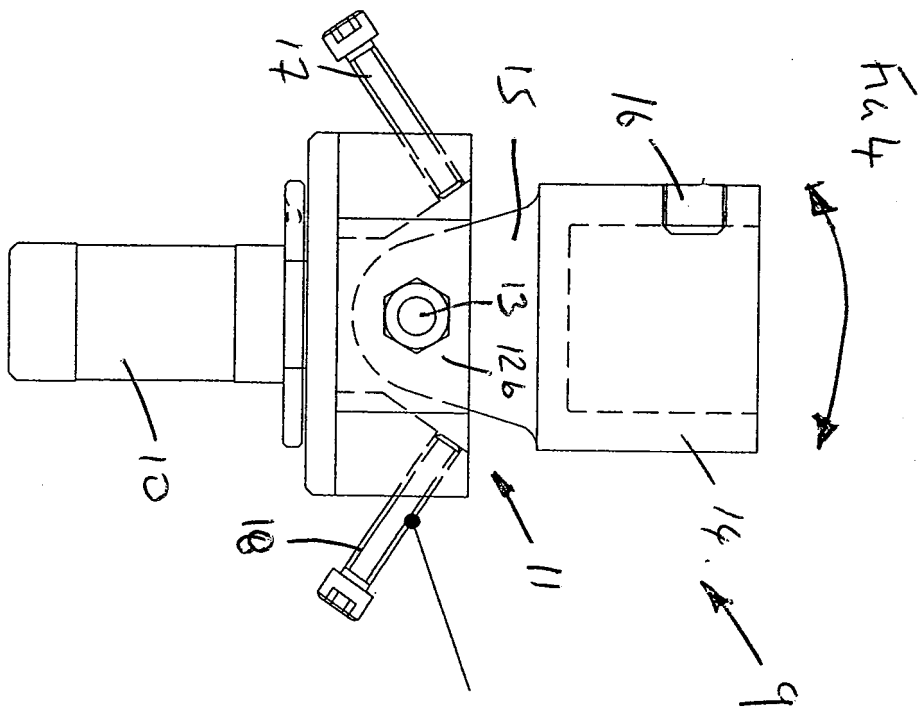
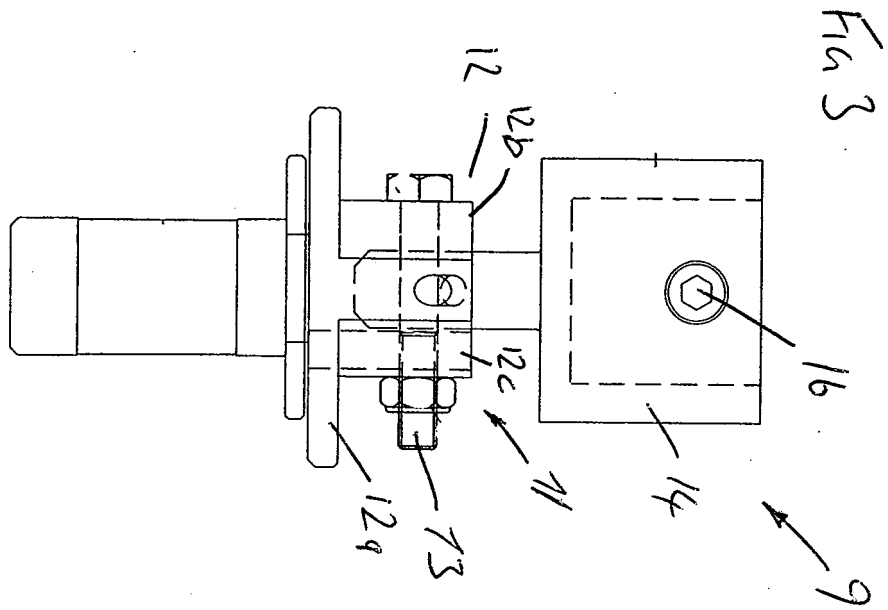
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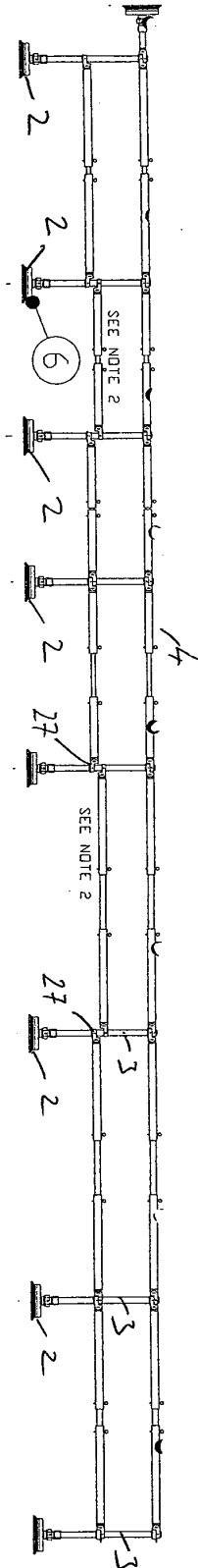
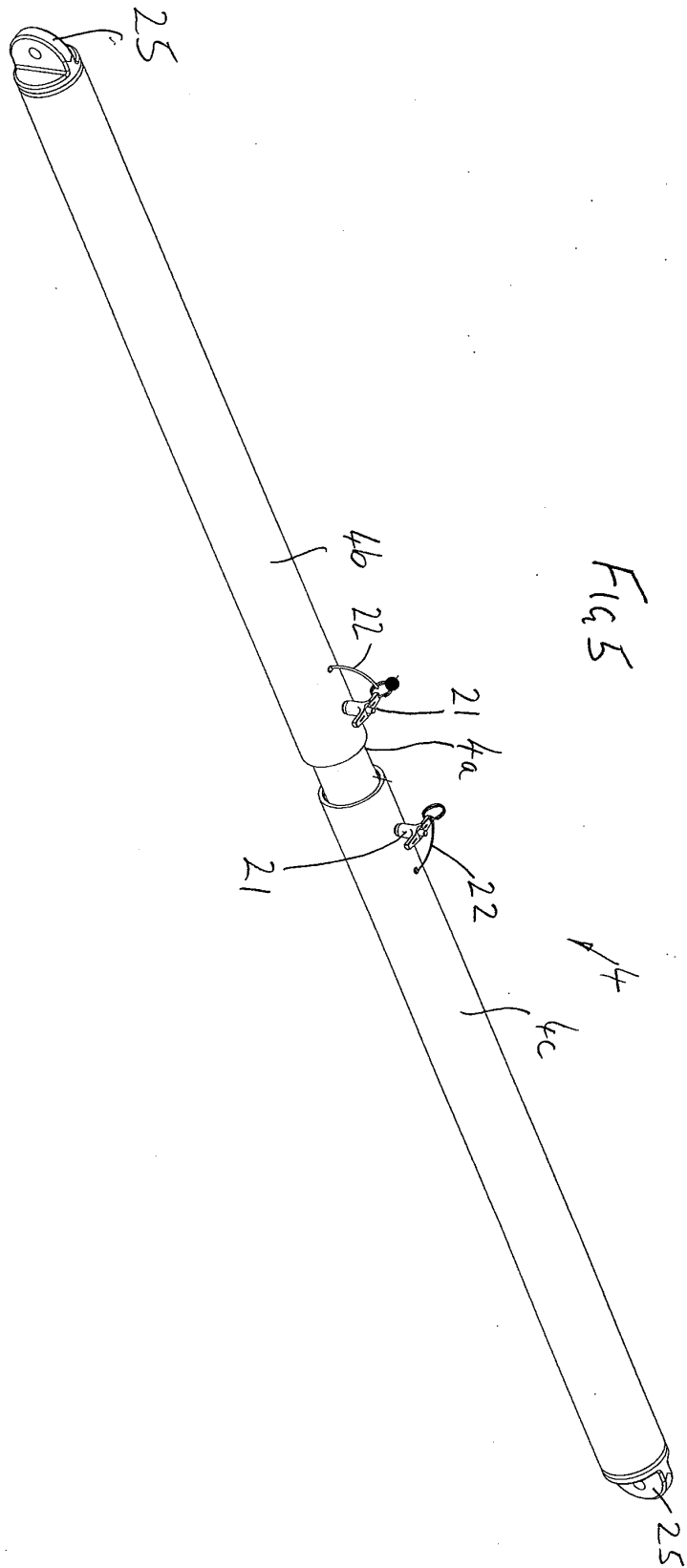
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REFERENCES CITED IN THE DESCRIPTION

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