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(54) Support structure

(57) Support structure including a platform (2) supported by a plurality of stanchions (8). A connector (4) is provided at the end of each stanchion (8) for connecting the stanchion (8) to the platform (2). A connecting pin (6) connects the stanchion (8), connector (4) and platform (2).

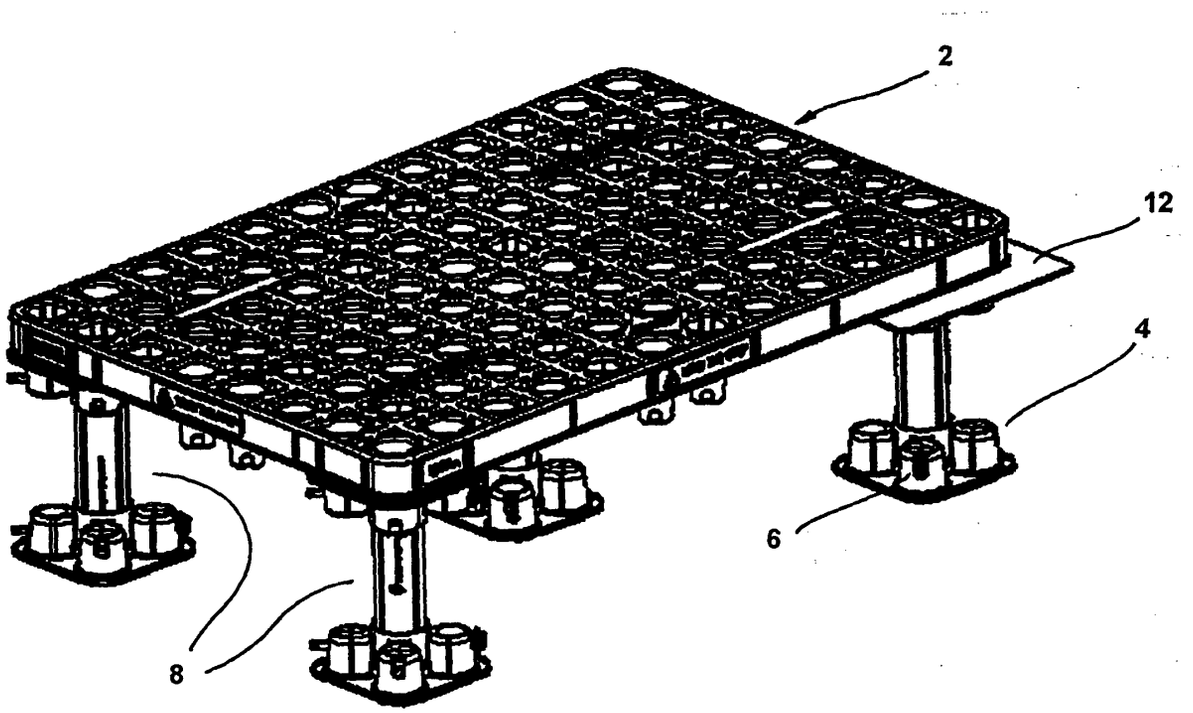

FIG. 1

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Description

[0001] The present invention relates to a support structure, and in particular to a support structure in the form of an elevated platform able to arrest the fall of a person, and/or to act as a working platform able to support the weight of people and/or tools. The invention also relates to various components of the support structure.

[0002] Especially in the building industry, it is common for people to work at heights. Working platforms enable people to work at a desired height. When working at an elevated height, there is a danger that people may fall and cause themselves injury. There is a particular problem relating to the internal spaces within buildings where there is a void above the next lower floor which may be of such a height that a person falling into the void would be injured. This may occur when installing concrete blocks, beams and timber roof trusses. To help reduce the risk of serious injury to people falling from an elevated height in these and other circumstances, it has been known to provide a fall arrest system comprising a platform supported by a plurality of legs.

[0003] Previously proposed systems, such as that proposed in British Patent Application GB 2322400, have relied on a platform formed as a plurality of intersecting strips of plastics material giving a platform having some resilience to absorb the impact of a person falling onto the platform. The platform is supported by legs provided at each corner. Each of the legs comprises a tube with a rubber or plastics foot at one end and a locating plate at the opposite end. The upper surface of the locating plate includes a number of upstanding projections or bosses that are received within apertures in the support platform. In use, the support platform can be tied to the locating plate via a number of ties. Alternatively, metal screws or bolts can be used to screw or bolt the components together.

[0004] Another system proposed by the present applicant uses a moulded platform including lower projections that are received within recesses of a stanchion support integrally formed on one end of a stanchion or leg.

[0005] There are various potential problems with prior art support platforms. Some support platforms are not able to satisfactorily absorb the impact of a body falling upon them, either because the support platform itself is not sufficiently strong to absorb the impact, or due to the support legs not being able to withstand the impact. In particular, it is known to form a platform using cut-down plastics pallets. The cutting of these pallets can weaken them, the cutting resulting in stress factors or stress concentration raising features, and may therefore result in a fragile surface.

[0006] Further, there is a risk that the impact of a body falling onto the support platform will cause the platform to bounce out of connection with the leg or stanchion. Whilst this can be avoided by use of ties to tie the platform to the connecting plate connecting the platform and leg, this may be time consuming. Accordingly, it may be that either the working platforms are not erected, or the platforms are not tied to the leg plates, due to the time required. Similar considerations apply where metal screws or bolts are used to secure the components.

[0007] According to a first aspect of the present invention, a support structure comprises a platform, a plurality of stanchions, and a connector coupled to the end of each stanchion for coupling the stanchion to the platform, wherein at least one connecting pin is provided to pass through a portion of the platform, stanchion and connector to removably connect these.

[0008] The provision of a pin that passes through parts of the platform, stanchion and connector to connect these is of advantage as this is a simple and quick way of connecting the components of the support structure which helps ensure that the support structure is properly assembled for use, whilst effectively connecting the components to avoid the problem of these becoming separated during use, and especially as the result of an impact on the support platform. As a result, the support structure of the present invention will be more widely and correctly used, and will be better suited to absorb impacts and thereby protect injury in use. The structure is usable both as a working platform and as a fall arrest system. Preferably, the connectors are removably connected to the stanchions. The use of separate stanchions, connectors and platforms is advantageous for transportation of the support platforms, allowing the support platforms to be broken down into individual components that may easily be packaged and transported.

[0009] It is preferred that the connector comprises a generally central opening for receiving one end of the stanchion, and includes at least one recess for receiving a projection from the underside of the platform. In this case, it is preferred that the side wall of the opening for receiving the stanchion include aligned openings for receiving the pin, the end of the stanchion received within the opening of the connector including similarly aligned openings for receiving the pin, the side wall of the recess of the connector include aligned holes for receiving the pin, and the at least one projection from the platform includes an aligned hole for receiving the pin when the projection is received within the recess. The openings are preferable in the form of elongate slots which, in use, are arranged generally vertically. This allows some relative movement between the components in one, generally vertical direction.

[0010] It will be understood that some or all of the projections and recesses of the stanchion, connector and platform may be reversed, for example with the connector having projections received in corresponding recesses of the platform. However, this may lead to difficulties in inserting a connecting pin.

[0011] It is preferred that the connector includes a mating component for mating with the stanchion attached to the connector, helping prevent relative rotation

of stanchion with respect to the connector. The mating component may also provide a frictional engagement between the connector and the stanchion to help prevent the accidental removal of the stanchion from the connector.

[0012] It will be appreciated that separate pins could be used for connecting the stanchion and connector and for connecting the connector and platform. However it is preferred that a single pin is used passing through all of the openings to ensure simple connection of the components.

[0013] It is preferred that the connector includes a number of recesses for receiving the at least one projection from a platform. Ideally, the connector includes four recesses arranged in a square configuration. In this case, it is preferred that each of the platforms includes a plurality of projections from the lower side of the platform at each corner to be received within the recesses of the connector. Where three projections are provided at the corner, and the stanchion is provided at the corner of a single platform, all three projections are received in the recesses of the connector. Alternatively, where two platforms are provided next to each other, two side by side projections may be received in two side by side recesses of the connector, and two side by side projections on the second platform may be received in the other two recesses of the connector, thereby giving reliable support for both platforms. If four platforms are to be supported, the outer corner projection of each of the four platforms may be received in the four recesses of the connector, enabling the connector to connect the four platforms. In this case, a second pin may be provided to connect all four projections of the platforms to the recesses of the connector. In addition to the projections at the corner of the platform, it is preferred that other projections are provided at other positions for connection to a connector, for example projections along the side edges or in the centre of the platform.

[0014] It is preferred that the upper surface of the connector, that being the surface from which the recesses extend, is formed with an embossed or gripping surface to prevent slipping. This helps ensure that movement between the connector and platform is minimised. Further, a connector may be provided at the end of the stanchion opposite that which supports the platform. The connector may be connected to the stanchion by a pin in a similar manner as the connector supporting the platform. Where a connector is provided at the opposite end of the stanchion to that supporting the platform, the second connector acts as a foot to help support the platform. In this case, the gripping surface will be in contact with the floor, and this will help avoid slipping of the platform.

[0015] The platform may be moulded. In a preferred embodiment, the platform may be formed by moulding, for example by injection moulding or by rotational moulding. This enables the platform to be formed as a hollow structure, which helps reduce the cost for manufacture by reducing the amount of material used, and also reduces weight. However, the platform may have a solid structure, and in this case can be formed by injection or other moulding techniques.

[0016] It is preferred that the platform includes a number of apertures extending through the platform. This reduces the weight of the platform, and reduces the cost of manufacture, by reducing the amount of material required. Further, the openings allow drainage through the platform. This is particularly advantageous as any moisture or rain water collecting on the surface of the platform or in the recesses which may make this slippery and dangerous. Further, this helps to avoid water collecting which may otherwise wet users assembling the structure. It is preferred that at least the upper surface of the platform includes an embossed or grip surface to help prevent slipping.

[0017] To produce a platform having high strength suitable for use as both a fall arrest system and as a working platform, but with minimum weight and using minimal material it is preferred that the platform includes a supporting rib structure.

[0018] Whilst the platform may be of any suitable dimensions, it is preferred that the platform has sides of between around 0.8m and 1.2m in length, and ideally that the platform has a rectangular shape having a length of around 1.2m and a width of around 0.8m. This is a size which can be easily supported by a minimum number of legs or stanchions whilst giving the required strength. The platform may have a thickness or height of around 60mm.

[0019] Whilst the platform should be able to support the impact of a body falling onto the platform, and at least two other people to assist in the rescue of a person fallen onto the platform, the platform ideally has some resilience to absorb the shock of impact, rather than being brittle. Ideally, the platform is made from a polyolefin material. The stanchion and other components of the support may also be formed from polyolefin.

[0020] Although not considered necessary, the use of additional ties or safety straps for connecting the components in addition to the pins is not excluded by the present invention.

[0021] According to a second aspect of the present invention, a stanchion or support leg for a support structure is provided comprising a generally tubular elongate member including axially extending grooves or ridges.

[0022] The stanchion is preferably around 2m in length. However, the height will be dependent upon the desired height of the platform, and therefore longer or shorter legs could be used. The diameter and wall thickness of the stanchion will be dependent upon the load to be supported and the length of the stanchion. It is preferred that the diameter of the stanchion is around 70mm, especially where the stanchion length is around 2m.

[0023] The provision of a hollow leg, as opposed to a solid leg, is advantageous as it reduces the amount of

material required to form the leg, thereby reducing manufacturing costs, and also reduces the weight of the stanchion. The provision of axially extending grooves or ridges enhances the overall strength of the stanchion, and in particular its resistance to buckling.

[0024] The stanchion preferably includes a foot attached to or formed integrally at one end. The foot is preferably a rubber foot received within or extending over one end of the stanchion.

[0025] It is preferred that the support platform according to the first aspect of the present invention includes a plurality of stanchions according to the second aspect of the present invention.

[0026] In this case, it is preferred that the mating means on the connector for mating the leg or stanchion and the connector comprises one or more axially extending ribs or projections on the inner wall of the opening of the connector that receives the end of the stanchion, the elongate ribs or projections being received in the grooves or ridges of the stanchion to prevent relative rotation between the stanchion and the connector. It will be appreciated that the ribs or projections may be in the form of discrete projections rather than elongate projections, and may either extend into grooves of the stanchion or abut against elongate ridges to prevent relative rotation.

[0027] According to a third aspect of the present invention, there is provided a subsidiary platform for a support structure arranged to be held between a support platform and a stanchion and arranged to extend beyond the outer periphery of the support platform in at least one direction.

[0028] This aspect of the invention is of particular benefit where the area in which the support structure is provided cannot be covered completely by the normal support platforms. This is a problem since voids are typically not of a standard size. In the prior art, it was known to try and bridge gaps by providing additional separate platforms overlying the main support platforms, the additional support platforms not being independently supported by a stanchion. Using the subsidiary support structures of this aspect of the invention enables an extension to extend from the main support platform to fill any gaps, for example around the periphery of the support platform to a side wall of a void or opening in which the support platform is provided. It is generally necessary to provide 'bridging' platforms, these being additional platforms that are provided on top of supported platforms to bridge gaps between these to cover a desired area. Such bridging platforms are undesirable as these create different levels of the overall platform which can create a tripping hazard. The use of subsidiary support platforms according to the present invention which do not lie on top of the remainder of the support helps supplement the use of bridging platforms, and may help reduce the number of bridging platforms required to provide a platform over a required or desired area. The use of subsidiary platforms or supports, it is possible to ensure that the overall platform extends to and abuts against any generally vertical walls or surfaces. This helps ensure the stability of the platform, since this is not able to sway, twist or rock due the abutment with the sides. This is especially useful in an enclosed void.

[0029] Especially where the subsidiary support structure is to be provided in a support structure according to the first aspect of the present invention, it is preferred that the subsidiary support structure includes openings which receive the projections from the support platform that are in turn received within the recess of the connector. In this way, the subsidiary support structures are held firmly in place, both being prevented from lateral movement and from vertical movement. However, the subsidiary support structure can be used with other support structures.

[0030] The subsidiary support structures may be of any desired size and various different size subsidiary support structures may be provided for different size openings.

[0031] In this aspect of the present invention, it is preferred that the openings through which the at least one pin extends to connect the components is in the form of an elongate opening. This allows parts of the openings to be aligned whether or not the spacer is provided between the platform and the connector or not, and therefore allows the pin to pass through the openings to connect the components as required.

[0032] An example of a support platform according to the present invention will be described in accordance with the accompanying figures in which:

Figure 1 shows a support platform according to the present invention;

Figure 2 shows a cross-sectional view through a platform, stanchion and connector;

Figure 3 shows top and bottom views of a platform;

Figure 4 shows a view of a connector;

Figure 5 a view of a stanchion;

Figure 6 shows a view of a pin; and

Figure 7 shows a view of a subsidiary support.

[0033] As shown in Figure 1, a fall arrest or working platform according to the present invention comprises a platform 2 which may be formed from a plastics material, such as polyolefin, and may be suitably moulded. Most preferably, the components are formed from a Block co-polymer polypropylene. As shown in greater detail in Figure 3, the support platform includes a number of through holes 30 arranged to reduce the weight of the platform, and to allow drainage of liquid. The top surface 34 of the platform is either textured or

formed from a material to give enhanced grip. The underside of the platform includes a series of ribs 36 that are provided to enhance the strength of the platform, whilst reducing the overall weight.

[0034] The underside of the platform also includes a series of projections 32 extending from the underside of the platform, and arranged to be located in a stanchion support or connector as described below. In the arrangement of the present invention, three projections are provided at each corner, with a further two projections being provided approximately half way along each side of the platform, and four projections being provided in or around the centre of the platform. It will be appreciated that different numbers and arrangements of projections are possible.

[0035] As shown in Figure 1, the platform is supported by a number of legs or stanchions, with appropriate stanchion supports. In the example shown in Figure 1, a single platform is supported by five such stanchions or legs, one provided at each corner, and a further stanchion provided in the centre. It will be appreciated that if more than one platform is to be provided, the stanchion supports may be offset to support a plurality of platforms. As shown in greater detail in Figure 5, the stanchions comprise a generally tubular, elongate member which is preferably formed from polyolefin. The elongate member preferably has a length of around 2m, a maximum cross-sectional dimension of around 70mm, and has a wall thickness of around 4.5mm. The elongate member has a series of elongate ridges, grooves or channels extending substantially along the length of the elongate member. In the example shown in Figure 5, grooves 50 are provided. These grooves act to strengthen the leg, and in particular help resist compressive forces on the leg, and buckling.

[0036] Any number of grooves may be used, although it is preferred that these are equally spaced around the circumference of the stanchion. In a preferred embodiment, four grooves are provided.

[0037] In one example, a stanchion support is provided at either end of the stanchion - one support to support the platform, the other to act as a foot for the stanchion. In this case, both stanchion supports are connected to the stanchion using a pin. In an alternative example of the present invention, the lower end of the stanchion may include a foot or grip provided integrally or otherwise fixed to the stanchion. In one example, the foot may be a rubber end piece which is attached to the end of the stanchion, for example by a friction fit or by adhesive. In this case, the foot contacts the ground on which the platform is provided, and holds this in place. The advantage of using a foot of this type is that the manufacturing costs can be reduced, and the time required for assembly of the support can be reduced as there is no need to separately attach a support to the lower end of each stanchion.

[0038] The receiving cavity of the stanchion support includes internal projections, projecting inwardly from the inner wall of the cavity, and receivable within a corresponding groove of the stanchion. In this way, the stanchion and the stanchion support are interconnected in such a way as to resist removal of the stanchion from the stanchion support, and to prevent relative rotational movement between the stanchion and the stanchion support. This is of particular advantage as it helps ensure that the stanchion is correctly located within the support such that the openings for receiving the pin are aligned.

[0039] The stanchion support is shown in greater detail in Figure 4. The stanchion support has a central opening 44 which is shaped and sized to receive one end of the stanchion 8. Arranged around the central recess, and extending from the opposite side or face of the support, are a plurality of recesses 40. These recesses 40 are arranged to receive the projections 32 of the working platform. The surface 42 from which the recesses 40 open should include an embossed or gripping surface or material. This helps prevent slipping of the stanchion support with respect to the working platform or floor. As shown in Figure 1, it is preferred that a stanchion support is provided at each end of the stanchion, one end acting as a foot, and the other end acting as a support for the working platform.

[0040] As shown in the cross-sectional view of Figure 2, each of the projections 32 of the platform 2, each of the recesses 42 of the stanchion support 4 and the stanchion 8 include openings 14, 16 and 10 respectively. In use, when the stanchion is provided within the central opening of the stanchion support 4, and one or more projections of the support platform are contained within the recesses 42 of the stanchion support 4, these holes 14, 16, 10 will be in alignment.

[0041] A pin 6, shown best in Figure 6, is then extended through the holes, thereby constraining the stanchion support, stanchion, subsidiary platform or 'spacer' (where provided) and working platform to prevent relative movement of these. The pin preferably has a total length of around 260 to 270mm, although the length will be dependent upon the size of the stanchion support through which the pin must extend. As best seen in Figure 6, the pin includes a means for locking this in place, and further includes a transverse extension 62 provided at one end. In one example, the locking means includes a circular rib provided adjacent the transverse end 62 of the pin. In use, the rib passes beneath a coupling aperture of the connector, and is prevented from removal. Alternatively or additionally, the locking means may comprise a bifurcated end 64 at the opposite end of the pin to the transverse extension 62. The bifurcated end 64 of the pin is biased apart, such that when the pin is inserted into the holes of the working platform, the ends are forced towards each other, against the bias, to allow the pin to pass through the holes, but as the pin end passes through the end of the holes, the bifurcated ends are biased apart, thereby creating a gripping force on the outer surface of the stanchion support to hold the

pin in place. The transverse end 62 is provided to assist in positioning and removal of the pin.

[0042] As shown in Figure 2, a second pin may be provided through the side walls of the lower stanchion support and through the holes in the opposite end of the stanchion to clip the stanchion support to the stanchion.

[0043] Also shown, and shown in detail in Figure 7, is a spacer plate 12. As shown in Figure 7, the spacer plate 12 includes through holes 56. In use, and as shown best in Figure 2, the spacer plate is provided between the upper stanchion support and the lower surface of the fall arrest or working platform, effectively sandwiching the extension support between the platform and the stanchion support. In this case, the projections 32 of the platform extend through the openings 56 in the extension plate 12 and into the recesses 42 of the stanchion support 4. As can be seen in Figure 12, the extension support will extend beyond the outer periphery of the platform 2. This extension extends the effective area covered by the working platform, without requiring additional platforms. The extension support piece is therefore ideal for filling small gaps around the periphery of the platform to a side wall of a void in which the support platform is provided. Also, by abutting against the side walls of a void, the support platform is more stable, being resistant to tipping.

[0044] The spacer may be of any desired size, and it is considered optimal to have spacers of different size to enable the platform to fit any desired size. However, it is preferred that the spacer has a size of around 280mm x 320mm, and a thickness of around 5mm.

[0045] It will be appreciated that the extension support piece may be used in conjunction with other fall arrest or working surface systems, and is not limited to use with a fall arrest system according to the main aspect of the present invention. It will also be appreciated that the stanchions according to the present invention can be used in other fall arrest systems.

Claims

1. A support structure comprises a platform, a plurality of stanchions, and a connector coupled to the end of each stanchion for coupling the stanchion to the platform, wherein at least one connecting pin is provided to pass through a portion of the platform, stanchion and connector to removably connect these.

2. A support structure according to Claim 1, in which the connectors are removably connected to the stanchions.

3. A support structure according to Claim 1 or Claim 2, in which the connector comprises a generally central opening for receiving one end of the stanchion, and includes at least one recess for receiving a projection from the underside of the platform.

4. A support structure according to Claim 3, in which the side walls of the opening for receiving the stanchion include aligned openings for receiving the pin, the end of the stanchion received within the opening of the connector includes similarly aligned openings for receiving the pin, the side wall of the recess of the connector include aligned holes for receiving the pin, and the at least one projection from the platform includes an aligned hole for receiving the pin when the projection is received within the recess.

5. A support structure according to Claim 3 or Claim 4, in which the openings are in the form of elongate slots which, in use, are arranged generally vertically.

6. A support structure according to any one of the preceding claims, in which a single pin is used for each connector and passing through all of the openings to ensure connection of the components.

7. A support structure according to any one of the preceding claims, in which the surface of the connector from which the projection receiving recesses extend, is formed with an embossed or gripping surface to prevent slipping.

8. A stanchion or support leg for a support structure comprising a generally tubular elongate member including axially extending grooves or ridges.

9. A support structure according to any one of Claims 1 to 7, including at least one stanchion according to Claim 8.

10. A support structure according to Claim 9, in which the connector includes mating means for mating the leg or stanchion and the connector, the mating means comprising one or more ribs or projections on the inner wall of the opening of the connector that receives the end of the stanchion, the elongate ribs or projections being received in the grooves or ridges of the stanchion.

11. A subsidiary platform for a support structure arranged to be held between the support platform and stanchion and arranged to extend beyond the outer periphery of the support platform in at least one direction.

12. A subsidiary platform according to Claim 11, comprising a generally planar platform including opening for receiving projections on a stanchion, stanchion support or support platform to hold the subsidiary platform in place.

13. A support structure according to any one of Claims 1 to 7, 9 or 10 and including a subsidiary platform

according to Claim 11 or Claim 12.

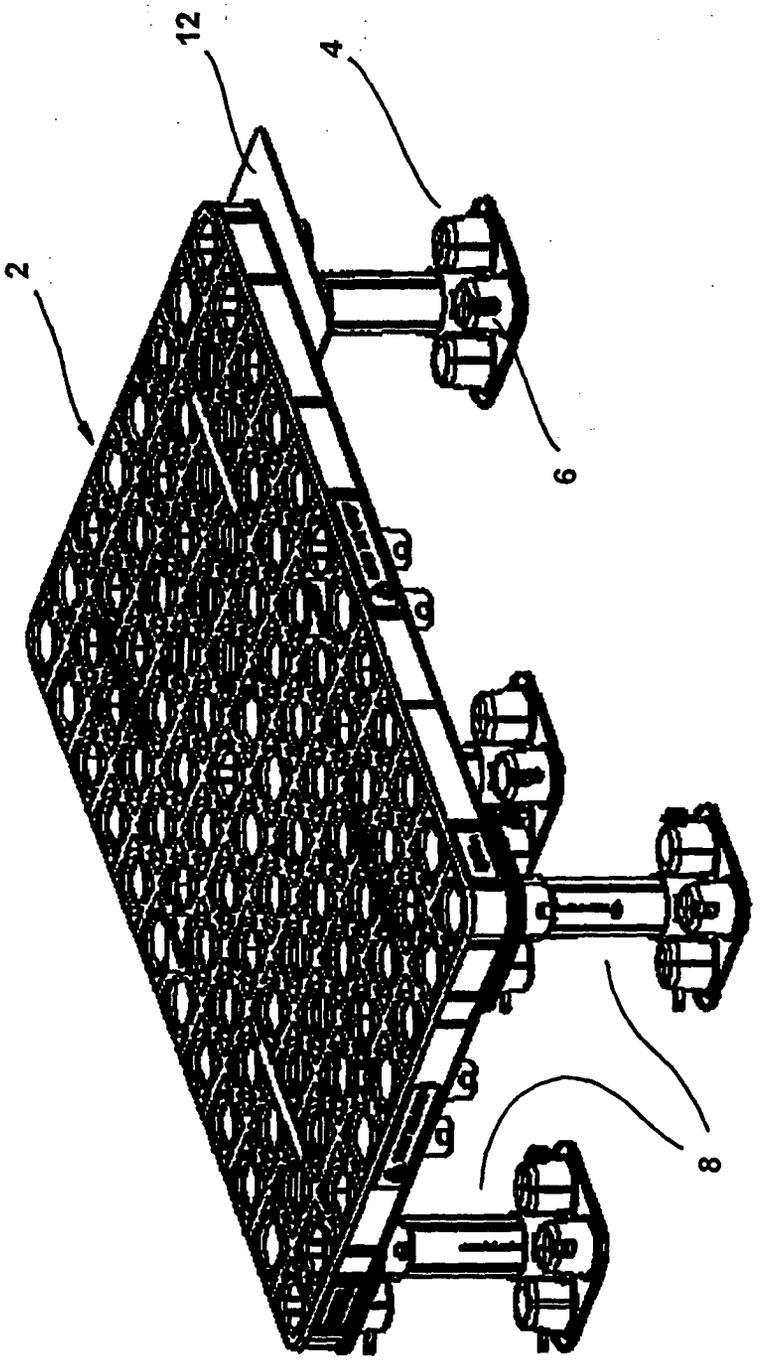
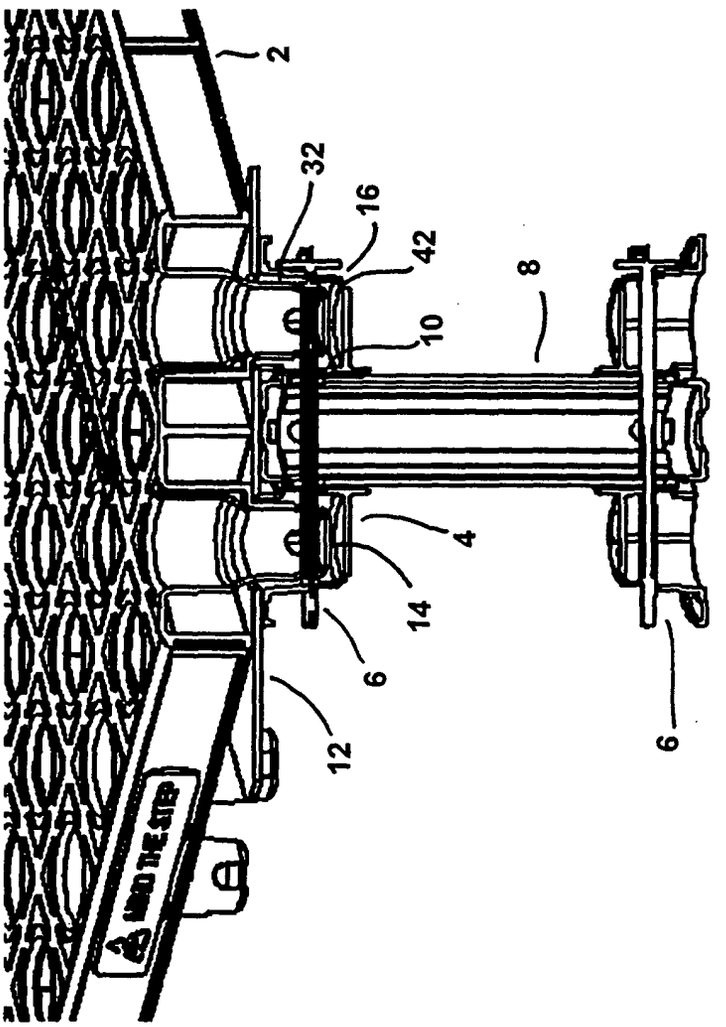


FIG. 1

FIG. 2



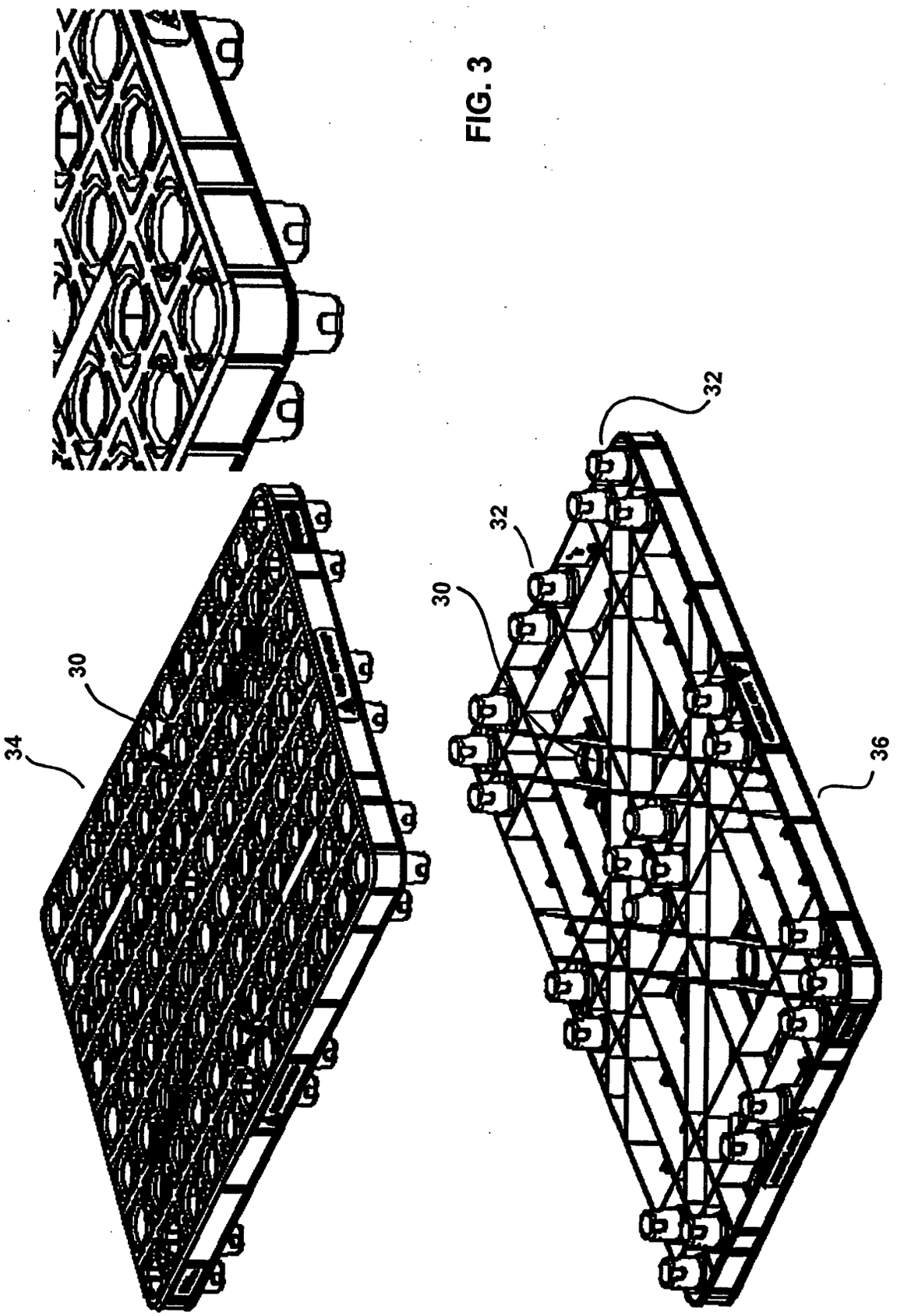


FIG. 3

FIG. 4

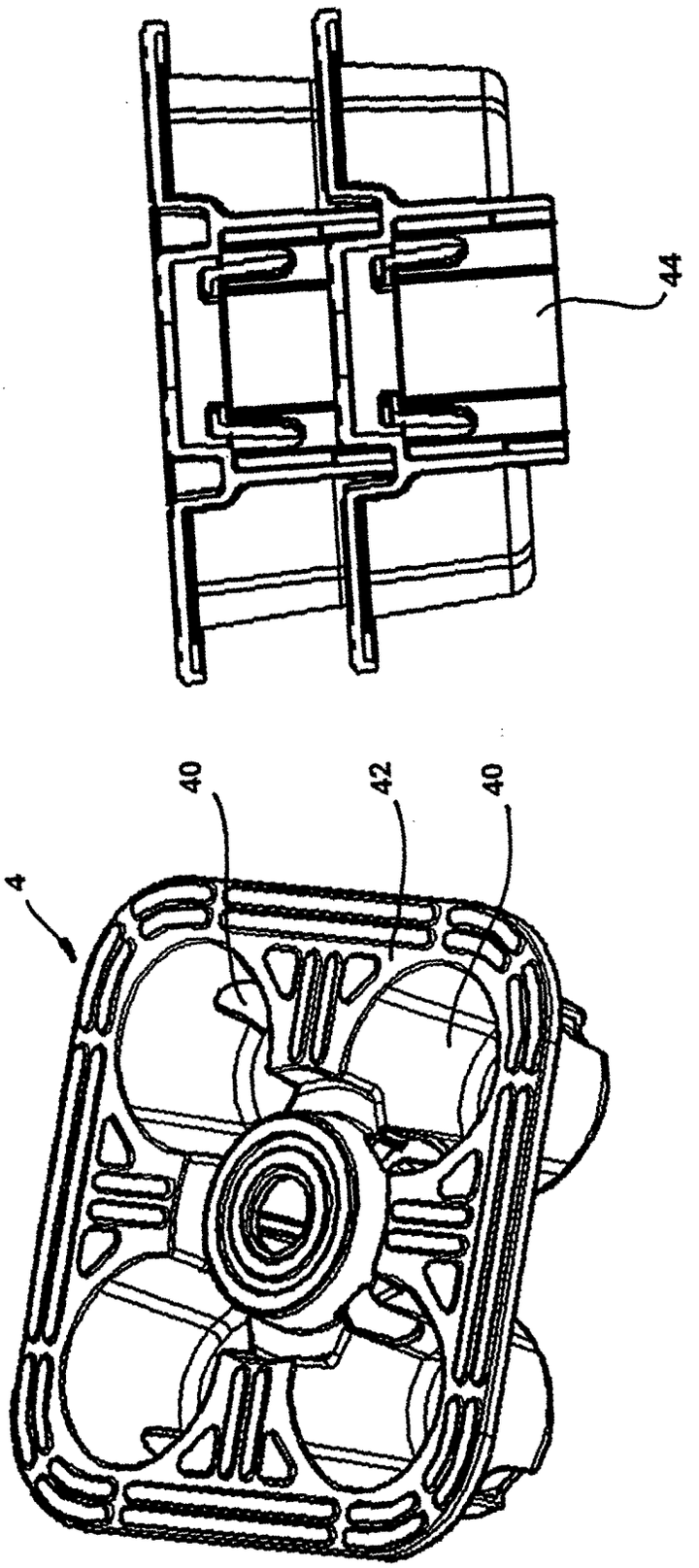
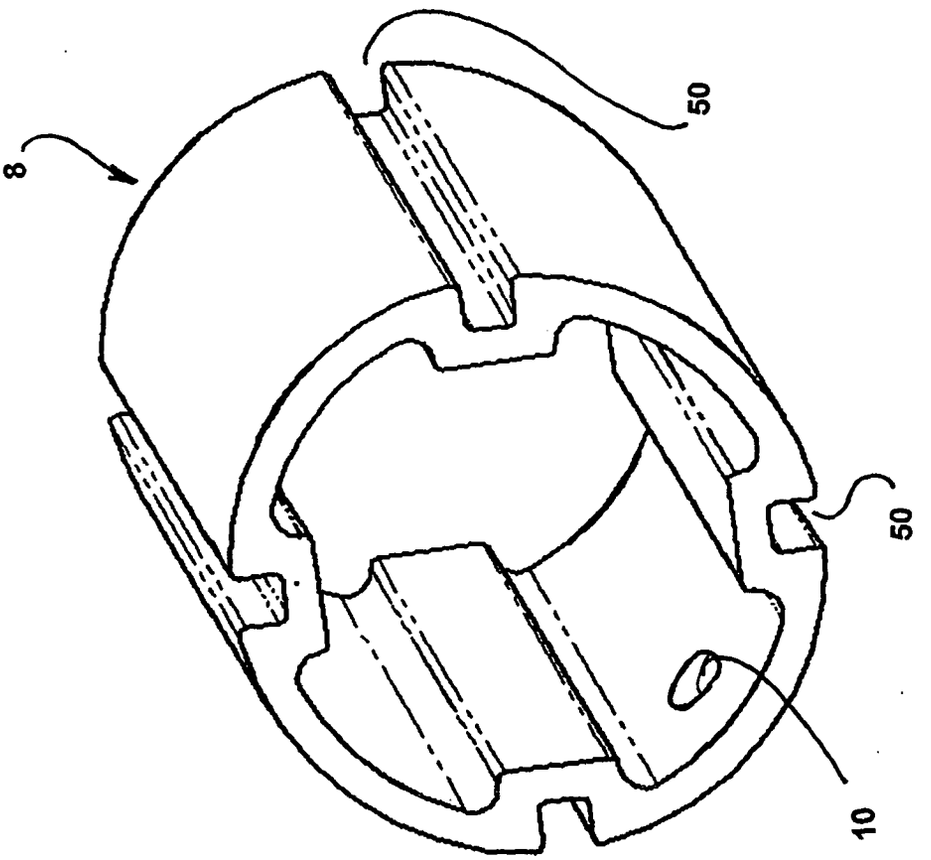


FIG. 5



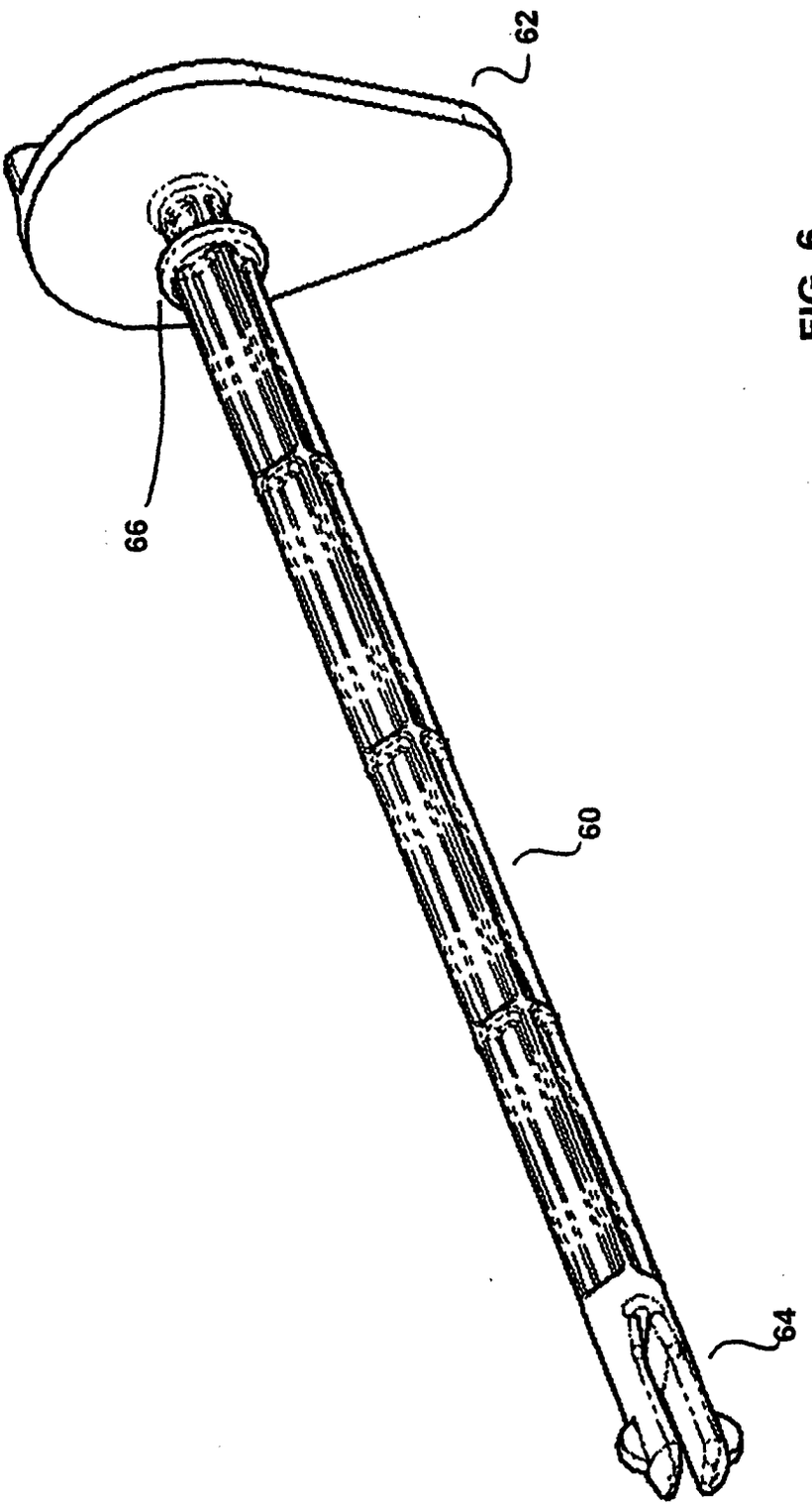


FIG. 6

FIG. 7