A fall prevention apparatus 410 for use adjacent a perimeter of an area. The fall prevention apparatus comprises a plurality of panels 440 and support means 16 for supporting the panels. The apparatus comprises a mounting arrangement 411 on the support means for mounting the panels thereon. The mounting arrangement projects from the support means to hold the panels spaced from the support means. Preferably the, or each mounting means extends substantially transverse to the support member.
Fig. 51
Fall Prevention Apparatus

This invention relates to fall prevention apparatus. More particularly, but not exclusively, this invention relates to fall prevention apparatus for use on buildings.

Known fall prevention apparatus comprises a plurality of panels mounted on supports at the edge of, for example, building roofs. Generally, the panels are mounted a few centimetres inwards of the edge. The panels can be raised individually to allow work at the edge, but provide minimal room, even when raised.

According to one aspect of this invention, there is provided a fall prevention apparatus for use adjacent a perimeter of an area, the fall prevention apparatus comprising a plurality of panels and support means for supporting the panels, wherein the apparatus comprises a mounting arrangement on the support means for mounting the panels thereon, the mounting arrangement projecting from the support means to hold the panels spaced from the support means.

The fall prevention apparatus may comprise a barrier apparatus. The fall prevention member may comprise a barrier member.

The mounting arrangement may comprise at least one mounting structure. Desirably, the mounting arrangement comprises upper and lower mounting structures. The, or each, mounting structure may extend substantially at a right angle to the support member.

The, or each, mounting structure may comprise an elongate projecting means, which may be secured to the support member. The, or each, mounting structure may comprise a holding arrangement, which may be on the projecting means. The holding arrangement may further include a hook member, which may define a holding portion. The hook member may be a wall member. The, or each, mounting structure may comprise a plurality of the hook members, which may define a plurality of the holding portions.

The plurality of the hook members may comprise an inner hook member and an outer hook member. The plurality of hook members may further include an intermediate hook member between the inner and outer hook members. Each of the hook members may be spaced from the support member. The plurality of hook
members may be sequentially spaced from the support member. The plurality of hook members may be in alignment with each other.

The plurality of holding portions may include an inner holding portion between the inner and intermediate hook members, and an outer holding portion between the intermediate and outer hook members.

The elongate projecting means may comprise a projecting portion and an adjustable means to allow the distance of the holding arrangement from the support member to be adjusted. The adjustable means may comprise a threaded portion on the projecting portion and at least one spacer. The adjustable means may comprise a plurality of spacers.

Each panel may include a main part, which may define a plurality of access openings to allow a person to reach through the panel. Each panel may include hatch member, which may be movably mounted on the main part. The hatch member may be mounted on a lower region of the main part. The hatch member may comprise a sliding hatch member, which may be slidably mounted on the main part.

The hatch member may provide an access region below, or at a lower region of, the main part. The hatch member may be movable relative to the main part between a lowered closed position and a raised open position. The hatch member may be slidably movable between the lowered closed position and the raised open position. When the hatch member is in the open position, a person can reach through to obtain access to regions on the opposite side of the hatch member.

A seal may be provided on the lower edge of the hatch member to seal against the floor or an article disposed on the floor. The seal may be formed of a resilient material, and may comprise a plurality of resilient strands that can deform. Thus, in the embodiment described herein, the seal can provide a seal around the article or discontinuities in the floor.

Each panel may have opposite first and second side edge portions and hinge formations on the side edge portions. The hinge formations on the first side edge portion may be offset relative to the hinge formations on the second side edge portion, so that the panel can be secured to an adjacent similar panel by the hinge formations on adjacent side edge portions of each panel. When so secured, the
hinge formations of the panel may overlap with the hinge formations of the adjacent panel. Each hinge formation may define an aperture. An elongate hinge pin may be provided, which extends through the apertures in the overlapping hinge formations, thereby securing the panels to each other.

A bracing member may be provided to enable the panel to be supported on the mounting arrangement. The bracing member may be received by the mounting arrangement to mount the panel on the support member. Upper and lower bracing members may be provided to enable the panel to be supported on the mounting arrangement. The upper and lower bracing members may be received by the upper and lower mounting structures.

According to another aspect of this invention there is provided a panel assembly comprising a plurality of panels as described above secured together.

According to another aspect of this invention there is provided a fall prevention apparatus for use adjacent a perimeter of an area, the fall prevention apparatus comprising a panel assembly comprising plurality of panels secured together and support means for supporting the panel assembly, wherein the apparatus comprises a mounting arrangement on the support means for mounting the panel assembly thereon, the mounting arrangement projecting from the support means to hold the panels spaced from the support means.

The panels may be secured to one another at the hinge formations. A respective hinge pin may extend through the overlapping hinge formations of adjacent panels. The, or each, elongate bracing member may extend across the plurality of panels.

The panel assembly may comprise four of the panels secured together.

The side edge portions of each panel may define aligned through holes. The side edge portions of each panel may define aligned upper and lower through holes. The upper bracing member may extend through the aligned upper through holes. Where the panel assembly has a lower bracing member, the lower bracing member may extend through the aligned lower through holes of each panel of the panel assembly. The upper and lower bracing members may be formed of a suitably rigid robust material, such as steel.
The panel assembly may comprise four of the panels secured together.

A plurality of the panel assemblies may be arranged along the side of the building. The panel assemblies may be supported on the support means by the mounting structures. The, or each, bracing member may be received by the mounting arrangement, or a respective one of the mounting structures. The, or each, bracing member of each panel assembly may be received in the inner or outer holding portions of the mounting portion

Alternatively, the panel assemblies may be supported on the support members by arranging the bracing members of some of the panel assemblies in the inner holding portions of the mounting arrangement, and by arranging the bracing members of the remaining panel assemblies in the outer holding portions of the mounting arrangement. This alternative arrangement is suitable where the length of the side of the floor along with the panel assemblies is not equal to the distance along which a whole number of panel assemblies extends.

When the plurality of the panel assemblies are so arranged, the outermost panels of adjacent panel assemblies may be secured to each other. The securing of the panel assemblies to one another may be effected by the hinge formations on the respective outer first and second side edge portions of the adjacent panels. The hinge formations may be disposed in an overlapping relation so that the apertures therein are aligned. One of the hinge pins may extend through the aligned apertures to secure the adjacent panels of adjacent panel assemblies to each other and, thereby, secure the adjacent panel assemblies to each other.

Each panel may include a gripping formation for gripping a flexible cover material. The flexible cover material may comprise netting.

Each gripping formation may comprise a gripping member defining an aperture, which may have a central region and radiating regions extending from the central region. The aperture may be a cruciform aperture. The gripping member may comprise a substantially planar member. In one embodiment, the gripping member may comprise a plate, which may be a substantially square plate. A respective gripping formation may be provided at each upper corner of each panel.
Some of the flexible material may be inserted into the aperture of each gripping formation to fasten the flexible material to each panel. Thus, when so fastened, the flexible material may extend along substantially the whole length of the fall prevention apparatus.

According to another aspect of this invention, there is provided a fall prevention apparatus for use at or adjacent a perimeter of an area, the fall prevention apparatus comprising a plurality of panels and support means for supporting the panels, each panel having an upper edge and a lower edge, the support means being configured such that, when the panels are supported by the support means, the lower edge of each panel is displaced horizontally relative to the upper edge.

The area may be a work area, which may be a work area of a building, such as a floor of a building. The floor may be on the first or a higher storey. Each panel may have a fall prevention member, which may have a front main face.

The fall prevention apparatus may comprise a barrier apparatus. The fall prevention member may comprise a barrier member.

The main face may curve concavely between the upper and lower edges. In use, the main face of each panel may be directed towards the work area. The fall prevention member may include a rear face. The fall prevention member may have a shoulder, whereby the fall prevention member defines a rebate to allow an edge region of a fall prevention member of an adjacent second panel to overlie the fall prevention member of the first mentioned panel.

The fall prevention apparatus may comprise a barrier apparatus. The fall prevention member may comprise a barrier member.

The support means may comprise a plurality of upstanding support members, and a plurality of mounting arrangements to mount the panels to the support members. Each support member may be elongate. Each mounting arrangement may comprise at least one carrying member on each support member, and at least one rail carried by the, or each, carrying member.
Each mounting arrangement may comprise upper and lower carrying members on each support member, and upper and lower rails carried respectively by the upper and lower carrying members.

The lower carrying member may be displaced horizontally relative to the upper carrying member, whereby the lower rail may be displaced horizontally relative to the upper rail. The lower carrying member may be displaced rearwards relative to the upper carrying member, whereby the lower rail may be displaced rearwards relative to the upper rail.

Each of the upper and lower carrying members may define an aperture through which the respective rail can extend. Each carrying member may comprise an annulus defining the aforesaid aperture.

The support means may comprise a plurality of mounting arrangements. A respective mounting arrangement may be provided for each support member. Each mounting arrangement may be mounted on an upper region of the respective support member. Each mounting arrangement may comprise at least one connecting member to connect the carrying members to the support member. The, or each, connecting member may comprise a sheath to receive the respective support member.

In one embodiment, the upper and lower carrying members may be attached to each other. In another embodiment, each mounting arrangement may comprise upper and lower mounting structures, which are separate from each other and thereby may be adjustable along the support member relative to each other. The upper mounting structure may comprise an upper carrying member, and the lower mounting structure may comprise a lower mounting member.

At least one attaching element may be provided on each carrying member to attach the, or each, carrying member to the connecting member. The, or each, attaching element may comprise a web member.

Where the upper and lower carrying members are attached to each other, the attaching element may attach the upper and lower carrying members to the connecting member.
Where the fall prevention apparatus mounting arrangement comprises upper and lower mounting structures, the mounting arrangement may comprise upper and lower connecting members. An upper attaching element may attach the upper carrying member to the upper connecting member. A lower attaching element may attach the lower carrying member to the lower connecting member.

Each panel may include locating means for locating the panel on the mounting arrangement. The locating means may comprise a hook portion which can be hung over the mounting arrangement. Desirably, the hook portion can be hung over the rails to extend across the rails and locate the panel on the mounting arrangement.

Each panel may include a pair of locating members. Each locating member may comprise the hook portion and a reinforcing portion. The reinforcing portion may be attached to the fall prevention member, and the hook portion may extend rearwards from the reinforcing portion and may also extend downwardly along the reinforcing portion.

Each panel may be locatable on the support means in lowered and raised positions. The locating means may comprise a first locking means to lock the panel in the lowered position, and a second locking means to lock the panel in the raised position.

When the panel is in the raised position, the embodiments described herein have the advantage that they allow a worker to work in a region of the work area below the panel.

According to another aspect of this invention, there is provided fall prevention apparatus for use adjacent a perimeter of an area, the fall prevention apparatus comprising a plurality of panels and support means for supporting the panels, each panel defining a plurality of apertures, wherein the support means comprises a holding arrangement and gripping means for gripping the panels, the gripping means comprising a plurality of gripping devices and reaction formations, wherein the gripping devices can urge the panels against the reaction formations.

The fall prevention apparatus may comprise a plurality of the holding arrangements.
The support means may comprise a plurality of support members for supporting the holding arrangements. Each holding arrangement may comprise a substantially C shaped member. Each holding arrangement may have first and second holding portions. Each holding portion may be elongate.

Each reaction formation may be provided on the holding arrangement. In one embodiment, each reaction formation may comprise an end surface of the holding arrangement. Desirably, each end surface may be an end surface of a respective one of the holding portions. In this embodiment, each gripping device may comprise a panel engaging portion for engaging the panel, and a shaft portion for securing the gripping device to the first or second holding portion.

Respective gripping devices may be configured to be secured to an end of the first and second holding portions. The shaft portion may be received in the end of the first or second holding portions.

The shaft portion may be threaded and the first and second holding portions may be correspondingly threaded to allow the gripping device to be screwed into the first or second holding portion.

The panel engaging portion may be wider than the shaft, and may be substantially circular.

Each aperture may be in the shape of a key aperture, and may have a first region for receiving the panel engaging portion, and a second region through which the shaft can extend, the second region being smaller than the panel engaging portions, thereby preventing movement of the panel engaging portions through the second region. In another embodiment, each aperture may be in the form of a slot, which may extend substantially horizontally across the panel.

In another embodiment, each reaction formation may comprise a projecting member on the holding arrangement. Each holding portion may be provided with a respective reaction formation, which may project transverse to the holding portion. In this embodiment, the gripping means may comprise urging means for urging the panels into engagement with the reaction formation.
The urging means may comprise a plurality of cam members, which may be rotatably mounted on the holding arrangements. Desirably a respective cam member may be mounted on each holding portion. Each cam members may be pivotally attached to a respective one of the holding portions.

Each cam member may be rotatable between a gripping position in which the cam member can grip the panel between the reaction formation and the cam member, and a non-gripping position in which the panel can be removed from the holding arrangements.

Each cam member may be rotatable between first and second gripping positions. In this embodiment, when the cam member is in the first gripping position, the cam member may grip the panel between the reaction formation and the cam member. When the cam member is in the second gripping position, the cam member may grip two overlapping panels between the reaction formation and the cam member. In this embodiment, the second gripping position may be between the first gripping position and the non-gripping position.

The support means may further include securing means for securing the holding arrangements to the support member. The securing means may comprise a plurality of sleeve arrangements. Each sleeve arrangement may comprise a first sleeve portion to receive the support member and a second sleeve portion to receive the upper or lower holding portion.

The first and second sleeve portions may be oriented transverse to each other. The first and second sleeve portions may be oriented substantially at right angles to each other. The securing means may further include a respective insertion member for each of the first and second sleeve portions. Each sleeve portion may define an aperture through which the insertion member can be inserted.

Each holding portion and each support member may define apertures to receive the insertion member when the insertion members are inserted through the aperture in the sleeve portions. Each insertion member may comprise a pin.

Each holding portion may be elongate and may be cylindrical. A connecting member may extend between the first and second holding portion.
The panel may comprise front and rear skins. The panel may include a plurality of downwardly extending fingers. The plurality of fingers may be provided on the front or rear skin, and may extend downwardly from the lower edge of the front or rear skin. The plurality of fingers may be formed of a resiliently deformable material, which may be an elastomeric material, such as rubber. The fingers may be arranged side by side. Each finger may have an upper edge and a lower edge.

The fingers may be substantially rectangular in configuration, and may be secured at their respective upper edges to the front face of the rear skin. The fingers may be secured as aforesaid along a line spaced from the lower edge of the rear skin.

The fall prevention apparatus may include a plurality of receiving arrangements for holding the support members. Each receiving arrangement may comprise a receptacle to receive a respective one of the support members. Each receptacle may define a cavity into which the respective support member can be received.

The fall prevention apparatus may include a plurality of attaching arrangements to attach the support members to a base member. Each attaching arrangement may include a respective one of the receiving arrangements. Each attaching arrangement may comprise clamping means to clamp the base member, thereby attaching the receiving arrangement to the base member.

According to another aspect of this invention, there is provided an attaching arrangement for attaching a support member to a base member, the attaching arrangement comprising a receptacle to receive the support member, and clamping means to clamp the base member.

The receptacle may define a cavity to receive the support member. The cavity may be substantially cylindrical.

The attaching arrangement may comprise a fastening means to fasten the support member to the attaching arrangement.

The fastening means may comprise a bayonet fitting. The support member may comprise a fastening region at one end thereof.

In a first embodiment, the fastening means may comprise a fastening element extending into the cavity. The fastening region may define a substantially L shaped
passage or slot for receiving the fastening element. Desirably, the fastening region defines a pair of opposed substantially L shaped passages or slots. In one embodiment, the fastening element may comprise a threaded fastener, such as a screw or bolt, screwed into the cavity. The fastening region may define a pair of substantially L shaped passages or slots for receiving the fastening element.

In a second embodiment, the fastening means may comprise a channel portion on the receptacle and a fastening element on the support member. In this embodiment, the channel portion may define a substantially L shaped channel. The fastening element may be provided on the fastening region of the support member. The fastening element may be configured to be received in the channel. The fastening element may extend radially outwardly from the support member.

The channel portion may define a pair of substantially L shaped channels, and the fastening region may comprise a pair of fastening elements, each of which may extend radially outwardly from the support member. The channels may be arranged opposite each other, and the fastening elements may be arranged opposite each other.

In a third embodiment, the fastening means may comprise a pair of fastening elements on the receptacle. The fastening means may extend into the cavity. The fastening elements may be arranged substantially opposite each other.

Each fastening element may comprise a projection on the receptacle. Each projection may comprise a cylindrical member. Each projection may comprise a stud.

Each receiving arrangement may further include strengthening members extending from the receptacle. The strengthening members may extend radially outwardly from the receptacle. The strengthening members may comprise ribs.

The clamping means may comprise first and second clamping members. The base member may comprise an I beam.

The clamping means may further include tightening means co-operable with the clamping members to tighten the clamping members onto the base member, thereby
clamping the base member. The tightening means may comprise threaded fasteners, such as screws or bolts.

The receptacle may be attached to the first clamping member. Each of the first and second clamping members may be substantially V shaped. The first and second clamping members may include respective first and second co-operating formations which can co-operate with each other to allow the clamping members to be fastened to each other.

The attaching arrangement may be slidable along the base member to a desired position. The base member may have an elongate flange member having opposite edge regions. The flange member may be an upper flange member. The substantially V shaped clamping members may be configured to receive respective opposite edge regions of the elongate flange member.

In the first embodiment, one of the first and second co-operating formations may comprise a socket portion, and the other of the first and second co-operating formations may comprise an insertion portion for insertion into the socket portion. The fastening means may be receivable by the insertion portion and the socket portion to fasten the clamping members to each other.

In the second embodiment, the first and second co-operating formations may comprise receiving formations for receiving a threaded fastener, such as a bolt. Each of the first and second co-operating formations may have respective first and second receiving apertures defined therein. The threaded fastener may extend through the first and second bolt receiving apertures to fasten the first and second clamping members to each other.

In the third embodiment, the clamping means may comprise a locking arrangement. The locking arrangement may comprise a threaded fastener and a locking member for receiving the threaded fastener, the locking member being pivotally mounted on a support for movement between locking and non-locking positions. When the threaded fastener is received by the locking member, the threaded fastener can be turned in a first direction to move the locking member pivotally to the locking position and the threaded fastener can be turned in an opposite second direction to move the locking member pivotally to the non-locking position.
In another embodiment of the attaching arrangement, the clamping means may comprise first and second clamping arrangements. At least one of the first and second clamping arrangements, and desirably each of the first and second clamping arrangements, may comprise a fixed clamping member for engaging a first side of the base member, and a moveable clamping member, moveable relative to the fixed clamping member, for engaging the opposite second side of the base member.

The fixed clamping member may define an aperture through which at least a part of the moveable clamping member can move. The moveable clamping member may be slidable relative to the fixed clamping member.

Each of the first and second clamping arrangements may comprise a driver extending between the fixed and movable clamping members. The driver may be configured to drive the moveable clamping member. The moveable clamping member may comprise a driver receiving portion for receiving the driver. The driver may comprise a bolt.

Movement of the driver in a first direction may drive the moveable driving member towards the fixed clamping member, to clamp the base member between the fixed clamping member and the moveable clamping member. Movement of the driver in a second opposite direction may drive the moveable clamping member away from the fixed clamping member, to release the base member from the first or second clamping arrangement.

The moveable clamping member may include a clamping portion for engaging the base member, whereby the base member can be clamped between the fixed clamping member and the moveable clamping member.

Desirably, the moveable clamping member comprises a pair of clamping portions. The fixed clamping member may define a pair of apertures through each of which a respective one of the pair of clamping portions can extend.

The driver receiving portion may be U shaped having a pair of downwardly extending arms to define the U shape. The clamping portions may constitute extensions of the respective arms. The fixed clamping member may comprise a substantially flat plate.
The driver may be threadably received in the moveable clamping member. The driver may be threadably received by the bolt receiving portion.

The clamping means may further include an elongate force transmitting member for transmitting the force from the driver to the fixed clamping member. The driver may engage the force transmitting member. The driver may engage the force transmitting member to urge the force transmitting member onto the fixed clamping member.

The elongate force transmitting member may extend between the first and second clamping arrangements, thereby connecting the first and second clamping arrangements to each other. The elongate force transmitting member may have a rectangular profile. The receptacle may be provided on the force transmitting member or on the fixed clamping member. The receptacle may define aligned apertures, through which the force transmitting member can extend. The fixed clamping member may include a socket portion to receive the receptacle. The socket portion may define further aligned apertures, through which the force transmitting member can extend. The further aligned apertures may be aligned with the first mentioned aligned apertures.

In one embodiment, the force transmitting member may extend between the first and second clamping arrangements, thereby connecting the first and second clamping arrangements to each other.

According to another aspect of this invention, there is provided a locking arrangement comprising a threaded fastener and a locking member for receiving the threaded fastener, the locking member being pivotally mounted on a support for movement between locking and non-locking positions, wherein when the threaded fastener is received by the locking member, the threaded fastener can be turned in a first direction to move the locking member pivotally to the locking position and the threaded fastener can be turned in an opposite second direction to move the locking member pivotally to the non-locking position.

When the locking member is in the non-locking position, the locking member may extend substantially perpendicularly to the threaded fastener. When the locking
member is in the locking position, the locking member may be canted relative to the threaded fastener.

The locking arrangement may include urging means to urge the locking member to the locking position. The urging means may comprise resilient urging means, such as a spring. The spring may comprise a compression spring. The urging means may extend between the support and the locking member.

The locking member and the urging means may be provided within the receptacle. An aperture may be defined in the receptacle, through which the threaded fastener can extend to the locking member.

The locking arrangement may include a receptacle for receiving the threaded fastener. When the threaded fastener is received by the locking member and the receptacle, the receptacle can be attached to the locking member when the locking member is in the locking position.

In the third embodiment, the locking member can be provided on one of the first and second clamping members, and the receptacle can be provided on the other of the first and second clamping members. Thus, when the locking member and the receptacle are attached to each other, the first and second clamping members can be clamped to the base member.

In the third embodiment, the support may comprise the receptacle. The locking member may be disposed in the receptacle.

In the second and third embodiments, the attaching arrangement may comprise a carrying member on which the receptacle is carried. The carrying member may be substantially rectangular in configuration. The carrying member may comprise a substantially planar member, which may be a substantially flat plate.

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

Figure 1 is a perspective view of a first embodiment of a fall prevention apparatus, showing a plurality of panels mounted on a support means;
Figure 2 shows a panel and the support means of the first embodiment, in which the panel is in a position prior to being mounted on the support means;

Figure 3 shows the panel and support means shown in Figure 2, in which the panel is mounted on the support means;

Figure 4 is a side view of the panel of the first embodiment, the panel being mounted on the support means, with the panel in a lowered position thereon;

Figure 5 is a side view of the panel of the first embodiment, the panel being mounted on the support means, with the panel in a raised position thereon;

Figure 6 is a close up side view of a mounting arrangement of the first embodiment, the mounting arrangements being for mounting the panels on the support means;

Figure 7 shows the first embodiment of the fall prevention apparatus in which a plurality of panels are in a lowered position, and one panel is in a raised position;

Figure 8 shows an attaching arrangement of the first embodiment, the attaching arrangement being for holding a support member;

Figure 9 shows an assembled attaching arrangement of the first embodiment, the attaching arrangement being about to be clamped onto a base member;

Figure 10 shows a plurality of attaching arrangements of the first embodiment clamped onto the base member;

Figure 11 shows a support member of the first embodiment being inserted into a holding arrangement, being part of the attaching arrangement;

Figure 12 shows a support means of the first embodiment for supporting the panels;

Figure 13 is a side view of a panel of a second embodiment, with upper and lower mounting structures in a first position, and the panel being mounted on a support means with the panel in a lowered position thereon;

Figure 14 is a side view of the panel of the second embodiment, with the upper and lower mounting structures in the first position, and the panel being mounted on the support means, with the panel in a raised position thereon;
Figure 15 is a side view of a panel of the second embodiment, with upper and lower mounting structures in a second position, and the panel being mounted on a support means with the panel in a lowered position thereon;

Figure 16 is a side view of the panel of the second embodiment, with the upper and lower mounting structures in the second position, and the panel being mounted on the support means, with the panel in a raised position thereon;

Figure 17 shows a further embodiment of an attaching arrangement, with a support member having radially outwardly extending pins thereon;

Figure 18 shows the embodiment shown in Figure 17, with a support member having L shaped slots for receiving a fastening element in a support member;

Figure 19 shows the attaching arrangement shown in Figure 18 mounted on a base member;

Figure 20 shows the attaching arrangement shown in Figure 19 with decking disposed on the base member;

Figure 21 shows a sectional view of the embodiment shown in Figures 17 to 20;

Figure 22 shows an exploded view of an embodiment of an attaching arrangement showing fastening means;

Figure 23 is a perspective view of a third embodiment of an attaching arrangement;

Figure 24 is a sectional perspective view of the attaching arrangement shown in Figure 23;

Figure 25 is a perspective view of the attaching arrangement shown in the Figure 23, clamped to a base member;

Figure 26 is a top plan view of the attaching arrangement shown in Figure 25, with a locking member in a non-locking position;

Figure 27 is a view similar to Figure 26, with the locking member in a locking position;
Figure 28 is a perspective view of a further embodiment of a fall prevention apparatus;

Figure 29 is a close up of the region marked XXIX in Figure 28;

Figure 30 is a side view of the fall prevention apparatus shown in Figure 28;

Figure 31 shows an upstanding member for use in the fall prevention apparatus shown in Figures 28 to 33;

Figure 32 shows the upstanding member shown in Figure 31 with a holding arrangement;

Figure 33 shows a view similar to Figure 32 with gripping devices;

Figure 34 shows a support means for use in the fall prevention apparatus shown in Figures 28 to 30

Figure 35 shows a panel about to be mounted on the support means shown in Figure 34;

Figure 36 shows the panel mounted on the support means shown in Figure 34;

Figure 37 shows a further embodiment of an attaching means;

Figure 38 shows the attaching means depicted in Figure 37 mounted on a base member;

Figure 39 shows the attaching means depicted in Figure 38 about to receive an upstanding member;

Figure 40 shows a further version of the attaching means depicted in Figure 37;

Figure 41 shows a further embodiment, which includes gripping means, showing the gripping means in a non-gripping position;

Figure 42 shows the embodiment depicted in Figure 41, in which the gripping means is in a first gripping position;

Figure 43 shows two overlapping panels, in which the gripping means at the overlapping region of the panels is in a second gripping position;
Figure 44 shows a further holding arrangement;

Figure 45 shows the holding arrangement shown in Figure 44, with gripping means thereon;

Figure 46 shows the holding arrangement shown in Figures 44 and 45, with a panel thereon.

Figure 47 shows a further embodiment of the fall prevention apparatus;

Figure 48 shows a plurality of attaching arrangements mounted on a base member;

Figure 49 shows a plurality of support members attached to the base member by the attaching arrangements;

Figure 50 shows one of the support members prior to its attachment to the base member;

Figure 51 is a close up of a mounting arrangement;

Figure 52 shows a plurality of panels mounted on the support members to form the fall prevention apparatus;

Figure 53 shows a plurality of panels, in which a hatch member is in an open position;

Figure 54 shows a hatch member;

Figure 55 shows hinge formations on a side edge portion of a panel;

Figure 56 shows hinge formations on an opposite side edge of the panel shown in Figure 55;

Figure 57 shows two panels attached to each other by means of the hinge formations;

Figure 58 shows the fall prevention apparatus with two rows of panels extending transverse each other;

Figure 59 shows a panel assembly comprising a plurality of panels;
Figure 60 is a close up of a mounting arrangement upon which one of the panels is mounted;

Figure 61 shows two rows of panels overlapping each other;

Figure 62 is a close up of a panel showing a gripping formation; and

Figure 63 shows a fall prevention apparatus with a flexible material attached thereto by the gripping formations.

Figure 1 shows a fall prevention apparatus 10 for use around the edge of a work area 100, for example a floor being constructed in a new building. The fall prevention apparatus 10 comprises a plurality of panels 12 and a support means 14 for supporting the panels 12. In the embodiments described herein, the fall prevention 10 comprises a barrier apparatus.

The support means 14 comprises a plurality of elongate, upright support members 16 in the form of poles. The support members 16 are attached to an elongate base member 18 and are spaced from each other along the length of the base member 18.

The base member 18 is in the form of an I beam comprising an elongate web 20 and a pair of opposed upper and lower rectangular flanges 22A, 22B. The support members 16 are attached to the upper flange 22A by attaching arrangements 48 (see below). The attaching arrangements 48 are shown in more detail in Figures 8 to 12 and described below.

One of the panels 12 is shown in more detail in Figures 2 to 5. Each panel 12 comprises a fall prevention member 26 having a concavely curved front main face 28 and a rear face 30. The concave curvature of the front main face 28 can be more clearly seen in Figure 4. In the embodiments described herein, the fall prevention member 26 comprises a barrier member

The front main face 28 is directed in use towards the work area 100. The fall prevention member 26 is substantially rectangular in shape, having an upper edge 32 and a lower edge 34.
The right hand edge region of the fall prevention member 26 has a rearward extending shoulder 36 to provide a rebate 38 extending from the shoulder to the right hand edge. The rebate 38 allows the fall prevention member 26 of the adjacent panel 12 to overlap the first mentioned panel 12, thereby making the fall prevention apparatus 10 more secure.

The panel 12 further includes a locating means 40 on the fall prevention member 26 for mounting the panel 12 on the support means 14. The locating means 40 comprises a pair of locating members 42 attached to the rear face 30 of the fall prevention member 26. Each locating member 42 comprises a reinforcing portion 44 attached to the rear face 30 of the fall prevention member 26. The reinforcing portion 44 is provided to reinforce and strengthen the fall prevention member 26. Each locating member 42 also includes a hook portion 46 extending rearwards from the upper end of the reinforcing portion 44 and downwardly along the reinforcing portion 44.

The support means 14 further includes a plurality of mounting arrangements 50 for mounting the panels 12 on the support means 14. A respective mounting arrangement 50 is provided for each of the support means 14. Each mounting arrangement 50 is provided at the upper end region of each support member 16.

Each mounting arrangement 50 comprises a connecting member in the form of a sheath 51 in which an upper end region of a respective one of the support members 16 is received.

Upper and lower carrying members 52, 54 are attached to the sheath 51 by an attaching means comprising a web member 56. Each of the upper and lower carrying members is in the form of an annulus. An upper rail 58 extends through each upper carrying member 52 and a lower rail 60 extends through each lower carrying member 54.

Figure 6 shows a close up side view of a mounting member 50 one of the support members 16. The lower carrying member 54 is displaced rearwards relative to the upper carrying member 52, and is further away from the sheath 51 than the upper carrying member 52.
In order to mount the panel 12 on the support means 14, the locating members 42 are arranged so that the upper rail 58 is received between the hook portion 46 and the reinforcing portion 44 of each locating member 42. The panel 12 is then lowered so that the lower rail 60 is received between the hook portion 46 and the reinforcing portion 44, and is further lowered until the upper rail 58 engages the rearward extending region of the hook portion 46, as shown in Figures 3 and 4. The position of the panel 12 in Figures 3 and 4 is a lowered position. Each panel 12 may include first locking means to lock the panel 12 to the upper and/or lower rail 60 in the lowered position.

The rearward displacement of the lower carrying member 54 relative to the upper carrying member 52 causes the fall prevention member 26 to be cantilevered rearwards, so that the lower edge 34 thereof is displaced rearwards relative to the upper edge 32. As can be seen from Figure 1, the lower edge 34 is also displaced rearwards relative to the support member 16, as indicated by the double headed arrow A in Figure 4.

In the embodiment described herein, the rearward canting of the fall prevention member 26 provides room for work to be carried out behind the support means 14. This is not possible with prior art vertical panels 12. Moreover, the concave curvature of the main face 28 provides further room for such work.

In some circumstances, it is necessary to carry out work behind the panels 12. In such circumstances, the panels 12 can be moved to a raised position, as shown in Figures 1, 5 and 7. In the raised position, only the upper carrying member 52 is received between the hook portion 46 and the reinforcing portion 44 of the locating member 42. Each panel 12 may include second locking means to lock the panel 12 to the upper rail 58 in the raised position.

Figure 7 shows six panels 12 mounted on the support means 14. In this Figure the construction of the floor has been largely completed. Five of the panels 12 are in the lowered position, and one is in the raised position. The raised panel 12 is shown with a cladding plate beneath 62. Such plates 62 are installed in the final step of constructing a floor and, in the situation shown in Figure 6, the cladding plate 62 shown is to be installed behind the panels 12. As can be seen from Figure 6, individual panels 12 can be raised to allow the installation, which provides greater
safety than prior art fall prevention apparatus, in which a whole section between adjacent supports would have to be raised.

Figures 8 to 12 show the support means 14 and the method by means of which it is constructed. Figure 8 shows an attaching arrangement 48 comprising a holding arrangement in the form of a receptacle 70 and clamping means 72 for attaching the receptacle 70 to the upper elongate flange 22A. The receptacle 70 is in the form of a tubular, substantially cylindrical member. The receptacle 70 defines a cavity 74 to receive a lower region of one of the support members 16.

Referring to Figure 8, the clamping means 72 comprises first and second V shaped clamping members 76, 78, which engage, and receive in the V of each V shaped member 76, 78, respective opposite edges of the upper flange 22A of the base member 18. The receptacle 70 is attached to the first clamping member 76, for example, by welding.

The second clamping member 78 is fastened to the first clamping member 76 by fastening means comprising first and second threaded fasteners in the form of first and second bolts 80. In the embodiment shown in Figures 8 and 9, the fastening means further includes first and second co-operating formations. The first and second bolts 80 extend through first and second co-operating formations on the first and second clamping members 76, 78 respectively

In the embodiment shown, the first co-operating formation on the first clamping member 76 comprises a socket portion 82, and the second co-operating formation on the second clamping member 78 comprises an insertion portion 84 that can be inserted into the socket portion 82.

The socket portion 82 defines two threaded apertures 86 into which the first and second bolts 80 can be screwed. The insertion portion 84 defines two unthreaded apertures 88 which are aligned with the threaded apertures 86 when the insertion portion 84 is inserted into the socket portion 82.

The first and second bolts 80 extend through the unthreaded apertures 88 in the insertion portion 84 and are screwed into the threaded apertures 86 to secure the first clamping member 76 to the second clamping member 78.
The receptacle 70 defines a third threaded aperture 90 into which a third threaded fastener, in the form of a third bolt 92, can be screwed. The third bolt 92 extends into the cavity 74 therein and provides a fastening element to fix the support member 16 to the attaching arrangement 48, as explained below.

Figure 9 shows the first and second clamping members 76, 78 loosely fastened to each other with the first and second bolts 80. The first and second clamping members 78 are slid over the upper flange 22A of the base member 18 as indicated by the arrow B to a desired position on the base member 18.

The first and second bolts 80 can then be tightened to clamp the first and second clamping members 76, 78 onto the upper flange 22A. Figure 10 shows the base member 18 with three attaching arrangements 48 clamped thereon.

Figure 11 shows a support member 16 being inserted into the cavity in the receptacle 70. The lower end region of the support member 16 has a fastening portion 94 defining an L shaped slot 96, to provide a bayonet fitting for the support member 16.

By inserting the support member 16 so that the fastening element in the cavity 74 is received in the L shaped slot 96, and thereafter rotating the support member 16 about its main axis, as indicated by the arrow C, the support member 16 is fastened to the attaching arrangement 48.

Figure 12 shows an assembled support means 14, in which three support members 16 support the upper and lower rails 58, 60.

There is thus described a barrier apparatus 10 which, in the embodiment described herein, has the advantage of providing more room to access regions adjacent and behind the apparatus, and yet providing enhanced levels of safety.

The barrier apparatus 10 shown in the drawings can be mounted within the building. This provides an advantage over prior art systems, which are mounted on the edge of a building, thereby needing to be removed in order to add cladding and the brackets for such cladding.

A further advantage of the barrier apparatus 10 shown in the drawings is that the concavely curved front main face 28 provides benefits in the raised and lowered
positions of the panel 12. When the panel 12 is in the lowered position, the concave curvature of the front main face 28 allows more room than prior art panels for a worker to work immediately adjacent the panel 12. Also, when the panel 12 is in the raised position, the concave curvature of the front main face 28 provides more headroom than prior art panels.

The embodiment shown in Figures 13 to 21 comprises many of the same features as the embodiment shown in Figures 1 to 12. Those features have been designated with the same reference numerals as the corresponding features in Figures 1 to 12.

The embodiment shown in Figures 13 to 21 differs from the embodiment shown in Figures 1 to 12, in that the mounting arrangement 50 comprises upper and lower mounting structures 150A and 150B. The lower mounting structure 150B is adjustably mounted on the support member 16, such that the position of the lower mounting structure 150B thereon can be adjusted along the length of the support member 16.

In Figures 13 and 14, the lower mounting structure 150B is in a first position, and in Figures 15 and 16, the lower mounting structure 150B is in a second position. The lower mounting structure 150B is closer to the upper mounting structure 150A in Figures 13 and 14 than it is in Figures 15 and 16.

When the upper and lower mounting structures 150A and 150B are closer together, the lower edge 34 of the fall prevention member 26 is further from the support member 16 than when the upper and lower mounting structures 150A and 150B are further apart. This can be seen by comparing Figures 13 and 15.

The ability to adjust the position of the lower edge 34 relative to the support member 16 provides the advantage in the embodiment shown in Figures 13 to 16 that the lower edge 34 can be maintained level with the edge of the floor, even when the distance of the base member 18 (and the support member 16) from the edge of the floor is varied.

Figures 14 and 16 show the panel 12 in raised positions for the purpose discussed above.
The upper mounting structure 150A comprises an upper connecting member in the form of an upper sheath 151A. The upper mounting structure 150A further includes an upper carrying member 152A and an upper web member 156A attaching the upper sheath 151A to the upper carrying member 152A.

Similarly, the lower mounting structure 150B comprises a lower connecting member in the form of a lower sheath 151B and further includes a lower carrying member 154B and a lower web member 156B attaching the lower sheath 151B to the lower carrying member 154B.

Figures 17 to 21 show an attaching arrangement 148 of the second embodiment. The attaching arrangement 148 comprises many of the features of the attaching arrangement 48 described above and these features are designated with the same reference numerals as in Figures 1 to 12.

The attaching arrangement 148 differs from the attaching arrangement 48 in that, in addition to a bayonet fitting comprising the bolt 92 extending through the cavity 74, the receptacle 70 also includes a bayonet fitting comprising a pair of opposed channel portions 192 (see Figure 18).

When the bolt 92 is received through the aperture 90, the L shaped slot 96 in the fastening region 94 of the support member 16 receives the bolt 92 therein and by twisting the support member 16 in the direction indicated by the arrow D, the support member 16 is fastened to the attaching arrangement 148.

Referring to Figure 18 and 21, each of the channel portions 192 defines a channel 192A. The fastening region 94 is provided with two opposite radially outwardly extending pins 192B. When the support member 16 is inserted in to the cavity 74, the pins 192B are received in the channels 192A. When the pins 192B reach the lower end of the channels, the support member 16 can be twisted in the direction indicated by the arrow E to fasten the support member 16 to the attaching arrangement 148.

Figures 19 and 20 show the steps for installing the attaching arrangement 148 and support member 16 on the base member 18 and thereafter installing decking 110 thereon. In order to install the decking, it needs to be mounted on the base member
18. As a result, the decking 110 has to be cut around the attaching arrangement 148.

The first V shaped clamping member 76 comprises an upper portion 76A of the V and a lower portion 76B. In the second embodiment, the upper portion 76A is in the form of a rectangular flat plate. The shape of the upper portion 76A facilitates the cutting of the decking 110 around the upper portion 76A, thereby making it easier to install.

The fastening means for fastening the first and second clamping members 76, 78 to each other is not shown in Figures 17 to 21. An example of fastening means is shown in Figure 22.

The fastening means comprises a first co-operating formation in the form of a first bolt receiving formation 182 attached to the receptacle 70 and to the upper portion 76A. A first through aperture 183 extends through the bolt receiving formation 182.

The fastening means further includes a second co-operating formation comprising a second bolt receiving formation 184 attached to the second clamping member 78. A second through aperture 185 extends through the second bolt receiving formation 184.

A threaded fastener, in the form of a bolt 180, is received through the first and second through apertures 183, 185, and a nut 181 is screwed onto the bolt 180. The nut 181 is then tightened onto the bolt 180 thereby pulling the first and second clamping members 76, 78 towards each other and clamping them onto the base member 18.

Figures 23 to 27 show a third embodiment of an attaching arrangement for holding a fall prevention apparatus 10. In Figures 23 to 27, the attaching arrangement is generally designated 248. The attaching arrangement 248 comprises many of the features of the attaching arrangements 48 and 148 described above and these features are designated with the same reference numerals as in Figures 1 to 22.

The embodiment shown in Figures 23 to 27 includes the clamping means 72, which comprises the first and second clamping members 76, 78. The clamping means 72
further includes a locking arrangement 250 disposed within the cavity 74 of the receptacle 70.

The locking means 250 comprises the bolt 180, a locking member 252 and urging means in the form of a spring 254, such as a compression spring. An aperture 256 is defined in the receptacle 70 through which the bolt 180 can be inserted, thereby allowing the bolt 180 to be received in the cavity 74, as shown in Figures 26 and 27.

The locking member 252 and the spring 254 are disposed within the cavity 74 defined by the receptacle 70. The locking member 252 is pivotally mounted on the receptacle 70 and is pivotally movable between a locking position shown in Figure 27 and a non-locking position shown in Figure 26. The spring 254 urges the locking member 252 to the locking position.

The locking member 252 defines a hole 258 (see Figure 24) through which the bolt 180 extends when the bolt 180 has been inserted in the cavity 74 via the aperture 256. When the locking member 252 is in the locking position, shown in Figure 27, it is canted relative to the bolt 180 so that the edge of the hole 258 engage the threads on the bolt 182, thereby fastening the locking member 252 to the bolt 180.

In this position of the locking member 252, the bolt 180 can be screwed into the hole 258, thereby tightening the second clamping member 78 onto the I beam 18. The spring 254 ensures that the locking member 252 is pushed into engagement with the bolt 180.

When the locking member 252 is in the non-locking position, shown in Figure 26, the bolt 180 can be slid relative to the locking member 252 as indicated by the arrow A in Figure 26.

Referring to Figures 25 to 27, the first and second clamping members 76, 78 are arranged on the I beam 18. The bolt 180 is inserted through the second clamping member 78 into the receptacle 70 via the aperture 256. When the bolt 180 is so inserted, the locking member 252 is initially in the locking position, being urged to the locking position by the spring 254. The hole 258 in the locking member 252 is aligned with the aperture 256, so that insertion of the bolt 180 into the receptacle 70 causes the bolt 180 to be received by the hole 258.
With the locking member 252 in the locking position, the threads on the bolt engage the edge of the hole 258. Further insertion of the bolt 180 pushes the locking member 252 to the non-locking position, thereby allowing the bolt 180 to be inserted through the hole 258 to the position shown in Figure 26. With the locking member 180 in the non-locking position, the bolt 180 can then be screwed into the hole 258 in the locking member 252.

The screwing of the bolt 180 into the hole 258 in the locking member 252 moves the locking member 252 to the locking position, as shown in Figure 27 and further screwing of the bolt 180 into the hole 258 tightens the first and second clamping members 76, 78 on the I beam 18.

The first and second clamping members 76, 78 can be removed from the I beam 18 by unscrewing the bolt 180 from the locking member 252.

Figures 28 to 40 show a further embodiment of a fall prevention apparatus, generally designated 210, which comprises many of the features of the embodiments described above, and these features have been designated with the same reference numerals as the corresponding features in the above described embodiments.

In Figures 28 to 30, the fall prevention apparatus 210 comprises a plurality of panels 212, each having substantially planar front and rear skins 216, 218. Each of the front skins 216 defines upper and lower rows of front key apertures 220A, 220B. Correspondingly, each of the rear skins 218 defines upper and lower rows of rear key apertures 222A, 222B. The front and rear upper key apertures 220A, 222A are aligned with each other, and the front and rear lower key apertures 220B, 222B are also aligned with each other. The alignment of the front and rear key apertures 220A, 222A and 220B, 222B allow the panels 212 to be secured to the support means 14.

The rear skin 218 has a front face 224, a rear face 226, and a lower edge 228. At the lower edge 228 of the rear skin 218 of each of the panels 212 there is provided with a plurality of downwardly extending resiliently deformable flexible fingers 230 arranged side by side, each finger 230 having an upper edge 232A and a lower edge 232B. The fingers 230 may be formed of an elastomeric material, such as rubber.
The fingers 230 are substantially rectangular in configuration, and are secured at their respective upper edges 232A to the front face 224 of the rear skin 218 along a line spaced from the lower edge 228 of the rear skin 218. This allows the fingers 230 to be relatively easily deformed so that the lower edges 232B move in the forward direction, towards the front skin 216 by, in effect, bending about the line at which the fingers are attached to the rear skin 218.

However, because of the lower edge 228, the deformation of the fingers 230 so that the lower edge 232B moves in the rearward direction away from the front face 216 is more difficult. This difficulty is caused by the fingers 230 having to bend about the lower edge 228 of the rear skin 218.

As can be seen from Figure 29, each of the key apertures 220A, 220B, 222A, 222B has a relatively large lower circular region 234, a narrow connecting channel region 236 extending upwardly from the circular region 234, and a cross region 238 extending horizontally on opposite sides of the channel region 236. The reason for this shape of the key apertures 220A, 220B, 222A, 222B is described below.

The assembly of the support means 14 of this embodiment is shown in detail in Figures 31 to 36, and comprises a plurality of the upstanding support members 16 to which are attached respective holding arrangements for holding the panels 212 displaced horizontally from the upstanding support members 16. The holding arrangements are in the form of C shaped members 240. Each C shaped member 240 comprises upper and lower elongate tubular holding portions 242A, 242B which are attached to each other at their ends by an elongate tubular connecting member 244. The C shaped members 240 are attached to the upstanding member by respective securing means 250, each of which comprises first and second sleeve portions 252, 254.

As can be seen from Figures 31 to 33, the sleeve portions 252, 254 are attached to each other and are arranged at right angles relative to each other. The first sleeve portion 252 is configured to receive the upstanding member 16 therethrough, and the second portion sleeve 254 is configured to receive the upper or lower holding portion 242A, 242B.
Each of the upper and lower holding portions 242A, 242B defines a plurality of opposed apertures 256 to allow the position of the securing means 250 to be selected along the first and second holding portions 242A, 242B. The upstanding member 16 defines two pairs of opposed apertures 258, one pair of the opposed apertures 258 being defined at an upper region of the upstanding member 16, and the other pair being defined at a lower region of the upstanding member 16. Only the upper opposed apertures 258 are shown in Figure 31, the lower apertures 258 being covered by one of the securing means 250.

Each of the first and second sleeve portions 252, 254 defines a respective pair of opposed apertures 260, 262. The two securing means 250 are arranged on the upstanding member 16 so that the opposed apertures 260 in the first sleeve portions 252 are aligned with the upper and lower opposed apertures 258 in the upstanding member 16, and both of the securing means 250 are secured to the upstanding member 16 by a pin 264 inserted through both sets of aligned apertures 258, 260 in the upstanding member 16.

As can be seen from Figure 33, the upper and lower holding portions 242A, 242B extend through the second sleeve portion 254 of the respective securing means 250. The upper or lower holding portion 242A, 242B is slid to the desired position along the second sleeves 254 of both securing means 250, so that the pair of opposed apertures 262 in each of the second sleeve portions 254 is aligned with one of the pairs of apertures 256 in the respective upper and lower holding portions 242A, 242B.

Further pins 264 are then inserted through the aligned apertures 256, 262 to secure the securing means 250 to the upper and lower holding portions 242A, 242B, and thereby secure the C shaped member 240 to the upstanding member 16 in, for example, the configuration shown in Figure 33.

Prior to the securing of the C shaped members 240 to the upstanding members 16, the upstanding members 16 are attached to the base member 18 in a manner described below.

When a plurality of the upstanding members 16 with the C shaped members 240 secured thereto are attached to the base member 18, the panels 212 can then be
mounted on the C shaped members 240 by means of respective gripping devices 270 fastened to the free ends 276 of the upper and lower holding portions 242A, 242B of each C shaped member 240.

Each gripping device 270 comprises a substantially circular panel engaging portion 272 and a shaft portion 274 extending from the panel engaging portion 272.

The shaft portion 274 is threaded and can be screwed into the free end 276 of the upper or lower holding portions 242A, 242B, which is internally threaded. The respective gripping devices 270 can be screwed into each of the upper and lower holding portions 242A, 242B. The panels 212 can then be mounted on the gripping devices 270.

The mounting of the panels 212 onto the gripping devices 270 is carried out by arranging the panels 212 so that the substantially circular panel engaging portions 272 of the gripping devices 270 are received through the circular regions 234 of the key apertures 220A, 220B, 222A, 222B.

The connecting channel region 236 is slightly wider than the diameter of the shaft 274 so that when the panel engaging portions 272 have been received through the circular regions 234, the panel 212 can be lowered so that the shafts 274 pass along the channel regions 236 to the cross regions 238.

The panel 212 can then be moved left or right so that the shafts 274 are seated within the left or right arms of the cross regions 238 of the key apertures 220A, 220B, 222A, 222B. When so arranged, the gripping devices 270 can then be screwed into the respective holding portion 242A, 242B until the panel engaging portions 272 engage the panel 212 between the panel engaging portions 272 and the free ends 276 of the upper and lower elongate holding portions 242A, 242B, thereby securing the panel 212 to the C shaped member 240.

Further panels 212 can then be mounted on further support means along the whole of the perimeter to be covered. If desired, the end regions of adjacent panels 212 can overlap each other to ensure that there are no gaps between the adjacent panels 212 (see Figures 28 and 29).
Figures 37 to 39 show another embodiment of the attaching arrangement 48. In this embodiment, the upstanding member 16 is received within the receptacle 70 by means of a bayonet fitting, as described above. Although not shown in Figures 37 to 39, a cylindrical pin or bolt extends across the inside of the receptacle 70 at the aperture 90 so that the upright member 16 can be fastened thereto arranging the upright member so that the pin or bolt is received in the L shaped slot 96.

The attaching arrangement shown in Figures 37 to 39 comprises first and second clamping arrangements 280, 282. The first clamping arrangement 280 includes the receptacle 70 for receiving the upstanding member 16.

Each of the first and second clamping arrangements 280, 282 comprises a fixed clamping member 284, in the form of a substantially flat plate, for engaging the top face of the upper flange 22A of the base member 18, and a moveable clamping member 286 which comprises a bolt receiving portion 288 and a pair of downwardly extending clamping portions 290. The bolt receiving portion is substantially U shaped.

A bolt 289 is screwed into the bolt receiving portion 288. The fixed clamping member 284 defines a pair of apertures 292 through which the downwardly extending clamping portions 290 can extend.

Each of the clamping portions 290 includes a clamping foot 294 which can engage the underside of the upper flange 20 of the base member 18 to apply the clamping force thereto.

An elongate rectangular force transmitting member 296 is provided. The force transmitting member 296 separate from, and extends between, the first and second clamping arrangements 280, 282. The U shaped bolt receiving portion 288 of each of the moveable clamping members 286 can receive the end regions of the force transmitting member 296 therethrough. The receptacle 70 defines a pair of aligned slots to receive the force transmitting member 296 therethrough, thereby allowing the receptacle 70 to move along the force transmitting member 70.

In order to fasten the attaching arrangement 48 to the base member 18, the first and second clamping arrangements 280, 282 are arranged thereon as shown in Figure 38. The transmitting member 296 is arranged to extend between the first and
second clamping arrangements 280, 282, and extends beneath the bolts 289 in each of the bolt receiving portions 288.

The bolts 289 are then tightened into the bolt receiving portions 288, thereby engaging the force transmitting member 296 and urging the force transmitting member 296 onto the fixed clamping members 284.

The moveable clamping member 286 is urged upwardly by the tightening of the bolt 289 so that the clamping portions 290 engage the underside of the upper flange 20 of the base member 18, thereby clamping the upper flange 20 between the fixed clamping member 284 and the clamping portions 290 of the moveable clamping member 286, and clamping the attaching arrangement 48 to upper flange 22A of the base member 18.

It will be appreciated that the elongate force transmitting member 296 allows different widths of the upper flange 22A to be accommodated by the attaching arrangement 48.

Figure 40 depicts a further version of the embodiment of the attaching arrangement 48 described above with reference to Figures 37 to 39. The first clamping arrangement 284 of the attaching arrangement 48 shown in Figure 40 comprises a base plate 300 having a socket portion 302.

The receptacle 70 is separate from, and received in, the socket 302. The socket 302 defines a pair of opposed aligned slots (not visible), through which the transmitting member 296 can extend.

The tubular receptacle 70 also defines opposed slots (not visible) which can be aligned with the slots in the socket portion so that the transmitting member 296 can extend through the tubular receptacle 70 as well as through the socket portion 302.

A further modification of the fall prevention apparatus 210 is shown in Figures 41 to 46, which includes many of the features of the embodiment described above, and shown in Figures 28 to 40. These features have been labelled with the same reference numerals in Figures 41 to 46 as in Figures 28 to 40.

The embodiment shown in Figures 41 to 46 includes gripping means 310 for gripping the panels 212 to the C shaped members 240. The gripping means 310 comprise a
plurality of cam members 312. Each cam member 312 is pivotally attached to a collar 314 mounted over the respective free ends 276 of the holding portions 242A, 242B. The cam members 312 are movable between a non-gripping position, shown in Figure 41, a first gripping position shown in Figure 42, and a second gripping position shown in Figure 43.

The cam members 312 in the second gripping position are shown gripping the overlapping panels 212 in Figure 43. Accordingly, the second gripping position is between the non-gripping position and the first gripping position.

Referring to Figures 44 to 46, hook members 316 are provided on the free ends 276 of the holding portions 242A, 242B. When the cam members 312 are pivoted to the first or second gripping positions, the cam members 312 urge the panels 212 onto the hook members 316. As a result, the panels 212 are gripped between the cam members 312 and the hook members 316.

Figure 44 shows the C shaped member 240 with the hook members 316 at the free ends 276 of the holding portions 242A, 242B. The hook members 316 extend from the free ends 276 of the holding portions 242A, 242B. The hook members 316 are rotatable from an upstanding position shown in Figures 44 to 46 to a horizontal position to allow the panel 212 to be mounted on the carrier portions 242A, 242B. The rotation of the hook members 316 is by 90° about the main axis of the respective holding portions 242A, 242B.

Figure 45 shows a view of the C shaped member 240, which is similar to Figure 44, but includes the cam members 312 mounted on the holding portions 242A, 242B adjacent the free ends 276 thereof by the collars 314. Each of the collars 314 is in the form of a cylindrical member, split along its length. A respective threaded lug 318 is provided on each side of the split. A bolt (not shown) is screwed into the lugs 318 to pull them together and clamp the collar 314 around the holding portion 242A or 242B.

Figure 46 shows a panel 320 mounted on the C shaped member 240. The panel 320 is different from the panel 212, having a single skin 322 defining upper and lower mounting slots 342A, 342B, through which the respective carrying members 242A, 242B extend when the panel 320 is mounted thereon.
When the panel 320 is mounted on the carrying member 240, the holding portions 242A, 242B extend through slots 342A, 342B in the panel 320. The hook members 316 extend upwardly across the slots, thereby allowing the panel 312 to be gripped between the cam members 312 and the hook members 316.

Figure 47 shows a further embodiment of the fall prevention apparatus generally designated 410, which comprises many of the features described above, said features being designated in Figures 47 to 63 with the same reference numbers as used to designate those features in Figures 1 to 46.

Figure 48 shows a plurality of attaching arrangements 448 attached to the base member 18. Each attaching arrangement 448 comprises a receptacle 70 for receiving the support member 16. Referring to Figure 49, the support member 16 is fastened to the receptacle 70 by means of a bayonet fitting, as described above. A clamping means 490 clamps the receptacle 70 to the base member 18. The clamping means 490 is shown schematically in Figures 47 to 63 and could be any of the clamping means described above.

The fall prevention apparatus 410 further includes a mounting arrangement 411 comprising upper and lower mounting structures 412, 414 on each support member 16. The mounting structures 412, 414 extend substantially at right angles to the support member 16.

Figure 49 shows a plurality of the support members 16 attached to a base member 18, each support member 16 having the mounting arrangement 411 comprising the upper and lower mounting structures 412, 414 extending from the support member 16.

Figure 50 shows one of the support members 16 during the step of attaching the support member 16 to the base member 18. The lower end region of the support member has the fastening portion 94 defining an L shaped slot 96, to provide a bayonet fitting for the support member 16, as described above.

Figure 51 shows a close up of the mounting structure 414, which comprises an elongate projecting means 416. The projecting means 416 is secured to the support member 16. This is not shown in Figure 51, but it can be seen from Figure 50.
The mounting structure 412 includes a holding arrangement 418 on the projecting means 416. The holding arrangement 418 includes an inner wall member 420A, an intermediate wall member 420B and an outer wall member 420C spaced from the support member 16 sequentially, and in alignment with each other. Aligned apertures 421 are defined in each of the inner, intermediate and outer wall members 420A, 420B, 420C. A pin (not shown in Figure 51) can be inserted through the apertures 421 for reasons discussed below.

The holding arrangement 418 also includes an inner holding portion 422 between the inner and intermediate wall members 420A, 420B, and an outer holding portion 424 between the intermediate and outer wall members 420B, 420C.

The elongate projecting means 416 comprises a projecting portion 426 and an adjustable means 428, to allow the distance of the holding portion 422 from the support member 16 to be adjusted. The adjustable means 428 comprises a threaded portion 430 screwed into a threaded blind hole 431 in the projecting portion 426. The adjustable means 428 also includes at least one spacer 432 between the inner wall member 420A and the projecting portion 426. The number of spacers 432 can be varied to change the distance from the support member 16 to the holding portion 422. The mounting structure 412 is the same as the mounting structure 414.

Referring to Figure 52, the fall prevention apparatus 410 further includes a plurality of panels 440 which can be supported on the support members 16, the panels being carried by the mounting structures 412, 414.

Each of the panels 440 includes a main part 442 defining a plurality of access openings 444 to allow a person to reach through the panels 440. Each panel 440 also includes a sliding hatch member 446 slidably mounted on a lower region of the main part 442.

Figure 53 shows four of the panels 440, in one of which, the hatch member 446 is raised to provide an access region 448 below the main part 442. The hatch member 446 is slidably movable between a lowered closed position and a raised open position. When the hatch member 446 is in the open position, a person can reach through the access region 446 to obtain access to the opposite side of the panel 440.
The hatch member 446 has a main portion 450 having a lower edge 452. A seal 454 extends along the lower edge 452. A pair of arms 456A, 456B extend upwardly from the main portion 450 on opposite sides thereof. The arms 456A, 456B define apertures 457 to allow the arms 456A, 456B to be attached to sliding runners (not shown) held by the panels.

The hatch member 446 also includes a flange 458 extending from the main portion 450 and the right hand arm 456B. In use, the flange 458 is disposed behind the adjacent hatch member 446 to ensure there are no gaps between the panels 440.

In one embodiment, the seal 454 comprises a plurality of resilient strands that can deform to provide a seal around an article on the floor when formed, or around any discontinuities in the floor. The seal 454 can be formed of any other suitable material.

Referring to Figures 55 and 56, each panel 440 has opposite first and second side edge portions 460, 462. Hinge formations 464 defining apertures 465 extend from the side edge portions 460, 462.

The hinge formations 464 on the first side edge portion 460 are offset relative to the hinge formations 464 on the second side edge portion 462, so that a plurality of panels 440 can be secured to each other side by side, with the hinge formations 464 of the adjacent edges 460, 462 of the adjacent panels 440 overlapping with the apertures 465 aligned.

As shown in Figure 57, an elongate hinge pin 466 extends through the aligned apertures 466 in the overlapping hinge formations 464 to secure the panels 440 to one another. The hinge formations 464 and the hinge pin 466 allow the panels 440 to extend in any desired angle relative to each other, such as a straight line (as shown in Figure 47). Alternatively, the hinged attachment allows two rows of the panels 410 or transverse to each other, such as at 90°, (as shown in Figure 58).

A plurality of the panels 440 (for example four, as shown in Figure 59) can be secured together to form a panel assembly 468. The panels 440 are secured to one another by the hinge formations 464, as described above, and by elongate substantially cylindrical upper and lower bracing members 470, 472.
The side edge portions 460, 462 define aligned upper through holes 474, and aligned lower through holes 476. The upper bracing member 470 extends across all of the panels 440 forming the panel assembly 468. The upper bracing member 470 extends through the aligned upper through holes 474. Similarly, the lower bracing member 472 extends across the four panels 440, and through the aligned lower through holes 476. The upper and lower bracing members 479, 472 can be formed of a suitably rigid robust material, such as steel.

As shown in the drawings, the upper and lower bracing members 470, 472 are sufficiently long to extend across four panels 440. Thus, when the bracing members 470, 472 are received through the upper and lower apertures 474, 476 of all of the panels 440 forming the panel assembly 468, the panels 440 are held substantially in a straight line.

A plurality of the panel assemblies 468 are arranged along the side of the building. The panel assemblies 468 are supported on a plurality of the support members 16 by the mounting structures 412, 414. The upper and lower bracing members 470, 472 of the panel assemblies 468 are received respectively in either the inner holding portions 422 or the outer holding portions 424 of the upper and lower mounting structures 412, 414. Figure 60 shows the upper bracing member 470 received in the outer holding portion 424 of the upper mounting structure 412. A securing pin 477 is inserted through the apertures 421 in the wall members 420C, 420B and 420A to secure the bracing member 470 to the upper mounting structure 412.

Adjacent panel assemblies 468 can be secured to each other by means of the hinge formations 464 and the hinge pins 466 in the same way as described above.

In some circumstances, it may be necessary to arrange the panel assemblies 468 in rows so that two or more of the panel assemblies 468 overlap each other. This could occur, for example, where the length of the side of the floor along with the panel assemblies 468 extend is not equal to the length of a whole number of panel assemblies 468. In such an arrangement, the panel assemblies 468 can be supported on the support members 16 by arranging the panel assemblies 468 as shown in Figure 61.
In Figure 61, there is shown forward and rearward panel assemblies 468 supported by the upper and lower mounting structures 412, 414. The upper and lower bracing members 470, 472 of the rearward panel assembly 468 are arranged in the inner holding portions 422 of the upper and lower mounting structures 412, 414. The upper and lower bracing members 470, 472 of the forward panel assembly 468 are arranged in the outer holding portions 424 of the upper and lower mounting structures 412, 414.

The above arrangement of the panel assemblies 468 allows the rearward panel assemblies 468 supported by the inner holding portions 422 to overlap one or more of the forward panel assemblies 468 supported by the outer holding portions 424. As a result, the total distance across which the panel assemblies 468 extend can be adjusted by varying the extent to which the forward and rearward panel assemblies 468 overlap.

Referring to Figures 62 and 63, each panel 440 includes a gripping formation 480 for gripping a flexible cover material 482 so that the cover material 482 is attached to the panels 440. In the embodiment shown, the flexible cover material 482 may comprise netting.

Each gripping formation 480 comprises a gripping member 484 defining cruciform aperture 486. The gripping member 484 is in the form of a substantially square plate. A respective gripping formation 480 is provided just above each of the bracing members 470, 472 adjacent the side edge portions 460, 462.

Some of the flexible material 482 can be inserted into the cruciform aperture 486 of each gripping formation 480 to fasten the flexible material 482 to each panel 440 so that the flexible material 482 extends along the whole length of the fall prevention apparatus 10.

Various further modifications can be made without departing from the scope of the invention. For example, although the panel 320 is shown with upper and lower mounting slots 342A, 342B, it will be appreciated that the panel 320 could define key apertures similar to the key apertures 220A, 220B, as described above. In such a modification, the hook members could be replaced by gripping devices similar to the gripping devices 270 described above.
In a further modification, the panel 212 could have a single skin. Also, the panel 320 could have front and rear skins.
Claims

1. A fall prevention apparatus for use adjacent a perimeter of an area, the fall prevention apparatus comprising a plurality of panels and support means for supporting the panels, wherein the apparatus comprises a mounting arrangement on the support means for mounting the panels thereon, the mounting arrangement projecting from the support means to hold the panels spaced from the support means.

2. A fall prevention apparatus according to claim 1, wherein the support means comprises a plurality of support members, and a respective mounting arrangement is provided on each support member.

3. A fall prevention apparatus according to claim 2, wherein the mounting arrangement on each support member comprises at least one mounting structure.

4. A fall prevention apparatus according to claim 2 or 3, wherein the mounting arrangement on each support member comprises upper and lower mounting structures.

5. A fall prevention apparatus according to claim 3 or 4, wherein the, or each, mounting structure extends substantially transverse to the support member.

6. A fall prevention apparatus according to any preceding claim, wherein the, or each, mounting structure comprises an elongate projecting means secured to the support member, and a holding arrangement for holding at least one panel, the holding arrangement being on the projecting means.

7. A fall prevention apparatus according to claim 6, wherein the holding arrangement includes at least one wall member to provide a holding portion.

8. A fall prevention apparatus according to claim 6 or 7, wherein the, or each, mounting structure comprises a plurality of the wall members, which define a plurality of the holding portions therebetween.
9. A fall prevention apparatus according to claim 8, wherein the plurality of the wall members comprises inner and outer wall members and an intermediate wall member between the inner and outer wall members, each of the wall members being sequentially spaced from the support member, in alignment with each other.

10. A fall prevention apparatus according to claim 8 or 9, wherein the plurality of holding portions include an inner holding portion between the inner and intermediate wall members, and an outer holding portion between the intermediate and outer wall members.

11. A fall prevention apparatus according to any of claims 6 to 9, wherein the elongate projecting means comprises a projecting portion and an adjustable means to allow the distance of the holding arrangement from the support member to be adjusted.

12. A fall prevention apparatus according to claim 11, wherein the adjustable means comprises a threaded portion on the projecting portion or the holding arrangement and at least one spacer.

13. A fall prevention apparatus according to any preceding claim, wherein the panel defines a plurality of access openings to allow a person to reach through the panel.

14. A fall prevention apparatus according to any preceding claim, wherein each panel includes a main part and a hatch member, the hatch member being movably mounted on the main part between open and closed positions.

15. A fall prevention apparatus according to claim 14, wherein the hatch member is slidably mounted on the main part for sliding movement between the open and closed positions.

16. A fall prevention apparatus according to claim 14 or 15, wherein the hatch member is mounted on a lower region of the main part to provide an access region below the main part.
17. A fall prevention apparatus according to claim 14, 15 or 16, wherein the closed position of the hatch member is a position in which the hatch member is lowered, and wherein the open position of the hatch member is a raised open.

18. A fall prevention apparatus according to any of claims 14 to 17, wherein the hatch member is slidably movable between the closed position and the open position.

19. A fall prevention apparatus according to any of claims 14 to 18, wherein the hatch member has a lower edge, and the fall prevention apparatus includes a seal on the lower edge of the hatch member to seal against the floor or an article disposed on the floor.

20. A fall prevention apparatus according to claim 19, wherein the seal is formed of a resilient material, and comprises a plurality of resiliently deformable strands.

21. A fall prevention apparatus according to any preceding claim, wherein each panel has opposite first and second side edge portions and hinge formations on the side edge portions, the hinge formations on the first side edge portion being offset relative to the hinge formations on the second side edge portion, so that the panel can be secured to an adjacent similar panel by the hinge formations on adjacent side edge portions of each panel overlapping each other.

22. A fall prevention apparatus according to claim 21, wherein each hinge formation defines an aperture, and the fall prevention apparatus further includes an elongate hinge pin to extend through the apertures in the overlapping hinge formations, thereby securing the panels to each other.

23. A fall prevention apparatus according to any preceding claim, comprising a bracing member to enable the panel to be supported on the mounting arrangement, the bracing member being received by the mounting arrangement to mount the panel on the support member.

24. A fall prevention apparatus according to claim 23 when dependent upon claim 4, wherein upper and lower bracing members are provided to enable the panel to be
supported on the mounting arrangement, the upper and lower bracing members being received by the upper and lower mounting structures.

25. A fall prevention apparatus for use adjacent a perimeter of an area, the fall prevention apparatus comprising a panel assembly comprising plurality of panels secured together and support means for supporting the panel assembly, wherein the apparatus comprises a mounting arrangement on the support means for mounting the panel assembly thereon, the mounting arrangement projecting from the support means to hold the panels spaced from the support means.

26. A fall prevention apparatus according to claim 25, wherein the panels are secured to one another at the hinge formations, a respective hinge pin extending through the overlapping hinge formations of adjacent panels.

27. A fall prevention apparatus according to claim 25 or 26, comprising an elongate bracing member to enable the panels to be supported on the mounting arrangement, the bracing member being received by the mounting arrangement to mount the panel on the support member, wherein the elongate bracing member extends across the plurality of panels.

28. A fall prevention apparatus according to any of claim 27, wherein each panel has opposite first and second side edge portions, the side edge portions of each panel defining aligned through holes to receive the bracing member therethrough.

29. A fall prevention apparatus according to claim 27, wherein the mounting arrangement on each support member comprises upper and lower mounting structures, and the panel assembly comprising upper and lower bracing members to enable the panel assembly to be supported on the mounting arrangement, the upper and lower bracing members being received by the upper and lower mounting structures.

30. A fall prevention apparatus according to claim 29, wherein the side edge portions of each panel define aligned upper and lower through holes, the upper bracing member extending through the aligned upper through holes, and the lower bracing member extending through the aligned lower through holes.
31. A fall prevention apparatus according to claim 28, 29 or 30, wherein a plurality of the panel assemblies are supported on the support means by the mounting arrangements, the, or each, bracing member being received by the mounting arrangement.

32. A fall prevention apparatus according to claim 31, wherein the mounting arrangement comprises at least one holding arrangement, and the, or each, bracing member of each panel assembly is received by the, or a respective, holding arrangement.

33. A fall prevention apparatus according to claim 32, wherein the holding arrangement comprises inner and outer holding portions, and the, or each, bracing member of the panel assembly is received in the inner or outer holding portions of the mounting portion.

34. A fall prevention apparatus according to claim 33, comprising a plurality of panel assemblies, wherein the panel assemblies are supported on the support members by arranging the bracing members of some of the panel assemblies in the inner holding portions, and by arranging the bracing members of the remaining panel assemblies in the outer holding portions.

35. A fall prevention apparatus according to claim 34, wherein the outermost panels of adjacent panel assemblies are secured to each other at the first and second side edges of outermost panels, the first and second side edges having hinge formations thereon, and the securing of the panel assemblies to one another is effected by the hinge formations on the respective outer first and second side edge portions of the adjacent outermost panels.

36. A fall prevention apparatus according to claim 35, wherein the hinge formations on the adjacent first and second side edge portions of the outermost panels are disposed in an overlapping relation so that the apertures therein are aligned, and a hinge pin extends through the aligned apertures to secure the adjacent panels of adjacent panel assemblies to each other and, thereby, secure the adjacent panel assemblies to each other.
37. A fall prevention apparatus according to any of claims 25 to 36, wherein each panel includes a gripping formation for gripping a flexible cover material.

38. A fall prevention apparatus according to claim 37, wherein each gripping formation comprises a gripping member defining an aperture having a central region and radiating regions extending from the central region.

39. A fall prevention apparatus according to claim 38, wherein the aperture is a cruciform aperture.

40. A fall prevention apparatus according to claim 38 or 39, wherein the gripping member comprises a substantially planar member.

41. A fall prevention apparatus according to claim 38, 39 or 405, wherein a respective gripping formation may be provided at each upper corner of each panel.
Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

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<td>1-3, 4, 5-10, 13-18</td>
<td>GB2420818 A (WILLIAM HARE LTD) See Figures 9-11, 12a-12c,13 and 15</td>
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<td>X</td>
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<tr>
<td>X</td>
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E04G

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