

A CABLE ZONE ASSEMBLY ATTACHABLE TO A RACK FRAME FIELD OF THE INVENTION

This invention relates to a cable zone assembly which is attachable to a rack frame to provide room for cables; and to a rack frame
5 having a cable management system and which can be used with the cable zone assembly.

BACKGROUND ART

A rack frame forms part of an enclosure or cabinet which is used to house electronic equipment. Figure 1 illustrates a typical prior art cabinet.
10 The cabinet has a rack frame, an example of which is illustrated in Figure 2. The rack frame either sits inside the cabinet or forms part of the cabinet, and has a base plate 10 (see Figure 2), a top plate 11, and a number of vertical rack members 12. Members 12 are provided with an array of openings or slots, and horizontal platforms (not shown) can be supported by the vertical
15 members 12. Electronic equipment can then be supported on the horizontal platforms. The cabinet has side walls and a front door. The front door typically has a glass or acrylic portion such that the electronic equipment can be easily viewed.

Cabinets containing rack frame are well-known and an IEC
20 standard defines such an enclosure or cabinet as a free standing and self-supporting enclosure for electronic equipment capable of being used alone or in combination with other cabinets to form a suite. The cabinet will house or incorporate vertical members to which can be attached panels etc.

The primary purpose for the cabinet is to hold data and
25 communications equipment.

It is typical for a rather large array of wires and cables to be present in the cabinet to connect the various data and communication devices. If the number of cables is low, the cables can be simply passed between pieces of equipment or through and along gaps in the interior of the
30 panel. However, when a large number of cables are present, threading the cables and placement of the cables can present a problem.

For this reason, it is known to provide a cabinet, generally as

illustrated in Figure 1, but which is wider than the base plate and top plate generally illustrated in Figure 2. By making the cabinet wider, a gap is produced between the vertical members and the cabinet wall and this gap can be used as a cable zone to properly house cables.

5 When a suite of cabinets are attached together to form a bayed enclosure (see generally Figure 3), the number of cables passing through or into a particular cabinet can become extremely large. This also occurs if a large number of cables are passed into a single cabinet. While it may be possible to rebuild or replace the cabinet enclosure to make the enclosure
10 larger again, this generally requires total disassembly of the existing cabinet which requires removal of all the data and communication equipment, unplugging and removal of all the wiring which can cause downtime, and is extremely undesirable. On the other hand, it is equally undesirable to manufacture oversized cabinet just in case extra cabling is used, as often a
15 cabinet will have a normal amount of cabling and purchase of an oversized cabinet will increase expense and can make the cabinet unsuitable for placement in small spaces.

One attempt to overcome this disadvantage is to provide a rack frame with a standard size and instead of having a flat side panel attached to
20 the rack frame, a curved or channel-shaped panel is attached instead. This curved or channel-shaped panel provides a cable zone. If not required, the panel can be removed and replaced with a standard flat panel. A disadvantage with this system is that the curved or channel-shaped panel is not structural and therefore adjacent cabinets cannot be attached together to
25 form a bayed enclosure. The curved or channel-shaped panel needs to be fixed in place to define the cable zone before cables are passed into the zone and this reduces the accessibility of the cables.

OBJECT OF THE INVENTION

The present invention is directed to a cable zone assembly
30 which can be attached to an existing rack frame to provide a cable zone, and which is also designed to allow other rack frames to be attached to the cable zone. Thus, a bayed enclosure can now be assembled with cable zones. In

this manner, a standard cabinet can be quickly modified to include a cable zone. The modification can be made without requiring dismantling of the vertical members and generally with minimal disturbance to existing equipment. If the cable zone is no longer required, it can be disassembled to
 5 return the cabinet to its original size. More than one cable zone assembly can be attached to a cabinet. For instance, it is envisaged that a cable zone assembly can be attached to each side of the cabinet. It is also envisaged that two cable zone assemblies may be placed side by side if a larger than usual cable zone is required.

10 The present invention is also directed to a unique design of the top plate and/or the bottom plate of a rack, which can provide cable management features in visually concealed areas.

It is an object of the invention to provide a cable zone assembly, a rack enclosure which has a cable zone assembly, and an improved rack
 15 which can overcome the abovementioned disadvantages or provide the public with a useful or commercial choice.

In one form, the invention resides in a cable zone assembly which is attachable to a rack frame of the type having a base plate, a top plate and a plurality of vertical rack members extending between the base
 20 plate and top plate, the assembly comprising:

a cable zone base member which is attachable to the base plate to form an extension of the base plate,

a cable zone top member which is attachable to the top plate to form an extension of the top plate, and

25 attachment means on the base member and the top member to allow a vertical panel to be attached to the base member and the top member.

In another form, the invention resides in a rack enclosure which comprises a base plate, a top plate and a plurality of vertical rack members extending between the base plate and top plate, and at least one cable zone
 30 which comprises a cable zone base member which is attached to the base plate to form an extension of the base plate, a cable zone top member which is attached to the top plate to form an extension of the top plate, and

attachment means on the base member and the top member to allow a vertical panel to be attached to the base member and the top member.

In another form, the invention resides in a bayed rack enclosure comprising at least two rack enclosures which are connected to opposite
5 sides of a common cable zone, each rack enclosure comprises a base plate, a top plate and a plurality of vertical rack members extending between the base plate and top plate, and at least one cable zone which comprises a cable zone base member which is attached to the base plate of each base
10 member to form an extension of each said base plate, a cable zone top member which is attached to the top plate of each top plate to form an extension of each said top plate.

In another form, the invention resides in a rack frame which comprises a top access plinth, a bottom access plinth, a plurality of vertical rack rails which extend between the top plinth and the bottom plinth,
15 characterised in that the top plinth and/or the bottom plinth incorporate a built in cable management system.

The rack frame typically has a base plate, a top plate, and usually four vertical members which are provided with slots or openings. The rack frame is usually formed of mild steel which can be roll formed or bent to
20 shape. The base plate and the top plate of the rack frame typically comprises sheet steel which has been bent at the edges. Various openings may be punched or otherwise formed in the base plate and the top plate either to reduce weight and/or to facilitate passage of cabling and the like.

The cable zone assembly has a base member and a top
25 member. The base member and the top member may be formed of material similar to the base plate and the top plate of the rack frame, and therefore are usually formed of mild steel. The base member and the top member may be box-like or tray-like in configuration such that when attached to the base plate or the top plate, the members form an extension of the base plate or the top
30 plate. The base member and the top member may also be punched or otherwise have openings or slots formed through it either to reduce weight and/or for cable access.

The length of the base member and of the top member is typically the same as the length of the portion of the base plate or top plate against which it can abut. As the base plate and the top plate of a typical rack frame is square or rectangular and has sides having a length of between 50-
5 100cm, the length of the cable zone base member and top member may be the same such that the base member and the top member do not protrude past the side of the base plate and top plate.

The base member is attachable to the base plate. The attachment can be by various means including projections which pass into
10 recesses, ribs or ridges which pass into slots, fasteners such as nuts and bolts, and the like. It is however preferred that the base member is attached to the base plate in such a manner that it can be removed without too much difficulty.

The top member is attached to the top plate and this can be
15 achieved in a manner similar to that described above with respect to the base member and the base plate.

The base member and the top member can be formed with attachment means. The attachment means facilitates attachment of a vertical panel to enclose the cable zone. The attachment means may be in the form
20 of projections on the member or panel which pass into recesses on the panel or member, and/or separate fasteners, and the like. The vertical panel is preferably attached in such a manner that it can be quite easily removed to provide access to the cables and wiring in the cable zone. This is achievable as the vertical panel forms only part of the cable zone assembly. This can be
25 contrasted with the known curved or channeled metal panel which is fastened to an existing rack frame but where the curved panel forms the entire cable zone such that when removed to access the cables, the cable zone is also removed.

Where the rack frame has cable management features in
30 visually concealed areas, the rack frame typically comprises four vertical members which are provided with slots or openings. The rack frame is usually formed of mild steel which can be roll formed or bent to shape. The

top plinth and the bottom plinth are usually formed of sheet steel which can be bent or otherwise configured at the edges. Various openings may be punched or otherwise formed in the top plinth and/or bottom plinth to reduce weight and/or to facilitate passage of cabling and the like.

5 The top plinth and the bottom plinth are typically substantially identical. These plinths may be rectangular or square when viewed in plan. Each plinth may have a length of between 5-100cm although this can vary to suit. Each plinth may be initially formed from a flat sheet of metal. The edges of the flat sheet of metal may be turned, typically at approximately 90°, to
10 provide a peripheral edge. The width of the peripheral edge may vary but is typically between 20-100mm. The peripheral edge defines an internal volume or area which is visually concealed and which can be used to manage cables. This internal volume or area can comprise the built in cable management system which allows cables to be fitted in a concealed manner.

15 The top plinth is preferably positioned such that the peripheral edge extends upwardly from the remainder of the plinth, while the bottom plinth is preferably positioned such that the peripheral edge extends downwardly from the remainder of the plinth. In this manner, both the top plinth, and the bottom plinth has an internal area or volume which can house
20 and manage cables.

Each plinth may be provided with one or more areas which can be punched out, bent upwardly or downwardly, and/or may be provided with one or more openings for instance for cables, fasteners and the like. The peripheral edge can function to provide the spacing required to allow a flap in
25 the plinth to be bent upwardly without striking any adjacent surface.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will be described with reference to the following drawings in which

Figure 1 illustrates a cabinet which is known in the art.

30 Figure 2 illustrates a rack frame which sits in and/or forms part of the cabinet and is also generally of known design.

Figure 3 illustrates a bayed enclosure where three rack frame

are joined together and two rack frames are separated by a single cable zone.

Figure 4 is an enlarged view of a cable zone base member according to an embodiment of the invention.

Figure 5 illustrates a single rack frame having an attached cable zone assembly, the cable zone assembly having an attached vertical panel member.

Figure 6 illustrates the rack frame of Figure 5 from a different angle.

Figure 7 illustrates a lower view of the rack frame of Figures 5 and 6.

Figure 8 is a close-up view of one end of the base member showing its attachment to the base plate of a rack frame.

Figure 9 is an inside view of the attachment of the base member to the base plate of the rack frame.

Figure 10 is a view of a rack frame having cable management features in visually concealed areas.

BEST MODE

Referring to the drawings and initially to Figures 1 and 2, there is illustrated in Figure 1 a cabinet of known design and which functions to hold data and communication equipment. The cabinet has a box-like main body and a front hinged door 14. Inside the cabinet is a rack frame which consists of a base plate 10, a top plate 11, and four spaced apart vertical parallel members 12. In the industry, members 12 are separated by an imperial measure of 19 inches which is a standard in the industry. The base plate and top plate are rectangular in shape and typically have a length and width of between 50-100cm. The height of the cabinet can vary to suit but is typically between 1.0-2.5m.

Figure 3 illustrates a bayed enclosure where three rack frames 15, 16, 17 which are more or less identical are attached relative to each other. Rack frames 15, 16 are separated by a cable zone assembly 18, while rack frames 16, 17 are directly attached together. This illustrates the versatility of the cable zone assembly.

Figures 5, 6 and 7 are three views of a single rack frame fitted with a single cable zone assembly. Referring initially to Figure 5, rack frame 19 has a base plate 20, a top plate 21, and four vertical members 22-25. The vertical members are channel-shaped as is known and are provided with an array of linearly aligned openings or slots 26. Load bearing platforms (not illustrated) can be attached to members 22 via the slots 26 and on which an array of data and communication equipment can be supported. Rack frame 19 has a single attached cable zone assembly generally illustrated as reference numeral 27. The cable zone assembly comprises a base member 28, a top member 29, and in this embodiment there is also provided a vertical panel 30 which is attached to the base member 28 and the top member 29. In the particular embodiment, panel 30 extends and covers one face only and on each side of panel 30 is an additional narrow vertical panel 31, 32 (the edge of panel 32 being illustrated in Figure 6).

Each of the panels 30-32 is decouplable from the remainder of the cable zone assembly. In the embodiment, each panel member has projections or recesses in a bottom wall which attaches the respective panel to the base member, and has one or more latches 33 at the upper end of each panel to allow the panel to latch against top member 29. An advantage of this is that panel 30 can be easily removed from the remainder of the cable zone assembly to allow ready access to the cables. If a bayed enclosure is required as illustrated in Figure 3, panel 30 can be simply removed, while panels 31, 32 stay in place to protect the cable zone enclosure when the rack frames are bayed together.

The base member and the top member are fitted with an extending flange 35 (best illustrated in Figure 7) which functions as an abutment point for panel 30. The top member is formed with two spaced apart apertures 36 (see Figure 7) which function to hold the panel in place. It can be seen that base member and top member are identical or substantially identical which means that a single member can function either as a base member or a top member. Apertures 36, on the top member, function as keepers for the latches 33, which can be slid upwardly to latch the panel in

place. The base member 28 has a number of upstanding locating buttons or pins 44 (see figure 4) which pass into corresponding openings in the bottom of panel 30. Of course, the attachment arrangement could be reversed with base member having openings and the bottom of the panel 30 having pins, buttons or another type of locating means. Similarly, the latches could be reversed.

Similarly, buttons 44 (see Figure 8) are provided on the top wall and adjacent an edge of the base member and this functions to hold the narrower panels 31 in position. Of course, the attachment arrangement could be reversed with base member having openings and the bottom of the panel 30 having pins, buttons or another type of locating means. A latch 33 is provided to latch the side panel in place.

Figure 4 is a detailed view of a base member (or a top member which will be an inverted base member). The base member is substantially box-like in configuration and has a top wall 38, opposed side walls 39, and opposed end walls 40. Flange 35 is initially part of the top wall 38 and coplanar with the top wall but can be bent upwardly at right angles to the top wall, as illustrated in Figure 4, to form as the abutment edge for the panel 30. Thus, the flange can be formed integrally with the remainder of the base member during the manufacturing stage. A lower portion of the base member has an outwardly extending flange 41 provided with a number of upwardly turned projections 42 which function to clip under the base plate of an adjacent rack frame.

For added strength, a separate top connecting plate 43 in the form of a channel (see Figure 8) can extend over the top of the base member and the adjacent base plate and screwed or otherwise fastened to provide additional rigidity between the two members.

The cable zone assembly is manufactured with relatively few parts with the base member and the top member being interchangeable. The assembly can be attached to a standard known rack frame to provide a permanent or temporary cable zone depending on the circumstances. The assembly allows other rack frames to be attached in such a manner to provide

a bayed enclosure. The assembly can be attached relatively simply and does not require complete dismantling of a loaded rack frame.

Referring to figure 10, there is illustrated a rack frame 50. Rack frame comprises a top access plinth 51, a bottom access plinth 52, and 4
5 vertical rack rails 53-56. Top access plinth 51 comprises a flat square base plate 57 which has peripheral edges which are bent upwardly to form a continuous upwardly extending peripheral edge 58. Peripheral edge 58 and base plate 57 together make the top access plinth 51 which has a box like or tray like configuration. The upwardly extending edge 58 defines an internal
10 area or volume in which cables can be placed. This area or volume is visually concealed and is also protected by base plate 57 and edge 58 such that the cables in this area or volume cannot be inadvertently tampered with, cut, damaged and the like.

Similarly, bottom access plinth 52 has a top plate 59 and a
15 depending peripheral edge 60 which defines an internal area or volume which is visually concealed. Again, cables can be placed in this area and volume and the cables cannot be inadvertently tampered with, cut, damaged and the like.

Rack frame 50 functions to mount electronic and data
20 equipment which can be made to the International Electrotechnical Commission 279 19" rack standard. The rack can handle equipment totalling 180kg when the rack is on castors, and 300kg when the rack is on adjustable feet. The rack frame 50 has the top access plinth 51, the bottom access plinth 52, and the four vertical rack rails 53-56 in a fully welded construction.
25 The rack frame 50, is clad with the panels to form the cabinet which typically has a hinged lockable front acrylic door, two side panels and a hinged lockable rear metal door.

The top access plinth 51 allows cabling to pass through the internal volume or area of the plinth. One or more fan kits can be fitted to
30 plate 57, with peripheral edge 58 functioning to space the plate 57 below a top member thereby allowing the fan kits to operate properly. One or more recesses or cutouts may be required in the peripheral edge 58 to allow air to

flow properly through the fans. If necessary, a cover plate (optionally vented) can be fitted over the top of top access plinth 51 and to provide a fully secure enclosure.

5 The bottom access plinth 52 allows cabling from underfloor to pass through the internal volume or area of the plinth. One or more fan kits can be fitted to the top plate 59, with peripheral edge 60 functioning to space the top plate 59 above the floor thereby allowing the fan kits to operate properly. One or more recesses or cutouts may be required in the peripheral edge 60 to allow air to flow properly through the fans. Adjustable feet can be
10 fitted more easily to the bottom access plinth 52 due to its particular design. For instance, a nutsert can be more easily fitted to the plinth due to the provision of an edge wall. Various knockouts can be provided to allow for power entry into the rack. The configuration of access plinth 52 makes it easier to attach separate racks to each other to provide a bay of racks. The
15 design of the bottom access plinth allows a file server to be placed on the plinth, where previously it was necessary to provide a separate shelf for the file server.

The rack frame provide significant cost benefits when compared to existing racks and existing rack construction methodologies. By using the
20 specially designed top access plinth and bottom access plinth as internal presentation surfaces to the inside of the rack, internal areas of volumes are provided which allows efficient cable management to occur without the need for additional metalwork or assembly requirements.

It should be appreciated that various other changes and
25 modifications can be made to the embodiment described without departing from the spirit and scope of the invention.



CLAIMS

1. A cable zone assembly which is attachable to a rack frame of the type having a base plate, a top plate and a plurality of vertical rack members extending between the base plate and top plate, the assembly comprising:
 - a cable zone base member which is attachable to the base plate to form an extension of the base plate,
 - a cable zone top member which is attachable to the top plate to form an extension of the top plate, and
 - attachment means on the base member and the top member to allow a vertical panel to be attached to the base member and the top member.
2. The assembly of claim 1, wherein the rack frame has a base plate, a top plate, and at least four vertical members which are provided with slots or openings.
3. The assembly of claim 2, wherein the rack frame is formed of mild steel which is roll formed or bent to shape.
4. The assembly of any one of the preceding claims, wherein the base plate and the top plate of the rack frame comprise sheet steel which has been bent at the edges.
5. The assembly of any one of the preceding claims, wherein openings are formed in the base plate and the top plate either to reduce weight and/or to facilitate passage of cabling.
6. The assembly of any one of the preceding claims, wherein the base member and the top member are formed of mild steel.
7. The assembly of claim 6, wherein the base member and the top member are box-like or tray-like in configuration such that when attached to the base plate or the top plate, the members form an extension of the base plate or the top plate.
8. The assembly of claim 6 or claim 7, wherein the base member and the top member have openings or slots formed through it either to reduce weight and/or for cable access.



9. The assembly of any one of the preceding claims, wherein the length of the base member and of the top member are approximately the same as the length of the portion of the base plate or top plate against which it can abut.
- 5 10. The assembly of any one of the preceding claims, wherein the base member is attachable to the base plate via projections which pass into recesses, ribs or ridges which pass into slots, fasteners such as nuts and bolts.
- 10 11. The assembly of any one of the preceding claims, wherein the top member is attached to the top plate via projections which pass into recesses, ribs or ridges which pass into slots, fasteners such as nuts and bolts.
- 15 12. The assembly of any one of the preceding claims, wherein the base member and the top member are formed with attachment means to facilitate attachment of a vertical panel to enclose the cable zone.
13. The assembly of claim 12, wherein the attachment means comprises projections on the member or panel which pass into recesses on the panel or member, and/or separate fasteners.
- 20 14. A rack frame which comprises a top access plinth, a bottom access plinth, a plurality of vertical rack rails which extend between the top plinth and the bottom plinth, characterised in that the top plinth and/or the bottom plinth incorporate a built in cable management system.
15. The frame of claim 14, wherein the top plinth and bottom plinth are substantially identical.
- 25 16. The frame of claim 14 or claim 15, wherein the plinths are rectangular or square when viewed in plan.
17. The frame of any one of claims 14-16, wherein each plinth has a length of between 5-100cm.
- 30 18. The frame of any one of claims 14-17, wherein each plinth is initially formed from a flat sheet of metal, edges of the flat sheet of metal being turned, typically at approximately 90°, to provide a peripheral edge.
19. The frame of claim 18, wherein the width of the peripheral edge



is between 20-100mm.

20. The frame of claim 18 or claim 19, wherein the peripheral edge defines an internal volume or area which is visually concealed and which comprises the built in cable management system which allows cables to be fitted in a concealed manner.

21. The frame of any one of claims 14-20, wherein the top plinth is positioned such that the peripheral edge extends upwardly from the remainder of the plinth, while the bottom plinth is positioned such that the peripheral edge extends downwardly from the remainder of the plinth.

22. The frame of any one of claims 14-21, wherein each plinth is provided with one or more areas which are be punched out, bent upwardly or downwardly, and/or are with one or more openings for instance for cables, fasteners and the like.

23. A rack enclosure which comprises a base plate, a top plate and a plurality of vertical rack members extending between the base plate and top plate, and at least one cable zone which comprises a cable zone base member which is attached to the base plate to form an extension of the base plate, a cable zone top member which is attached to the top plate to form an extension of the top plate, and attachment means on the base member and the top member to allow a vertical panel to be attached to the base member and the top member.

24. A bayed rack enclosure comprising at least two rack enclosures which are connected to opposite sides of a common cable zone, each rack enclosure comprises a base plate, a top plate and a plurality of vertical rack members extending between the base plate and top plate, and at least one cable zone which comprises a cable zone base member which is attached to the base plate of each base member to form an extension of each said base plate, a cable zone top member which is attached to the top plate of each top plate to form an extension of each said top plate.

25. A cable zone assembly substantially as hereinbefore described with reference to the accompanying drawings.

26. A rack enclosure substantially as hereinbefore described with



reference to the accompanying drawings.

27. A rack frame substantially as hereinbefore described with reference to figure 10.