A cable manager (10) for managing cables (8) terminating in rack mounted patch panels (7) and the like is disclosed. The cable manager (10) includes an elongate frame (20) mountable to a rack (15) in a horizontal orientation, a plurality of horizontally spaced apart fingers (22) and (22', 23) and (23', 24) and (24', 25) (and 25') arranged to collectively support and direct the cables, an elongate separable cover (30) having a proximal end (31) and a distal end (39), the proximal end (31) hingedly mountable to a corresponding proximal end (20') of the frame (20) for pivoting about a first substantially vertical axis (31') from an open position to a closed position, a catch (40) pivotally mounted to distal end (39) of the cover for rotation about a second substantially vertical axis (41') from an unlocked position to a locked position, the catch (40) including a grippable lever arm 43 and a projection, wherein when the cover (20) is in its closed position and the catch (40) is in its locked position, the projection (45) engages a surface (50) on a distal end of the frame, thereby restraining the distal end of the cover from movement away from its closed position.
A CABLE MANAGER FOR RACK MOUNTED PATCH PANELS AND THE LIKE

FIELD OF THE INVENTION
5 The present invention relates to patch panels and or network racks. More particularly, the present invention relates to managing cabling associated with patch panels and/or network racks.

PRIORITY DOCUMENTS
The present application claims priority from Australian Provisional Patent Application No. 2007905523 titled "A CABLE MANAGER FOR MANAGING CABLES TERMINATING IN RACK MOUNTED PATCH PANELS AND THE LIKE" and filed on 9 October 2007. The entire content of the aforementioned application is hereby incorporated by reference.

BACKGROUND OF THE INVENTION
15 Increasingly, commercial, industrial and domestic buildings are provided with a large number of networked electrical and electronic devices. Network racks are provided to house electrical devices, equipment and patch panels. Various kinds of cable management apparatus are known for routing and managing dense cabling.

20 Cable managers employing simple hooks or D rings are known as are more complex cable managers employing ducts.

It is an object of the present invention to provide an improved cable manager for managing and routing cables.

SUMMARY
According to the invention there is provided a cable manager for managing cables terminating in rack mounted patch panels and the like, the cable manager including:

an elongate frame mountable to a rack in a horizontal orientation;

a plurality of horizontally spaced apart fingers arranged to collectively support and direct the cables;

an elongate separable cover having a proximal end and a distal end, the proximal end hingedly mountable to a corresponding proximal end of the frame for pivoting about a first substantially vertical axis from an open position to a closed position;

a catch pivotally mounted to distal end of the cover for rotation about a second substantially vertical axis from an unlocked position to a locked position, the catch including a gripable lever arm and a projection,
wherein when the cover is in its closed position and the catch is in its locked position, the projection engages a surface on a distal end of the frame, thereby restraining the distal end of the cover from movement away from its closed position.

Preferably the proximal end of the cover is hingely mounted to a proximal finger, the proximal finger located at the proximal end of the frame.

Preferably the surface on the distal end of the frame is a surface on a distal finger, the distal finger being one of the plurality of horizontally spaced apart fingers.

Preferably when the catch is in its locked position the projection and surface have a contact area that is closer to the first axis than the distance between the first and second axes, thereby ensuring that forces acting on the cover having a direction that would otherwise tend to move the cover towards its open position will cause a torque in the catch, the torque acting in a direction of the locked position.

Preferably the projection and the surface are mutually shaped and positioned, when the cover is in its closed position, to provide a wedging action both when the catch is moved from its unlocked position to its locked position and when the catch is moved from its locked position to its unlocked position, the wedging action causing displacement so as to provide a snap lock action.

Preferably the snap lock action arises primarily from the flexibility and resilience of the finger(s) of the frame and wherein no separate spring components are required.

Preferably the fingers include a plurality of horizontally spaced apart finger pairs extending outwardly from the frame, each pair including an upper finger and a lower finger, the upper and lower fingers arranged to collectively support and direct the cables.

Preferably the cover includes a plurality of inwardly directed tabs for engagement with respective upper and lower finger pairs to prevent them spreading apart.

A specific embodiment of the invention will now be described in some further detail with reference to and as illustrated in the accompanying figures. This embodiment is illustrative, and is not meant to be restrictive of the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS
A preferred embodiment of the invention is illustrated in the accompanying representations in which:

Figure 1 is a perspective view of a cable manager according to the invention.
Figure 2 is a similar view to that of Figure 1, but shows the cable manager with its cover removed and the catch disassembled.

Figure 3 is a perspective view showing the underside of the cover of Figure 2.

Figure 4 is an underside perspective view of the cable manager of Figures 1 and 2.

Figures 5 and 6 are similar views to that of Figure 4 showing progressive locking of the cover.

Figures 7a, 7b, 7c and 7d are side views of the cable manager of Figures 1 and 2 with its cover being progressively installed.

Figures 7e and 7f are similar to those of Figure 7c and 7d but show the latch mechanism in a close up view.

Figures 7g, 7h and 7i are schematic views illustrating the action of the latch mechanism shown in Figures 7e and 7f.

Figure 7j is a schematic view showing an alternative catch arrangement.

Figure 8 is a perspective view of the cable manager of Figure 1 and 2 in use with a rack-mounted patch panel.

Figure 9 is a further perspective view of the cable manager of Figures 1 and 2.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Referring first to Figures 1 and 2, a cable manager for managing cables terminating in rack mounted patch panels and the like is shown. The cable manager 10 includes an elongate frame 20 mountable to a rack such as the rack 15 shown in Figure 8. Generally, the frame 20 will be mounted in a horizontal orientation.

The cable manager further includes a plurality of horizontally spaced apart finger pairs 22 and 22', 23 and 23', 24 and 24' and 25 and 25' as is most clearly shown in Figure 2. The finger pairs extend outwardly from the frame 20, each pair including an upper finger and a lower finger, the upper and lower fingers arranged to collectively support and direct the cables as is shown in Figure 8. With the arrangement shown in Figure 8, the cables 8 are diverted neatly out to the side of the rank 15. This facilitates vertical stacking of patch panels 7 where required.

An elongate separable cover 30 having a proximal end 31 and a distal 39 is provided as is shown in Figures 1 and 2. The proximal end 31 of the cover 30 is hingedly mountable to a first of said fingers, proximal finger 22 at a proximal end 20' of the frame 20' for pivoting about a first substantially vertical axis 31' from an open position to a closed position as is illustrated in Figure 1 and progressively in Figures 7a and 7b. A hook 37, most clearly shown in Figures 3 and 4, slides from a position shown in Figure 7a to a position shown in Figure 7b to provide a hinge axis 31' illustrated in Figure 1. This hinge axis can be substantially vertical when the cable manager 10 is in its typical application shown in Figure 8.
Again, this hinge axis can be substantially vertical when the cable manager 10 is in its typical application shown in Figure 8.

A catch 40 pivotally mounted to a distal end 39 of the cover for rotation about a second axis 41' is shown in Figure 1. This catch 40 is moveable from an unlocked position illustrated in Figure 5 to a locked position illustrated in Figure 6. The catch 40 includes a gripable lever arm 43 and a projection 45 as can be seen in Figure 5.

When the cover 30 is in its closed position and the catch 40 is in its locked position as is shown in Figure 6, the projection 45 engages a surface 50 on a finger 25 as can be seen generally in Figure 9 and more clearly in Figures 7e and 7f. This distal finger 25 is located at a distal end 29 of the frame 20 which is distant from the proximal finger 22 about which the cover 30 is hinged. In its locked position, the catch 40 restrains the distal end 39 of the cover 30 from movement away from its closed position.

Referring now to Figures 7c and 7d, and corresponding Figures 7e and 7f, it can be seen that the cover 30 is arranged and constructed such that when the catch is in its locked position shown in Figure 7e and 7f, the second axis 41', the projection 45 and the surface 50 (on the underside of the finger 25) are relatively positioned so as to provide a snap action type latching effect. This snap action effect is most clearly shown in progressive schematic Figures 7g, 7h and 7i and will be described in some further detail below.

Referring now to Figures 3 and 4, it can be seen that the cover 30 has a plurality of inwardly directed tabs for engagement with respective upper and lower finger pairs to prevent them spreading apart. These tabs are indicated on Figure 3 and Figure 4 by numerals 32, 32', 34, 34', 36, 36' and 38, 38'.

While the embodiment of the invention illustrated in the drawings, four pairs of fingers are illustrated, in other embodiments of the invention more or less pairs of fingers may be employed.

Referring again to Figures 7e and 7f, it can be seen that a recess 35 is provided to facilitate finger access to the lever arm 43 of the catch 40.

Use of the cable manager 10 is straightforward. First of all, the frame 20 is mounted to the rack 15 in a position below a patch panel or other apparatus having sockets to receive cables. Integral clips 21 shown in Figure 6, are provided to facilitate easy installation to a rack 15. Alternatively, in other embodiments (not shown) conventional fasteners may be provided for and used. Once the frame 20 is securely installed in the position illustrated in Figure 8, cables 8 can be neatly fed between finger pairs 23, 23', 24, 24' and 25, 25'. With the cables 8 now neatly in place as shown in Figure 8, the cover 30 can be attached to the frame 20 as follows. First of all, the cover is held at its ends as is shown in Figure 8 and then is presented
to the frame 20 such that its proximal end 31 hinges about underside surface 52 of finger 22. A hook 37 is provided on cover 30 to facilitate the hinging action as is most clearly shown in Figures 4, 7a and then 7b.

Referring now to Figures 4 and 9, the hook 37 is more clearly shown. In this embodiment of the invention, the hook 37 defines a U-shaped slot that slides into the position shown in Figure 7b so as to cooperate with a lug 53 and to thereby form a stable hinge (the lug 53 is most clearly shown in Figures 4 and 7a). With a hinge now established about axis 31' (hinge axis 31' shown in Figure 1) the cover 30 can be rotated from the position illustrated in Figure 7a to the position illustrated in Figure 7b and then further to the position illustrated in Figure 7c.

As the distal end 39 of the cover 30 reaches the finger 25 the projection 45 of the catch 40 is pushed upwards to the position shown in Figures 7c and 7e. By this stage, the finger pairs 22, 22', 23, 23', 24, 24' and 25, 25' are prevented from spreading apart by tabs 32, 32', 34, 34', 36, 36' and 38, 38' of the cover 30.

To lock the cover 30 in the position shown in Figures 7e and 7f, a finger or thumb is used to depress the lever arm 43 of the catch 40 to the position shown in Figures 7d and 7f. This action rotates the projection 45 about the second vertical axis 41' to the position shown in Figure 7f in which the projection 45 engages the underside surface 50 of finger 25.

Figures 7g, 7h and 7i show schematically how the catch operates and snaps into position. As the catch 40 is moved from the position shown in Figure 7g the position shown in Figure 7H, the projection 45 engages with surface 50 of finger 25. Due to the shape and position of projection 45 and surface 50, a wedging action is produced which causes displacement of the finger 25 as is illustrated in Figure 7h.

Once the projection 45 and surface 50 have reached and “over-centre” position, the finger 25 returns to the position shown in Figure 7i securely holding the projection 45 of the catch 40 in place.

The contact area 80 on the projection 45 and the surface 50 is closer to the first axis 31' then the distance between the first and second axis 41' and 31'. This ensures that force is acting on the cover 30 having a direction that would otherwise tend to move the cover towards its open position (such as a force in the direction indicated by arrow f on Figure 7i) that would otherwise tend to move the cover towards its open position, will cause a talk in the catch 40, the talk acting in the direction indicated by the arrow t in Figure 7i and tending to hold the latch in its locked position shown in Figure 7i.

The cable manager is constructed such that when the catch 40 is in its locked position the projection 45 and surface 50 have a contact area 80 that is closer to the first axis than the distance r2 between the first and second axes (r2 together with r1, the distance between the contact area and the first axes, are both shown on Figure 7i). This ensures that forces acting on the cover having a direction that would otherwise
tend to move the cover towards its open position will cause a torque in the catch, the torque acting in a
direction of the locked position.

Curved ribs 71 and 79 shown in Figures 3, 4, 7e, 7f, 7g, 7h and 7i are provided to present unwanted
lateral movement of the cover 30. More specifically, the ribs 71 and 79 are provided to reduce the
chances of the cover 30 being dislodged from the frame 20. This is more clearly seen in Figure 7a through
to 7d. In these figures it can be seen that rib 71 is positioned immediately adjacent finger 23 when the
cover is in its closed position. This prevents the cover moving laterally in the direction L over to the right
(as shown in these figures) and dislodging hook 37 from the underside of finger 22. The positioning of the
rib 79 with respect to finger 25 is more clearly shown in Figures 7e and 7f. It is clear from these figures
that the rib 79 prevents lateral movement of the cover 30 to the left (as shown in the drawings) which
could otherwise cause dislodgement of the projection 45 from underneath the finger 25.

A lug 23 is provided on the underside of finger 25 and projection 45 is shaped to accept lug 23 so as to
provide stability for the catch 40. The lug 23 and projection 45 can more clearly be seen in Figures 5 and
6 in which the catch is shown in an open and then a closed position respectively.

In other embodiments of the invention not shown, the hook 37 may be replaced by a projection that
facilitates a more direct attachment of the cover 30 to the frame 20. With such an arrangement, an
installer can simply present the cover 30 directly to the frame 20 without the need to rotate it about an
axis. The installer simply forces the cover towards the fingers until the projection 37 (in lieu of hook 37)
and projection 45 snap into position. Removal of the cover is then the reverse of that described above.
That is, the catch 40 is first released by rotating the lever 43 away from the body of the cover 30. The
cover 30 can then be rotated about hinge axis 31’ for removal and separation from the frame 20.

With the above described cable manager, the fingers are held securely together by the tabs of the cover
and the hinging action of the cover from one end allows sequential holding of the fingers together and
allows gathering of cables across the width of the cable manager. With the 'Over-centre' arrangement
described above, as cables 8 push out against the cover 30, the catch 40 tends to lock more firmly. It will
resist releasing even when the cables 8 are pulled or otherwise disturbed.

While the present invention has been described in terms of a preferred embodiment in order to facilitate
better understanding of the invention, it should be appreciated that various modifications can be made
without departing from the principles of the invention. Therefore, the invention should be understood to
include all such modifications within its scope.
CLAIMS

1. A cable manager for managing cables terminating in rack mounted patch panels and the like, the cable manager including:
   an elongate frame mountable to a rack in a horizontal orientation;
   a plurality of horizontally spaced apart fingers arranged to collectively support and direct the cables;
   an elongate separable cover having a proximal end and a distal end, the proximal end hingedly mountable to a corresponding proximal end of the frame for pivoting about a first substantially vertical axis from an open position to a closed position;
   a catch pivotally mounted to distal end of the cover for rotation about a second substantially vertical axis from an unlocked position to a locked position, the catch including a gripable lever arm and a projection,
   wherein when the cover is in its closed position and the catch is in its locked position, the projection engages a surface on a distal end of the frame, thereby restraining the distal end of the cover from movement away from its closed position.

2. A cable manager as claimed in claim 1 wherein the proximal end of the cover is hingely mounted to a proximal finger, the proximal finger located at the proximal end of the frame.

3. A cable manager as claimed in claim 2 wherein the surface on the distal end of the frame is a surface on a distal finger, the distal finger being one of the plurality of horizontally spaced apart fingers.

4. A cable manager as claimed in claim 3 wherein when the catch is in its locked position the projection and surface have a contact area that is closer to the first axis than the distance between the first and second axes, thereby ensuring that forces acting on the cover having a direction that would otherwise tend to move the cover towards its open position will cause a torque in the catch, the torque acting in a direction of the locked position.

5. A cable manager as claimed in claim 4 wherein the projection and the surface are mutually shaped and positioned, when the cover is in its closed position, to provide a wedging action both when the catch is moved from its unlocked position to its locked position and when the catch is moved from its locked position to its unlocked position, the wedging action causing displacement so as to provide a snap lock action.
6. A cable manager as claimed in claim 5 wherein the snap lock action arises primarily from the flexibility and resilience of the finger(s) of the frame and wherein no separate spring components are required.

7. A cable manager as claimed in claim 6 wherein the fingers include a plurality of horizontally spaced apart finger pairs extending outwardly from the frame, each pair including an upper finger and a lower finger, the upper and lower fingers arranged to collectively support and direct the cables.

8. A cable manager as claimed in claim 7 wherein the cover includes a plurality of inwardly directed tabs for engagement with respective upper and lower finger pairs to prevent them spreading apart.

9. A cable manager substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.
H02G 11/00 (2006.01)  F16L 3/12 (2006.01)  H02G 3/14 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

ESP@CENET and EPOQUE (WPI and EPDOC); WIPO, CABL+, CORD?, MANAG+, ORGANIZ+, ROUT+, HING+, PIVOT+, LEVER+, LID?, COVER? and similar combinations of keywords.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 2006/0171075 A1 (CAVENEY et al.) 3 August 2006 Whole document and in particular see Figures 5-6</td>
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<tr>
<td>A</td>
<td>US 6766932 B2 (MCGRATH et al.) 20 July 2004 Figure 7</td>
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<td>A</td>
<td>US 6126123 A (YANG) 3 October 2000 Figure 5, items 34 and 60</td>
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X Further documents are listed in the continuation of Box C  X See patent family annex

* Special categories of cited documents:
  "A" document defining the general state of the art which is not considered to be of particular relevance
  "E" earlier application or patent but published on or after the international filing date
  "L" document which may throw doubts on prior art or which is cited to establish the publication date of another invention or other special reason (as specified)
  "O" document referring to an oral disclosure, use, exhibition or other means
  "P" document published prior to the international filing date but later than the priority date claimed
  "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  "X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  "Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
  "&" document member of the same patent family

Date of the actual completion of the international search 17 November 2008

Date of mailing of the international search report 21 Nov 2008

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Form PCT/ISA/2 10 (second sheet) (July 2008)
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<td>US 5820048 A (SHEREYK et al.) 13 October 1998 Abstract</td>
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INTERNATIONAL SEARCH REPORT

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. [ ] Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. [X] Claim No.: 9 because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
   Claim 9 does not comply with Rule 6.2 (a) because it relies on references to the description and/or drawings.

3. [ ] Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. [ ] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. [ ] As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. [ ] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. [ ] No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

[ ] The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

[ ] The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

[ ] No protest accompanied the payment of additional search fees.
This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.