The invention provides a clip (38) which includes a pair of arms (40, 42) connected to each other and which, in use, is connected to an element located between the arms (40, 42), with at least one of the arms (40) defining at least one connecting formation (39) providing a male formation standing proud of an inner side of the arm (40), with the male formation, in use, being positioned within a complementary female formation defined by the element located between the arms (40, 42).
— as to applicant's entitlement to apply for and be granted a patent (Rule 4.1(7)(H))
— of inventorship (Rule 4.1(7)(iv))

Published:
— with international search report (Art. 21(3))
GUIDE RAIL SECTION

This invention relates to a clip.

Opposed pairs of guide rails are used to guide the displacement of skips or cages in a mine shaft. Each guide rail comprises a plurality of guide rail sections which are connected to one another end-to-end to provide the guide rail. These guide rail sections can become damaged and require replacement. It is known to use guide rails comprising guide rail sections having guide formations to guide the displacement of skips or cages, the guide formations being connected to one another by means of complementary projections and recesses located on the ends of the guide rail sections, the projections, which are immoveable, being captured within the receiving formations, with the walls of the receiving formations surrounding the projections. The guide rails sections include, on opposite sides thereof, a plurality of longitudinally spaced flanges whereby the guide rail sections are connected to horizontally extending supporting members or struts (buntons) anchored to a wall of the mine shaft.

From time to time, one or more of the guide rails sections of such a guide rail may need to be replaced. The replacement of these guide rail sections is, however, dangerous, difficult and time consuming. Since the projections are captured within the recesses and are immoveable, the removal of one of the guide rail sections in a guide rail and the replacement thereof by another guide rail section requires that other guide rail sections in the guide rail also be unfastened since abutment of the projections with the walls of the receiving formations inhibit horizontal displacement of the guide rail sections. Bearing in mind that the guide rail sections can be about 10 metres in length and are located in mine shafts that can be extremely deep, it will be appreciated that the replacement of such guide rail sections requires a plurality of persons and is time consuming and hazardous. Furthermore, the temptation exists for workers simply to saw off the projection of the replacement guide rail section prior to its installation so that other guide rail sections of the guide rail do not need to be unfastened. However, this is dangerous since the guide rail section will then
only be supported by the flanges which are liable to become twisted and/or otherwise damaged resulting in misalignment and/or loosening of the guide rail section. An alternative method of connecting guide rail sections to supporting members and to one another which avoids these problems would thus be desirable.

Without limiting the potential application of this invention, this invention seeks provides a clip, which could for example be used in an alternative method of connecting guide rail sections to supporting members and/or to one another.

According to the invention there is provided a clip which includes a pair of arms connected to each other and which, in use, is connected to an element located between the arms, with at least one of the arms defining at least one connecting formation providing a male formation standing proud of an inner side of the arm, with the male formation, in use, being positioned within a complementary female formation defined by the element located between the arms.

Each arm may include at least one hole extending therethrough for receiving a shaft of a fastener when the holes of the arms are in register.

The or each connecting formation may in the form of a depression defined by the arm which provides a recessed receiving formation on an outer side of the arm, with a bottom portion of the depression providing the male formation. The or each hole of said arm may be located in the depression.

In use, a head of a fastener may be received within the depression. From the outer side of the clip, when the outer side of the arm with the depression is viewed face-on, the connecting formation of the clip gives the appearance of a countersunk hole or a counterbore.

The clip may be generally U-shaped. The clip may be of a unitary construction, the clip being fabricated from a single sheet of material which is
bent to provide the arms. The free ends of the arms may include portions which extend outwardly away from each other and at an obtuse angle to the remainder of their respective arms.

The depression may include a side wall and a planar wall which provides a bottom or floor of the depression and which extends orthogonally to the side wall. The bottom or floor of the depression and an adjacent portion of the side wall that protrudes from the inner side of the clip may thus provide a male formation that, in use, is received within the female formation of the element. The side wall may be circular cylindrical, and the bottom or floor may be circular in outline.

The clip may, in use, connect an element to a support, with a portion of the connecting formation of the clip being received in the formation of the element, the female receiving formation defining a hole which is in register with the hole of the connecting formation of the clip, with a shaft of a fastener extending through the registering holes. Thus, when the element is viewed face-on, the female formation may thus give the appearance of a countersunk hole or counterbore. The holes of the arms may be in register when the arms extend substantially parallel to each other. In use, a head of the fastener may be received within the depression which thus provides a receiving formation for the head of the bolt.

The element may be a guide rail section. In particular, the clip may be for use in connecting a guide rail section to a support connected to a wall of a mine shaft. The guide rail section may be for guiding displacement of conveyance in a mine shaft. The guide rail section may include a longitudinally extending guide formation. In particular, the guide formation may be a longitudinally extending protrusion, with the guide rail section including at least a pair of flanges, the flanges being located on opposite sides of the protrusion, with the protrusion standing proud of the flanges. As indicated above, the guide rail section may include a female formation. The guide rail section typically includes a plurality of such female formations. The female formations may be located on the flanges. In use, the holes of the clip will be in register with holes
of the female formations of the flanges and with holes or apertures defined by a support or of a connecting member, e.g. a saddle, which is connected to a support, with the flange and the support or connecting member, as the case may be, being received between the arms of the clip.

At least one of the arms may define a plurality of the connecting formations. At least one of the arms may define a pair of the connecting formations.

Each arm may define a plurality of holes. Each arm may define a pair of holes and at least one of the arms may define a pair of the connecting formations. The clip may be for use in connecting a pair of elements, which may be guide rail sections, to each other.

In use, the clip may straddle the ends of adjacent elements, each element defining female connection formations, with the portions of the connecting formations of the clip being received by the female formations of the adjacent elements, and with the holes of the clip being in register with the holes of the adjacent elements such that a shaft of a fastener can extend through the registering holes. Thus, in this embodiment, in addition to connecting the element to a support as described above, the clip may also be for use in connecting adjacent elements to one another.

The clip may be of a resiliently flexible material. The clip may be of spring steel. The clip may be fabricated from a sheet of spring steel that is at least 4 mm thick, preferably about 6 mm thick, and the sheet may be bent to provide the arms of the clip.

As indicated above, the element may be a guide rail section. In use, to secure the guide rail section in position in the mine shaft, the guide rail section may be connected, via its flanges, to a supporting member anchored to a wall of the mine shaft. The mine shaft may be divided by buntons, i.e. horizontally extending reinforcing components or struts, into a plurality of vertically extending compartments which may be used for different purposes,
e.g. there may be a compartment for a mine cage for transporting workers and supplies, further compartments for skips for hoisting ore etc, an additional compartment which provides an emergency exit and a still further compartment for services such as electrical cables and pipes for water, air and/or fuel. The supporting member to which the guide rail section is connected may thus be a bunton.

In particular, in use, the guide rail section may be connected, via the clip, to a supporting member, with the guide formation projecting forwardly, away from the supporting member. Thus, in use, the guide rail section may be connected to a bunton, with the guide formation projecting inwardly into a compartment of the mine shaft, and with a conveyance, such as a skip or cage, being displaceably mounted to the guide rail. The conveyance may be connected to a hoisting means for hoisting the conveyance along the guide rail.

The connecting member may be affixed to the bunton. In use, the clip may be releasably fastened to one of the flanges of the guide rail section via a fastening member having a shank, e.g. a bolt, the holes of the clip being in register with holes defined in the flange, with the shank extending through the registering holes of the clip and the flange, and with the fastening member also being directly or indirectly connected to the supporting member. For example the shank of the fastening member may be extend through a hole defined in a further connecting member, e.g. a saddle, which may in turn be affixed to the supporting member. If the clip includes a pair of the connecting formations on at least one of the arms, as described above, the clip may also connect adjacent guide rails to each other. The conveyance may include rollers, with the guide formation, in use, providing paths along which the rollers run.

The invention will now be described by way of non-limiting, illustrative examples, with reference to the accompanying schematic drawings, in which:

Figure 1 is a three-dimensional view of a conventional guide rail section;
Figure 2 is a front view of a guide rail section;
Figure 3a is a side elevation of the guide rail section of Figure 2;
Figure 3b is a cross-sectional end view of the guide rail section of Figure 2;

Figure 4 is a front view of a plurality of the guide rail sections of Figure 2 positioned end-to-end;

Figure 5 is a three-dimensional view of a clip, in accordance with the invention, for connecting the guide rail section of Figure 2 to a support;

Figure 6 is another three dimensional view of the clip of Figure 5, viewed from the opposite side;

Figure 7 is a front view of another guide rail section;

Figure 8 is a cross-sectional side view of the guide rail section of Figure 2;

Figure 9 is a cross-sectional side view of a still further guide rail section;

Figure 10 is a cross-sectional end view of the guide rail section of Figure 9;

Figure 11 is a front view of a latch guide component of the guide rail section of Figure 7;

Figure 12 is an end elevation of the latch guide component of Figure 11;

Figure 13 is a front view of a latch of the guide rail section of Figure 9;

Figure 14 is an end view of the latch of Figure 13;

Figure 15 is a side elevation of the guide rail section of Figure 2 with a harness positioned adjacent thereto;

Figure 16 is a side elevation of a tool for displacing the arms of the clip of Figure 5;

Figure 17 is a top plan view of the tool of Figure 16;

Figure 18 is a front view of a portion of a guide shaft or rail comprising a plurality of the guide rail sections of Figure 2; and

Figure 19 is a side elevation of the guide rail of Figure 18.

Referring to Figure 1, a conventional guide rail section is generally designated by reference numeral 2. The guide rail section 2 has a box-shaped guide formation 3. In use, the guide rail section 2 is connected to other such guide rails sections 2 to form a guide shaft or rail (not shown). In particular, the guide rail section 2 includes, on one end, a longitudinally extending projection 4 and, on an opposite end, a receiving formation or recess 5 for receiving the
locating projection 4 of another such guide rail 2. The projection 4 is immoveable, and is, in use captured within the receiving formation 5 of another such guide rail section 2 thereabove, with the walls of the receiving formation 5 surrounding the projection 4. The guide rail section 2 includes, on opposite sides thereof, a plurality of longitudinally spaced flanges 6 defining holes 7 for shafts of fasteners such as bolts (not shown). The guide rail sections 2 are connected, via the flanges 6, to horizontally extending supporting members or struts (buntons) (not shown) anchored to a wall of the mine shaft (not shown). The replacement of one of the guide rail sections 2 of an installed guide rail with another guide rail section 2 is dangerous, difficult and time consuming for the reasons indicated in the introductory section above.

Referring to Figures 2 to 4, an element in the form of a guide rail section is generally designated by reference numeral 10. The guide rail section 10 is for forming a guide in the form of a guide rail which, in use, guides displacement of a conveyance, such as a skip or cage, in a vertical or substantially vertical mine shaft (not shown).

The guide rail section 10 includes a C-shaped web portion or guide formation 14 and a pair of flanges 16 for securing the guide rail section 10 in position in a mine shaft (not shown), the guide formation 14 extending between the flanges 16. The guide rail section 10 has a conventional top hat profile. The guide formation 14 is in the form of a longitudinally extending protrusion which stands proud of the flanges 16. The guide formation 14 includes a medial or central portion 18, which is provided by a wall 19a, and includes two lateral portions 20 on opposite sides of the medial portion 18, which are provided by a pair of opposed walls 19b. The central or medial portion 18 and the lateral portions 20 are rectilinear in profile and are planar. The lateral portions 20 extend away from the medial portion 18 at right angles thereto. The lateral portions 20 extend from opposite edges of the medial portion 18 to the flanges 16. The flanges 16 extend laterally outwardly from the lateral portions 20 at right angles thereto. The guide rail section 10 has an end 21 which includes a retractable locking latch 24 (Figure 8) for connecting the guide rail section 10 to another such guide rail section 10 adjacent thereto when the guide
rail sections 10 are positioned end-to-end. The latch 24 is movable between an extended position (shown in Figure 8) in which the latch 24 projects beyond the end 21 and a retracted position in which it does not project beyond the end 21.

An opposite end 22 includes a longitudinally extending, locating projection 24, the locating projection 24 being defined by the wall 19a. The locating projection 24 includes a widened portion 26 located on an outer extremity of the locating projection 24 and a neck 28, the locating projection 24 being connected to the remainder of the guide rail section 10 via the narrowed portion or neck 28. The locating projection 24 extends axially along a longitudinal axis of the medial portion 18. The neck includes two parallel sides 29a and the widened portion includes two parallel sides 29b. The wall 19a defines a locating recess 32, in particular an outwardly opening recess on the end 21, for receiving a locating projection 24 of another guide rail section 10 (Figure 4), the locating recess 32 and the locating projection 24 being complementarily shaped, and the locating recess 32 extending through the wall 19a. The parallel sides 29a, 29b enables sufficient tolerance in the longitudinal direction to be provided between the locating projection 24 and the locating recess 32, which assists during the installation of a guide rail. In this regard is should be borne in mind that a guide rail in a mine shaft may need to extend a long way down the mine shaft and that sufficient tolerance in the longitudinal direction is thus required.

There is a pair of registering (i.e. transversely aligned), transversely spaced, female formations 34 proximate to the end 21. In register (i.e. longitudinally aligned) with the holes 34, there is a pair of registering (i.e. transversely aligned), transversely spaced, female formations 36 proximate to the end 22. Each female formation 34, 36 includes a circular cylindrical side wall and a flat circular floor or bottom which defines a hole 37 extending through the flange 16. When the guide rail section 10 is viewed face-on, the female formations 34, 36 thus give the appearance of counterbores. The female formations 34, 36 are defined in the flanges 16. As is explained more fully below, adjacent guide rail sections 10 are connected to one another by means of generally U-shaped clips 38 (one of which is shown Figures 5 and 6) in
accordance with the invention. The clips 38, in use, straddle adjacent ends 21, 22 of adjacent guide rail sections 10. The clips 38 also connect the guide rail section 10 to a supporting member which is in the form of a horizontally extending, metal reinforcing component or bunton (not shown). The bunton is anchored to a wall (not shown) of a mine shaft (not shown), as is more fully described below.

The clip 38 includes a pair of arms 40, 42 connected to each other. The arm 40 defines a pair of connecting formations 39 being in the form of a pair of depressions 41 which provide a pair of recessed openings or cavities on an outer side of the arm 40, with portions the formations 39 providing male formations 41a on an inner side of the arm 40, which, in use, are positioned in the complementary female formations 34, 36 when the clip 38 straddles adjacent guide rail sections 10. The formations 39 each include a side wall 43a (which extends orthogonally to an outer surface of the arm 40) and a wall 43b which extends orthogonally to the side wall 43a, the wall 43b, which is circular in outline, being planar and providing a flat bottom or floor of the depression 41. The wall 43b and an adjacent portion of the side wall 43a that protrudes from the inner side of the arm provides the male formation 41a. The side wall 43a is circular cylindrical and the wall 43b is circular. The wall 43b defines a hole 44 which extends therethrough. Thus, from the outer side of the arm 40, the formations 39 give the appearance of counterbores. The clip 38 is of a unitary construction, the clip 38 being fabricated from a single workpiece which is bent to provide the arms 40, 42. The free ends of the arms 40, 42 include portions 45 which extend outwardly away from each other and at an obtuse angle to the remainder of their respective arms 40, 42. The clip 38 is of spring steel, and is fabricated from a sheet of spring steel that is 6 mm thick. The arms 40, 42 are displaceable towards and away from each other with the use of a tool 95 (Figures 16 and 17), as is more fully described below. The arm 42 defines a pair of holes 46 (Figure 6) which are generally in register with the pair of holes 44 when the arms 40, 42 extend parallel to each other so that, in use, a pair of bolts can be threaded through the registering holes 44, 46. The guide rail section 10 also includes a pair of registering (i.e. transversely aligned), transversely spaced, female formations holes 48 (Figure 4) midway along the
length of the guide rail section 10. Each female formation 48 includes a flat bottomed floor which defines a hole 49. Thus, from the front of the guide rail section 10, the female formations 48 thus give the appearance of counterbores.

The guide rail section 10 further includes a pair of registering, transversely spaced, keyhole-shaped apertures 50 which are proximate to the end 21 and longitudinally inwardly spaced from the female formations 34. There is also a pair of registering (i.e. transversely aligned), transversely spaced, keyhole-shaped apertures 52 which are proximate to the end 22 and which are longitudinally inwardly spaced from the female formations 36. The keyhole-shaped apertures 50, 52 extend through the flanges 16. The keyhole-shaped apertures 50, 52 include a widened portion 54 and a narrowed portion 56 (Figure 2). As is described more fully below, the apertures 50, 52 are for receiving pins during installation of the guide rail section 10.

Another guide rail section in accordance with the invention is shown in Figure 7, the guide rail section being generally designated by reference numeral 100. Unless otherwise indicated, like features to those of the guide rail section 10 are designated by like reference numerals. The guide rail section 100 is the same as the guide rail section 10 save that, in place of the keyhole shaped apertures 50, 52, there are double keyhole shaped apertures 150, 152, each aperture 150, 152 having two narrowed portions 156 and a widened portions 154 between the narrowed portions 156. The guide rail section 100 permits greater flexibility in the manner in which the guide rail section 100 is installed as compared to the guide rail section 10, since pins may be received by either of the narrowed portions 156 when the guide rail section 100 is installed, thus permitting the guide rail section 100 to be installed with either end 21 or end 22 uppermost.

Referring back to the guide rail section 10, Figure 8 shows the latch 24, which is positioned on a rear side 58 of the wall 19a. The latch 24 is affixed to a carriage 60 which is displaceable along a shaft 62, a screw-threaded end of the shaft 62 being received in a bore defined by the carriage 60 which includes complementary screw threads. An opposite end of the shaft 62 is
connected to the rear side 58 of the wall 19a via a bracket 66. The bracket 66 has an inverted L-shaped profile, the bracket 66 having a pair of arms 68, 70 which extend at right angles to each other, with a bore being defined in the arm 70 which extends orthogonally to the medial portion 18, the shaft 62 extending through the bore. The bracket 66 is affixed to the rear side 58 of the wall 19a via the other arm 68. The guide rail section 10 includes locking means that includes a pair of locking nuts 74, 76 is located on the shaft 62, the nuts 74, 76 being located on either side of the arm 70 of the bracket 66, with a washer 78 being located between the nut 76 and the arm 70. The end 22 of the guide rail section 10 includes a transversely extending, tubular latch constraining element 80 which is rearwardly spaced from the wall 19a. Opposite ends of the constraining element 80 are respectively connected to walls 19b. The latch 24 is slideably displaceable along the rear side 58 of the wall 19a, in the space between the rear side 58 and the constraining element 80, the wall 19a and the latch constraining element 80 thus provided a receiving formation 82 in which the latch 24 is captured when it is in its extended position.

In still further guide rail section is generally designated by reference numeral 200 and is shown in Figures 9 to 14, the guide rail section 200 includes a latch guide formation 212 (Figures 9, 10, 11 and 12) for guiding the displacement of the latch 220 (Figures 9, 10, 13 and 14). Unless otherwise indicated, like features to those of the guide rail section 10 are designated by like reference numerals. The latch guide formation 212 includes a central portion 214 and two lateral portions 216 extending from the opposite sides of the portion 214, at right angles to the portion 214, to flanged ends, with flanges 218 on the ends of the lateral portions 216 respectively extending outwardly therefrom and at right angles thereto. The latch guide formation 212 is affixed, via its flanges 218, to the inner side 58 of the wall 19a, with the central portion 214 extending parallel to the wall 19a. The latch 220 is in the form of a U-shaped tray with planar sides. The guide rail section 200 includes locking means that includes a pair of ratchets 222, each of which comprises a gear component 224 and a pawl 226 which engages with teeth 227 of the gear component 224. Each gear component 224 includes an arm 230 which extends outwardly with respect to a pivot axis about which the gear component 224 is
pivotable, the teeth 227 of the gear component 224 being shaped such that the gear component 224 is pivotable in the direction of the arrow "A" in Figure 9 when the pawl 226 engages with the teeth 227. The gear components 224 are connected to each other via an axially extending, pivotable, common shaft 228. Opposite ends of the shaft 228 extend into holes 229 defined in the lateral portions 20, the ends of the shaft 228 (which are square in profile) being accessible from the outer sides of the walls 19b through the holes 229 by means of a tool (not shown).

The latch 220 is connected to the ratchets 222 via the arms 230 of the gear component 224, each arm 230 having an end 232 remote from the pivot axis of the gear component 224, with the arm 230 tapering towards the end 232. The ratchets 222 each include a spring 233 coiled about the shaft 228 between the walls 19b and the gear components 224, with ends of the springs 233 bearing against the arms 230 so as to urge the latch 220 towards its extended position. The latch guide formation 212 includes a pair of longitudinally extending, elongated slots 235 defined by the central portion 214. The latch 220 defines a pair of apertures 236 which are aligned or in register with the slots 235. The ends 232 extend through the slots 235 and the apertures 236, each end 232 being captured within one of the slots 235 and one of the apertures 236. The ends 232 are displaceable along the slots 235 when the gear components 224 pivot. The apertures 236 are complementary to the ends 232, being sized so that pivoting of the arms 230 causes the latch 220 to be displaced.

The end 22 of the guide rail section 10 includes a transversely extending U-shaped latch constraining element 240 rearwardly spaced from the wall 19a. Opposite ends of the latch constraining element 240 are respectively connected to the inner sides of the lateral portions 20. The latch 220 is slideably displaceable along the rear side 58 of the wall 19a, in the space between the rear side 58 and the latch constraining element 240, the wall 19a and the latch constraining element 240 thus providing a receiving formation 242 in which the latch 220 is captured when it is in its extended position.
In use, the guide rail sections 10 are secured in position in the mine shaft and are connected to one another in series to form a guide rail 83 (a portion of which is shown in Figures 18 and 19) for guiding displacement of a conveyance such as a skip or cage (not shown) along the mine shaft. In particular, the conveyance is provided, on opposite sides thereof, with one or more pairs of opposed channel formations (not shown) to which rollers (not shown) are rotatably connected. The rollers of each channel formation run along the lengths of the medial portions 18 and the lateral portions 20 of the interconnected guide rail sections 10, the conveyance thus being guided by one or more opposed pairs of guide rails 83.

When a new guide rail section 10 is being installed, to facilitate the connecting of the guide rail sections 10 to the buntons and to each other, a metal harness 84 (Figure 15) is brought to a level where the guide rail sections 10 are to be installed in the mine shaft. The harness 84 is clamped to an end of an already installed guide rail section 10 located adjacent to where the guide rail section 10 is to be installed. The harness 84 includes a framework of mild steel elements and includes two horizontal stationary platforms at about positions 86, 88 which are vertically spaced from one another. The harness 84 includes vertically spaced, pairs of pins 90, 92. The pins 90, 92 are attached to the harness 84 via heads of the pins 90, 92. The pins 90, 92 each define a circumferentially extending groove (not shown) on a shaft of the pin at a location on the shaft proximate to the head (and to the harness 84). To position the guide rail section 10 on the harness 84, the pins 90, 92 are threaded through the widened portions 54 of the keyhole-shaped apertures 50, 52 of the guide rail section 10, with the guide rail section 10 being orientated such that the narrowed portions 56 are above the widened portions 54 of their respective apertures 50, 52, until the grooves on the shafts of the pins 90, 92 are aligned with the narrowed portions 56. The narrowed portions 56 are pushed onto the grooved portions 56 of the shafts of the pins 90, 92, the shafts of the pins 90, 92 being sized so that only the grooved portions of the shafts are receivable by the narrowed portions 56, until the walls at the tops of the narrowed portions 56 of the apertures 50, 52 rest on the pins 90, 92. Displacement of the guide rail
section 10 along the shafts of the pins 90, 92 is inhibited by abutment of the
guide rail section 10 with the walls of the grooves of the pins 90, 92.

The vertical spacing between adjacent buntons is 4.5 m. The
guide rail sections 10, which are each about 9 m in length, are installed in the
mine shaft at positions where there are buntons at levels in the mine shaft where
the ends 21, 22 of each guide rail section 10 is to be installed, and there is a
bunton (not shown) at a level midway between the ends 21, 22. Connecting
members are affixed, e.g. by welding, to the buntons. The saddles 93a, 93b, 93c
are generally U-shaped, including a planar, central portion and a pair of legs
extending at right angles to the central portion on either side thereof. In this
element the connecting members are saddles but they could instead, for
example, be cleats. In the drawings, a pair of saddles (one of which is shown in
Figure 15) that is connected to the bunton to which the upper end 21 of the
guide rail section 10 is to be connected is designated by reference numeral 93a.
A pair of saddles (one of which is shown in Figure 15) that is connected to the
bunton to which the lower end 22 of the guide rail section 10 is to be connected
is designated by reference numeral 93c. A pair of saddles (one of which is
shown in Figure 15) that is connected to the bunton to which the middle of the
guide rail section 10 is to be connected is designated by reference numeral 93b.

The harness 84 includes mobile man cage 85, which is vertically
displaceable via a cable 85a between a position 86 toward an upper end of the
harness 84 and a position 87 about midway along the length of the harness 84.
The cage 85 carries a person to about the position 87, proximate to the bunton
to which the middle of the guide rail section 10 is to be connected, i.e. the
bunton connected to the saddle 93b. In an alternative embodiment, instead of
there being a mobile cage, there could be a stationary platform in the region of
the position 87 of the harness 84 on which a person is supported.

The guide rail section 10 is then lifted so that the pins 90, 92 are
received in the widened portions 54 of the apertures 52. The guide rail section is
then displaced horizontally along the shafts of the pins 90, 92 and is
manoeuvred so that the locating projection 24 of the guide rail section 10 is
positioned within the locating recess 32 of an installed guide rail section 10 thereabove. In this position, the guide rail sections 10 extend vertically and the medial portions 18 of the adjacent guide rail sections 10 are flush, and aligned, with one another. The guide rail section 10 being installed can, for example, be displaced by a pair of hydraulic rams (not shown) respectively positioned proximate to the upper end and a lower end of the harness 84.

The person fastens opposite sides of the guide rail section 10 to the saddles 93b via a pair of clips 94 (Figure 19). The clips 94 are identical to the clips 38 save that each clip 94 has only one connecting formation 39 and one set of 44, 46 (i.e. one hole 44 on the arm 40 and one hole 46 on the arm 42). As indicated above, the formation 39 is in the form of a depression 41 which provides a recessed opening or cavity on an outer side of the arm 40, with a portion of the formation 39 providing a male formation 41a on an inner side of the arm 40. To install one of the clips 94, each clip 94 is positioned around one of the flanges 16 of the guide rail section 10 and a central portion of one of the saddles 93b, the male formation 41a being received by the complementary female formation 48. In this position, the hole 44 of the clip 94 is in register with the hole 49 of the guide rail section 10. To position the arms 40, 40 of the clip 94 around the saddle 93b and the flange 16 of the guide rail section 10, the arms 40, 42 are displaceable by means of a tool 95 as described below. The holes 44, 49 are also in register with the hole 46 of the clip 38 and a hole (not shown) defined by the saddle 93b. The clip 94 is fastened to the guide rail section 10 and to the saddle 93b with a bolt 99 (Figure 18) and a nut (not shown), the shaft of the bolt 99 being inserted through the registering holes.

As is described more fully below, the person in the cage 85 then displaces the latch 24 of the guide rail section 10 from its retracted position to its extended position in which the latch 24 protrudes beyond the end 21 and is received by the receiving formation 82 of the installed guide rail section 10 thereabove, and the latch 24 is locked into its extended position.

Thereafter, a person, positioned on the platform located at about the position 86 of the harness 84, connects each side of the upper end 21 of the
guide rail section 10 being installed to the already installed, adjacent guide rail section 10 thereabove and to the saddle 93a with the clips 38. To install one of the clips 38, the clip 38 is positioned to straddle the upper end 21 of the guide rail section 10 and the lower end 22 of the adjacent guide rail section 10 thereabove, with the arms 40, 42 of the clip 38 being positioned around the adjacent guide rail sections 10 and the central portion of the saddle 93a. More particularly, the formations 39 are in register with the female formations 34, 36, the male formations provided by the formations 39 being received by the complementary female formations 34, 36 and the holes 44 of the clip 38 being in register with the holes 37 of the adjacent guide rail sections 10. The holes 44, 37 are also in register with the holes 46 of the clip 38 and holes defined by the saddle 93a. In particular, using a tool 95 as shown in Figures 16 and 17, the arms 40, 42 of the clip 38 are prised open, the portions 45 of the arms 40, 42 of the clip 38 being received by complementary recesses defined by connecting components 96 at free ends of displaceable arms 97 of the tool 95, the connecting components 96 being displaceable towards and away from each other via displacement of the arms 97.

More particularly, the arms 40, 42 are prised upon by tightening a nut located on a screw-threaded shaft 98 of the tool 95, so that the arms 40, 42 can be positioned around the adjacent guide rail sections 10 and the central portion of the saddle 93a. The nut on the shaft 98 is then untightened, and the resilience of the material of the clip 38 urges the arms 40, 42 towards each other so that the arms 40, 42 of the clip 38 clamp around the ends 21, 22 of the adjacent guide rail sections 10 and central portion of the saddle 93a, with the male formations 41a provided by the formations 39 being positioned in the female formations 34, 36. The tool 95 is disengaged from the clip 38 and shanks of a pair of bolts 99 (Figure 18) are inserted through the holes 44, 46 of the clip 38, the holes 37 of the flanges 16 and holes defined in the saddle 93a. The bolts 99 are then fastened in position with nuts (not shown). The heads of the bolts are positioned against the walls 43b of the clip 38, with the walls 43b, in turn, being positioned against the floors of the female formations 34, 36, the male formations 41a provided by the formations 39 being received by the female formations 34, 36. The arms 40, 42 of the clips 94 are similarly displaceable
away from each other by means of the tool 95. Instead of the tool 95, a pneumatically driven tool (not shown) may be used to displace the arms 40, 42 of the clips 38, 94, the tool otherwise operating in a similar fashion to the tool 95.

Whilst the guide rail section 10 is be fastened as described above, the pins 90, 92 remained threaded through the apertures 50, 52, the shafts of the pin 90, 92 extending past the guide rail section 10 to positions close to the buntons. The pins 90, 92 thus reduce the risk of the guide rail section 10 falling down the mine shaft during installation. Once the clips 38 has been fastened to the saddles 93a, the harness 84 can then be displaced away from the guide rail section 10, with the pins 90, 92 being withdrawn from the apertures 50, 52.

When another guide rail section 10 is installed therebelow, the adjacent guide rail sections 10 will be similarly connected to each other and fastened to the saddles 93c (one of which is shown in Figure 19), by means of the clips 38, the arms of each clip 38 being positioned around the central portion of the saddle 93c and the flanges 16 of the adjacent guide rail sections 10, and being releasably fastened to the flanges 16 and to the saddle 93c with bolts 99 and nuts (not shown). This can be done by a person positioned on the platform at about the position 88 of the harness 84 (Figure 15).

If the guide rail section 10 needs to be removed at a later stage e.g. if it become damaged and requires to be replaced, then the process of installation described above is reversed. It will be appreciated that the guide rail section 10 can be removed in this manner without the need for adjacent guide rail sections to be unfastened.

The guide rail sections 100, 200 can be similarly installed in position in the mine shaft. The guide rail section 100, with its double keyhole-shaped apertures 50, 52, permits greater flexibility in the manner in which the guide rail section 100 is installed as compared to the guide rail section 10, since the pins 90, 92 may be received by either of the narrowed portions 156 when the guide rail section 100 is installed, and thus the guide rail section 100 can be
positioned such that either of the ends 21, 22 are uppermost. The operation of the latches 24, 220 will now be described in detail.

With reference firstly to the latch 24 of the guide rail section 10 (Figure 8), the displacement of the latch 24 from its retracted position to its extended position is caused by manually rotating the screw-threaded shaft 62, which in turn causes the carriage 60 and the latch 24 affixed thereto to be displaced towards the extended position of the latch 24. The latch 24 is then locked in its extended position with the locking nuts 74, 76, the shaft 62 and the locking nuts 74, 76 being accessible by reaching behind the guide rail section 10. If the guide rail section 10 needs to be removed at a later stage e.g. if it becomes damaged and requires to be replaced, then the locking nuts are loosened and the shaft 62 is rotated in the opposite direction to retract the latch 24.

The latch 220 of the guide rail section 200 shown in Figures 9 to 14 is displaced from its retracted position to its extended position by rotating the shaft 228 with a tool (not shown) which engages with one of the ends of the shaft through one of the holes 229. The latch 220 is urged towards its extended position by the springs 233, with the shape of the teeth 227 of the gear component 224 inhibiting rotation in a direction opposite to that of the arrow "A" (Figure 9). If the guide rail section 200 needs to be removed at a later stage, then the pawl 226 is disengaged from the teeth 227, the pawl 226 being pivotable about a pivot pin which is accessible through apertures (not shown) extending through the walls 19b. The latch 220 is then displaced from its extended position to its retracted position by rotating the shaft 228.

The use of the guide rail sections 10, 100, 200 and the clips 38, 94 can provide for secure installation of a guide rail in a mine shaft, the guide rail sections being securely connected to each other and to supporting members in the mine shaft. Furthermore, guide rail sections 10, 100, 200 are relatively easy to install and, importantly, are relatively easy to replace, since the replacement
of one of the guide rail sections does not require other guide rail sections to be unfastened.

The receipt of the male formations 41a of the clips 38 by the female formations 34, 36 can assist in the alignment of the guide formations 14 of the guide rail sections 10. Furthermore, the receipt of the male formations 41a of the clips 38 by the female formations 34, 36 and the receipt of heads of the bolts within the depressions 41 can assist to provide a secure connection of the guide rail section 10 to the buntons (i.e. via the saddles) and of the guide rail sections 10 to one another so that misalignment or displacement of the guide rail sections 10 after installation is inhibited.
CLAIMS:

1. A clip which includes a pair of arms connected to each other and which, in use, is connected to an element located between the arms, with at least one of the arms defining at least one connecting formation providing a male formation standing proud of an inner side of the arm, with the male formation, in use, being positioned within a complementary female formation defined by the element located between the arms.

2. A clip as claimed in claim 1, in which each arm includes at least one hole extending therethrough for receiving a shaft of a fastener when the holes of the arms are in register.

3. A clip as claimed in claim 2, in which the or each connecting formation is in the form of a depression which provides a recessed receiving formation on an outer side of the arm, with a bottom portion of the depression providing the male formation, and with the or each hole of said arm being located in the depression.

4. A clip as claimed in claim 1, in which the clip is generally U-shaped.

5. A clip as claimed in claim 4, in which the free ends of the arms include portions which extend outwardly away from each other and at an obtuse angle to the remainder of their respective arms.

6. A clip as claimed in claim 3, in which the depression includes a side wall and a planar bottom wall which extends orthogonally to the side wall.

7. A clip as claimed in claim 1, in which at least one of the arms defines a pair of the connecting formations.
8. A clip as claimed in claim 3, in which each arm defines a pair of the holes and at least one of the arms defines a pair of the connecting formations.

9. A clip as claimed in claim 8, for use in connecting a pair of elements which are guide rail sections to each other.

10. A clip as claimed in claim 8, which is of a resiliently flexible material.

11. A clip as claimed in claim 10, which is of spring steel.

12. A clip as claimed in claim 11, in which the clip is fabricated from a sheet of spring steel which is at least 4 mm thick, and the sheet is bent to provide the arms of the clip.

13. A clip as claimed in claim 12, in which the sheet is 6 mm thick.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

INV. F16B2/24 F16B5/12

ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F16B

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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[Further documents are listed in the continuation of Box C.]

[See patent family annex.]

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Date of the actual completion of the international search:

24 October 2013

Date of mailing of the international search report:

04/11/2013

Name and mailing address of the ISA/

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Fax: (+31-70) 340-3016

Authorized officer:

Pol 1, Andreas
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