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Cable Retaining Apparatus

The present invention relates to a cable retaining
5 apparatus and relates particularly, but not exclusively, to a
cleat for holding three high voltage sheathed electrical
cables used in three phased power distribution.

In three phased power transmission cables, if a short
10 circuit occurs between any of the cables, the
electromechanical force set up between the cables causes a
sudden, large movement of the cables in opposite directions.
At the high voltages of power distribution cables, this is
extremely dangerous, with potential to cause injury to
15 personnel and damage to the cables and surrounding equipment.

As a result, it is known to use cable cleats in order
to hold the three cables together. This is particularly the
case where the cables are attached to a wall and regularly
20 spaced strong cleats are used to hold the cables together in
the event of a short circuit.

An example of the prior art has a triangular frame that
is divided into two hingedly connected parts. At the
25 opposite ends of these parts to the hinge, a nut and bolt
extend through holes and clamp the cleat with the three
cables therebetween.

Such cleats have the disadvantage that they are
30 designed to work with a single size of cable. Furthermore,
there is very little tolerance built into the cleat to
accommodate variation in the cable diameter along the length

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of the three cables. As a result cable can be incorrectly, and therefore unsafely, held.

Preferred embodiments of the present invention seek to
5 overcome the above described disadvantages of the prior art.

According to the present invention, there is provided a cable retaining apparatus for retaining at least one cable, the apparatus comprising:-

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at least one first cable retaining member adapted to engage a portion of at least one cable;

at least one second cable retaining member adapted to engage
15 another portion of said at least one cable or a portion of at least one further cable, wherein said first and second retaining members are hingedly connected to each other by pivot means;

20 clamping means for pulling said first and second retaining members into clamping engagement with the or each cable;

said first member further comprising hinging axis variation means for varying the position of an axis about which said
25 first and second retaining members pivot on the first cable retaining member.

By hingedly connecting the first and second retaining members using a hinge from which the position of the axis
30 about which the members pivot can be changed provides the advantage that a single cleat of the type of this invention can be used on a wide variety of cables of different diameters. In apparatus of the prior art, a cable cleat of

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this type was designed for use with a single size of cable and could not be readily adapted to work with any other sized cables. Furthermore, because cables can vary in their diameter along their length and since these cable cleats are most commonly used where three high voltage cables are used together, there is potential for a significant variation in the overall size of the three cables together that are to be retained. Cable cleats of the prior art may be unable to properly retain and grip the cables along their entire length.

In a preferred embodiment the hinging point variation means comprises:-

at least one hinge body having at least one slotted aperture extending therethrough for receiving at least one pivot axle, defining said axis, attached to said second retaining member said pivot axle adapted to move in said slot in a direction perpendicular to said axis; and

at least one limiter for limiting the movement of said axle within said slotted aperture.

By providing one, or preferably a pair of, slotted apertures into which the hinging axle together with a limiter to limit the axle's ability to move within the slots, provides the advantage that a simple and robust mechanism for varying the axle position is provided. Furthermore, this mechanism allows the position of the axle to be set even after the first and second retaining members are in position. For example, the cables can be placed within the cable cleat with the axle in its position that allows the largest size of cables to be used. The clamping means is closed and locked

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using the nut and bolt provided and then the limiter is used to apply a suitable level of grip to the cable.

In another preferred embodiment the limiter comprises
5 at least one threaded member adapted to engage a receiving threaded portion of said hinge body, an end of said hinge body limiting the movement of the pivot axle within said slotted aperture.

10 Using a threaded member to control the position of the limiter provides a simple and mechanically secure mechanism to allow the above described positioning of the pivot axle.

In a further preferred embodiment the clamping means
15 comprises at least one nut and bolt.

The apparatus may further comprise insert portion adapted to be attached to said first and/or second retaining member between a surface of said retaining portion that
20 engages said cable and a surface of the cable.

The insert portion may comprise a body for reducing the space between the first and second retaining portions.

25 By including an insert portion that attaches to the first or second retaining member, the advantage is provided that the cable cleat of the present invention can operate with an even wider range of cable diameters. The use of an insert also allows the profile of the surface that the cables
30 engage to be modified to suit the smaller cable diameter thereby ensuring that too much pressure is not applied to the cables. The insert portion also improves the lateral grip between the apparatus and the cable.

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Alternatively the insert portion may comprise a liner for locating between said first and second retaining members and the cable.

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By using a liner between the retaining portion and the cables the lateral grip between the cables and apparatus is improved.

10 In a preferred embodiment the apparatus is adapted to engage three cables arranged in a triangle.

In another preferred embodiment the first retaining portion is adapted to engage a single cable and said second
15 retaining member is adapted to engage two other cables.

Preferred embodiments of the present invention will now be described, by way of example only, and not in any limitative sense, with reference to the accompanying drawings
20 in which:-

Figure 1 is a perspective view from above of an apparatus of the present invention;

25 Figure 2 is a perspective view from below of the apparatus of Figure 1 including an additional component;

Figure 3 is a perspective view from the side of the apparatus of Figure 2;

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Figure 4 is a perspective view similar to that of Figure 3 but including an alternative additional component;

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Figures 5, 6, 7 and 8 are side views (with 7 and 8 being sectional side views and figure 7 being a sectional view of figure 6) of the apparatus of Figures 1 to 4 in use with different sizes of cables;

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Figure 9 is a perspective view of an alternative embodiment of the apparatus of the present invention;

Figures 10 and 11 are perspective views of alternative additional components used in conjunction with the apparatus of Figure 9;

Figures 12 and 13 are perspective views, from above and below, of the apparatus of Figures 9 in conjunction with the additional components of Figure 10 and 11.

Referring to the figures, a cable retaining apparatus or cable cleat 10 for retaining at least one, and typically three cables 12, has first and second cable retaining members 14 and 16. Both cable retaining members are adapted to engage portions of the cables and the cable retaining members 14 and 16 are hingedly connected to each other by a pivot means in the form of hinge 18. The first cable retaining member 14 has a hinge axis variation means 20 that forms part of the hinge 18 and allows the position of the axis about which the first and second retaining members pivot to be varied. Clamping means 22 pulls the first and second retaining members into clamping engagement with the or each cable. The clamping means 22 is formed from a bolt 24 and nut 26 that extend through apertures 28 and 30 in flanges 32 and 34 that are formed in the first and second cable retaining members 14 and 16. A bolt head cover 36 is used to

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cover the head of bolt 24 and this engages first cable retaining member so as to prevent rotation of the bolt 24.

Hinge axis variation means 20 is formed from a hinge body 38 that has a slotted aperture 40 extending therethrough. A threaded aperture 42 also extends through hinge body 38 and into slotted aperture 40. A hinge axle 44 that is formed as part of second cable retaining member 16 extends through slotted aperture 40. A hinge axle limiter 46 is a threaded member that extends through threaded aperture 42. A first end 48 of hinge axle limiter 46 has a tool engaging portion that engages an allen key to cause rotation of the hinge axle limiter within the threaded aperture, by co-operation of their respective threaded surfaces. This therefore allows the extent to which the hinge axle limiter extends through the threaded aperture 42 to be varied. A second end 50 of hinge axle limiter 46 engages hinge axle 44.

First cable retaining member 14 has a base portion 52 that contains fixing apertures 54 for fixing cable cleat 10 to a surface. Insert portions 56, 58 and 60 are inserted to provide support for various sizes of cable 12.

Use of the cable cleat 10 will now be described. The cable cleat 10, as shown in Figure 1, has an insert 56, 58 or 60 added to it, as shown in the remaining figures. The size of insert used depends on the size of the cables that the cleat is to hold. For example, for the smallest size of cable the cleat 56, shown in Figures 2, 3 and 5, is used. For the largest diameter cable a smaller insert 60 is used as shown in Figures 4, 6 and 8. For cables sized between the

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largest and smallest, an intermediate insert 58 is used as shown in Figure 7.

If it is already known from the size of cable that is being used what position the hinge axle 44 must be in to allow the first and second retaining members to retain the cables, then this can be set. For example, for the smallest size of cable, as seen in Figure 5, the hinge axle 44 must be in its lowest position and therefore the hinge axle limiter 46 is rotated, using an allen key inserted into first end 48, so that the second end 50 holds hinge axle 44 at the lowermost end of slotted aperture 40. The clamping means is released by separating nut 26 from bolt 24 and the first and second cable retaining members are opened about hinge 18. The cables 12 are inserted and the flanges 32 and 34 brought back towards engagement with each other. Bolt 24 is inserted through apertures 28 and 30 and the nut 26 brought into threaded engagement with bolt 24. A spanner is used to tighten nut 26 so that a light pressure is applied to cables 12, thereby holding them in place.

Where the largest size of cable is used, the smallest insert 60 is added to cable cleat 10 as shown in Figures 4 and 6. In this instance, the hinge 18 must be in its largest position with the hinge axle limiter having its second end 50 at the uppermost end of slotted aperture 40. When the cables are inserted and the nut 26 and bolt 24 extend through apertures 28 and 30, a spacer 62 is also used.

If an intermediate size of cable is used, it may not be immediately apparent what the correct position for hinge axle limiter 46 is. In this instance, the appropriate insert, in the example shown in Figure 4 insert 58, is added to first

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cable retaining member 14. The hinge axle limiter 48 is positioned so that its second axle end is furthest towards the upper end of slotted aperture 40 and the cables inserted. The bolt 24 and nut 26 are used to close the first and second
5 cable retaining members 14 and 16 around the cables 12. The hinge axle limited 48 and nut 26 can then be adjusted to apply a suitable gripping force to the cables 12.

Referring to Figures 9 to 13, alternative embodiments
10 are shown therein, including an insert 62, which has a cable engaging surface 64 and a retaining portion 66 extending from the surface 68 on the opposing side of insert 62 from cable engaging surface 64. The retaining portion 66 extends into and engages aperture 70 in first cable retaining member 14 to
15 locate and fixing the insert 62 in position.

It will be appreciated by persons skilled in the art that the above embodiments have been described by way of example only and not in any limitative sense, and that the
20 various alterations and modifications are possible without departure from the scope of the invention as defined by the appended claims. For example, a liner, located between the cable and the retaining portions, could be provided to improve the lateral grip between the retaining portions and
25 cables and to decrease the likelihood of damage to the cable sheaths.

Claims

1. A cable retaining apparatus for retaining at least one cable, the apparatus comprising:-

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at least one first cable retaining member adapted to engage a portion of at least one cable;

at least one second cable retaining member adapted to engage another
10 portion of said at least one cable or a portion of at least one further cable, wherein said first and second cable retaining members are hingedly connected to each other by pivot means;

clamping means for pulling said first and second cable retaining
15 members into clamping engagement with the or each cable;

said first cable retaining member further comprising hinging axis variation means for varying the position of an axis about which said first and second cable retaining members pivot on the first cable
20 retaining member,

said hinging axis variation means comprising:-

at least one hinge body having at least one slotted aperture
25 extending therethrough for receiving at least one hinge axle, defining said axis, attached to said second cable retaining member said hinge axle adapted to move in said slotted aperture in a direction perpendicular to said axis; and

30 characterised by at least one limiter for limiting the movement of said hinge axle within said slotted aperture,

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said limiter comprises at least one threaded member adapted to engage a receiving threaded portion of said hinge body, said threaded member limiting the movement of the hinge axle within said slotted aperture.

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2. An apparatus according to claim 1, wherein said clamping means comprises at least one nut and bolt.

3. An apparatus according to claim 1 or 2, further comprising
10 insert portion adapted to be attached to said first and/or second cable retaining member between a surface of said retaining portion that engages said cable and a surface of the cable.

4. An apparatus according to claim 3, wherein said insert portion
15 comprises a body for reducing the space between the first and second cable retaining members.

5. An apparatus according to claim 3, wherein said insert portion
20 comprises a liner for locating between said first and second cable retaining members and the cable.

6. An apparatus according to any one of the preceding claims,
wherein said apparatus is adapted to engage three cables arranged
in a triangle.

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7. An apparatus according to claim 6, wherein said first cable retaining member is adapted to engage a single cable and said second cable retaining member is adapted to engage two other cables.