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(71) Applicant: **DMM International Ltd**
Llanberis Gwynedd LL55 4EL (GB)

(72) Inventor: **Marsh, Simon**
Llanberis, Gwynedd LL55 4EL (GB)

(74) Representative: **Hamilton, Alistair**
Alistair Hamilton Intellectual Property
Ty Eurgain
Cefn Eurgain Lane
Rhosesmor
Mold, Flintshire CH7 6PG (GB)

(54) **Protection device for use in climbing**

(57) A camming device for use in climbing comprising a head (10) that carries one or more moveable cams (20), a shaft (12) extending from the head, an operating bar (46) carried on the shaft. A termination (40) is secured to the shaft (12), and a sling (70) is connected to the termination (40). The termination (40) is typically formed from a single block of metal. The sling (70) is formed from an endless loop of flexible material. The termination includes two (or, optionally, more) apertures through which the sling passes.

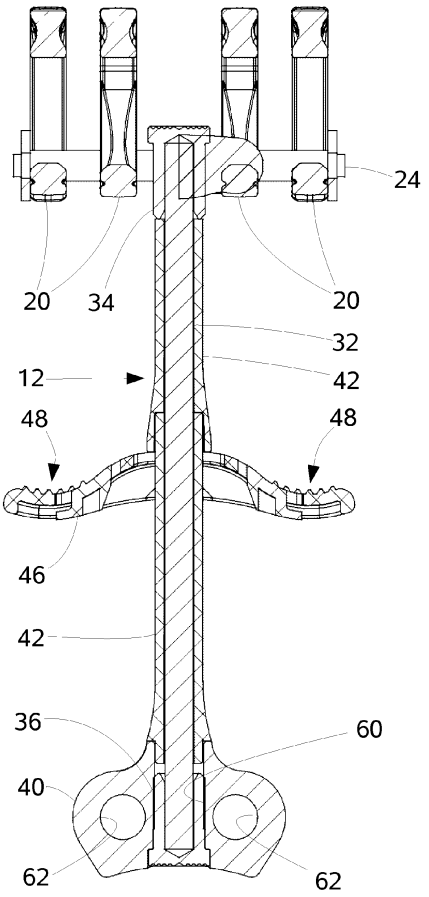

Fig 3

EP 2 353 664 A1

Description

[0001] This invention relates to a protection device for use in climbing. It has particular, but not exclusive, application to camming devices or to passive protection devices that can provide an anchor to which a climber can attach a protective rope.

[0002] A camming device is used by a climber to provide a secure anchor in a cleft in a rock. These devices typically comprise a head that includes several cams that are spring-loaded to an expanded position. The head is connected to a shaft that typically comprises a stem that is terminated in a thumb grip and connector. An operating bar is carried on the stem. It can be pulled manually axially along the stem to pull the cams to a withdrawn position against the spring loading. In the withdrawn position, the head can be inserted into a cleft in a rock, ice wall or whatever else is being climbed. The operating bar is then released to allow the cams to expand, and lodge the head securely within the cleft.

[0003] In a typical camming device, the thumb grip provides a comfortable surface on which a climber can place his or her thumb to create a reactive force against the force required to pull the operating bar. The connector provides a means to form a connection to which a flexible sling can be attached. For use, a carabiner is then connected to the sling, and that, in turn, connected to a climbing rope.

[0004] Developments of camming devices since that disclosed in GB-A-1 588 317 have been many and various, driven, to a large extent, by the desire to minimise weight of the devices without sacrificing their strength. In a modern camming device, the stem may be formed from cable, often of high-strength steel, which may be covered in a plastic sleeve. The cable can be extended to form a loop to constitute the connector. However, the present applicants have realised that there is still an important limitation associated with the sling and the thumb grip to which it is attached.

[0005] The sling can now be made from a polyethylene fibre of extreme strength, such as that made by DSM Dyneema B.V., and sold under the trade mark Dyneema. The strength of this material allows a sling of particularly light weight to be produced. The problem with this is that the sling may be significantly stronger than the material of the thumb grip. This limits the scope of a designer to shape the connector. In particular, care must be taken to ensure that the sling cannot bend into a small-radius bend that might allow it to rupture the connector. Moreover, the length of the sling is determined and fixed upon manufacture, which can be limiting when the device is in use.

[0006] An aim of this invention is to provide a camming device that is an improvement over known devices by reducing their limitations and disadvantages.

[0007] To this end, this invention provides a camming device for use in climbing comprising a head that carries one or more moveable cams, a shaft extending from the head, an operating bar carried on the shaft, a termination secured to the shaft, and a sling connected to the termination, in which the sling is formed from an endless loop of flexible material, and the termination is formed from a single block through which two apertures are formed, the sling passing through each aperture in the termination.

[0008] This arrangement allows the sling to be used in two or more configurations when connected to external equipment, thereby providing a camming device that is more versatile than previously known camming devices.

[0009] The termination may include one or more additional aperture through which the sling passes.

[0010] In typical embodiments, the single block is formed of metal. It may be secured to the shaft by a connector that passes through a bore in the block and is crimped onto a stem portion of the shaft. The block may be formed as a casting or forging, typically of a strong, lightweight alloy.

[0011] The apertures through which the sling passes are most advantageously formed with radiused end portions, such that each aperture is flared where it passes into or out of the termination. This defines a minimum radius of bend to which the sling may be subject as it passes into and out of the termination, thereby preventing unwanted localised concentrations of stress within the sling. For example, the minimum radius may be several mm, for example not less than 3-6 mm, 3.5 mm being typical.

[0012] The sling may comprise a length of flexible material that has opposite end portions connected together to form a continuous loop. For example, it may be a length of braided, spun or woven polymer fibres or metal wire.

[0013] To allow the sling to be reconfigured readily, the relative dimensions of the sling and the apertures through which it passes are chosen such that the sling can slide with little resistance through the apertures.

[0014] The termination typically has a surface shaped to enable a user to apply pressure to it with his or her thumb. For example, this may be a concave end surface.

[0015] An embodiment of the invention will now be described in detail, by way of example, and with reference to the accompanying drawings, in which:

Figure 1 is a side view of a camming device that is an embodiment of the invention with its cams in a withdrawn position;

Figure 2 is a side view of the camming device of Figure 1 with its cams in an expanded position;

Figure 3 is a sectional view of the camming device of Figure 1 taken along A-A f Figure 2;

Figure 4 is a 3-dimensional perspective view of the camming device of Figure 1;

Figures 5 and 7 show the camming device of Figure 1 with its sling in two alternative configurations; and

Figures 6 and 8 show a karabiner attached to the sling in the configurations of Figures 5 and 7 respectively.

[0016] With reference to Figure 1, a camming device embodying the invention comprises a head 10 and a shaft 12. The head 10 of this embodiment is conventional, and is shown as one of many possible alternative heads known to those familiar with the field of technology. Therefore, it will be described only briefly.

[0017] The head includes four metal cams 20 each pivotable about one of two axes 24 supported on a frame 26. The cams 20 can be pivoted between a withdrawn position, as shown in Figure 1, and an expanded position, as shown in Figure 2. Biasing springs 22 are provided to bias the cams 20 towards their expanded position.

[0018] The shaft 12 includes a stem 30. The stem 30 comprises steel cable 32 one end portion of which is secured by a crimped connection 34 to the frame 30. The opposite end portion of the cable 32 is secured by a crimped connection 36 to a thumb grip termination 40. Between the crimped portions, the cable 32 is covered in a flexible plastic sleeve 42. The thumb grip termination has a concave surface 50 facing away from the head 10.

[0019] An operating bar 46 is carried on the stem 30, such that it can slide along the stem 30. The operating bar 46 has two concave portions 48 facing the head 10. The operating bar 46 is connected to the head by cables 52 (shown in Figures 5 and 6) such that when it is drawn along the stem 30 towards the thumb grip termination 40, the cams 20 are urged towards their withdrawn position.

[0020] To use the camming device, a user places two of his or her fingers into the concave portions 48 of the operating bar 46 and the thumb of the same hand on the concave surface 50 of the thumb grip termination 40, and then squeezes the fingers and thumb together. This withdraws the cams, and the head 10 can then be placed into a cleft in a rock face that is being climbed. Upon release of the operating bar 46, the cams 20 move to the expanded position under the action of the biasing springs, so securing the head 10 in place in the cleft. The camming device can be removed from the cleft having first used the operating bar 46 to withdraw the cams.

[0021] The thumb grip termination 40, the details of which are specific to this invention, will now be described in more detail.

[0022] The thumb grip termination 40 is formed as a one-piece alloy body formed by casting or forging. The termination 40 has a central stepped through bore 60 that opens at the concave surface 50 of the termination 40. The through bore 60 is shaped and dimensioned to receive the crimped connection 36, whereby the crimped connection 36 has a head that is received in a step in the though bore 60 to secure the termination onto the end of the stem 30, such that the through bore 60 has an axis that is coincident with a long axis of the stem 30. The head of the crimped connection 36 is shaped to form approximately a continuous surface with the concave surface.

[0023] Two sling holes 62 are formed through the thumb grip termination 40. The sling holes 62 have parallel axes that extend normal to, and typically spaced symmetrically from, the long axis of the stem 30. The sling holes 62 have walls that are radiused, such that each sling hole has two openings that have a curved taper extending from outside the termination towards its centre.

[0024] A sling 70 is formed from a continuous loop of strong, flexible material. In this example, the sling is formed from an elongate length of braided polymer fibre, having end portions joined together to form it permanently into an endless closed loop. Prior to being formed into a continuous loop, the material of the sling 70 is passed once through each of the sling holes 62, whereby the sling 70 is secured permanently to the thumb grip termination 40. The relative sizes of the material of the sling 70 and the sling holes 62 is chosen to allow the sling to slide quite feely though the sling holes 62.

[0025] For use, a climber must be able to connect a main climbing rope to the camming device in such that the climbing rope can slide lengthways with respect to the camming device but cannot become separated from it. The climber must also be able to disconnect the main climbing rope from the camming device when required. This is normally achieved by clipping a carabiner to the sling 70 and to the main climbing rope. In general, a climber will want to achieve this without pulling the main climbing rope out of its natural alignment, but without having an excessive amount of slack in the sling. In conventional camming devices, this can be achieved by selecting a device with a suitable length of sling for a particular application. However, embodiments of this invention are more versatile, as will now be explained.

[0026] When a climber wishes to use a long sling (for example, when the device is used in a deep cleft), the sling 70 is used as shown in Figure 5. In this arrangement, two closely adjacent parts of the sling 70 pass through the respective sling holes 62. This means that the great majority of the length of the sling 70 forms a single large loop 72 to one side of the thumb grip termination 40 to which a carabiner 80 can be connected, as shown in Figure 6. When a climber wishes to use a short sling, for instance, where the device is secured close to the line of a main climbing rope, the sling is used as shown in Figure 7. In this arrangement, the two parts of the sling 70 that pass through the respective sling holes 62 are spaced from one another approximately half the entire length one of the sling 70. This means that the sling can be formed into two relatively short loops 74, and a carabiner 80 is connected to both of them, as shown in Figure 8. The effective length of the sling - the distance between the main climbing rope and the camming device - in the arrangement of Figure 7 is approximately half that of the arrangement of Figure 5.

[0027] The radius of the sling holes 62 ensures that,

however the sling is used, it is subject to a minimum radius of bend as it passes through the thumb grip termination 40. This limits the extent to which local stress concentrations will arise, so as to ensure that stresses within the material of the sling 70 and of the thumb grip termination 40 remain within their safe working limits.

[0028] Although the embodiment described has two sling holes 62, the device can be made yet more flexible by providing one or more additional sling holes. If three sling holes are provided, the climber can form one, two or three loops to which a carabiner can be connected, giving three different effective sling lengths.

[0029] DYNEEMA is a registered trade mark of DSM IP Assets B.V.

Claims

1. A protection device for use in climbing comprising a head (10) that carries one or more moveable cams (20), a shaft (12) extending from the head, an operating bar (46) carried on the shaft, a termination (40) secured to the shaft, and a sling (70) connected to the termination, in which the sling is formed from an endless loop of flexible material, **characterised in that** the termination (40) is formed from a single block through which two apertures (62) are formed, the sling (70) passing through each aperture of the termination.

2. A protection device according to claim 1 in which the termination (40) includes one or more additional apertures through which the sling passes.

3. A protection device according to claim 1 or claim 2 in which in which the single block is formed of metal.

4. A protection device according to any preceding claim in which the termination (40) is secured to the shaft (12) by a connector that passes through a bore in the block and is crimped (36) onto a stem portion of the shaft.

5. A protection device according to any preceding claim in which the block is formed as a casting or forging.

6. A protection device according to any preceding claim in which the apertures (62) through which the sling (70) passes are formed with radiused end portions, such that each aperture is flared where is passes into or out of the termination (40).

7. A protection device according to claim 6 in which the radiused end portions ensure a minimum bend radius to which the sling can be subject as it passes into and out of the aperture (62).

8. A protection device according to claim 7 in which the minimum bend radius is 3.5mm.

9. A protection device according to any preceding claim in which the sling (70) comprises a length of flexible material that has opposite end portions connected together to form a continuous loop.

10. A protection device according to claim 9 in which the sling comprises a length of braided, spun or woven polymer fibres.

11. A protection device according to any preceding claim in which the relative dimensions of the sling (70) and the apertures (62) through which it passes are chosen such that the sling can slide with little resistance through the apertures.

12. A protection device according to any preceding claim in which the termination has a concave end surface (50) against which a user can exert thumb pressure.

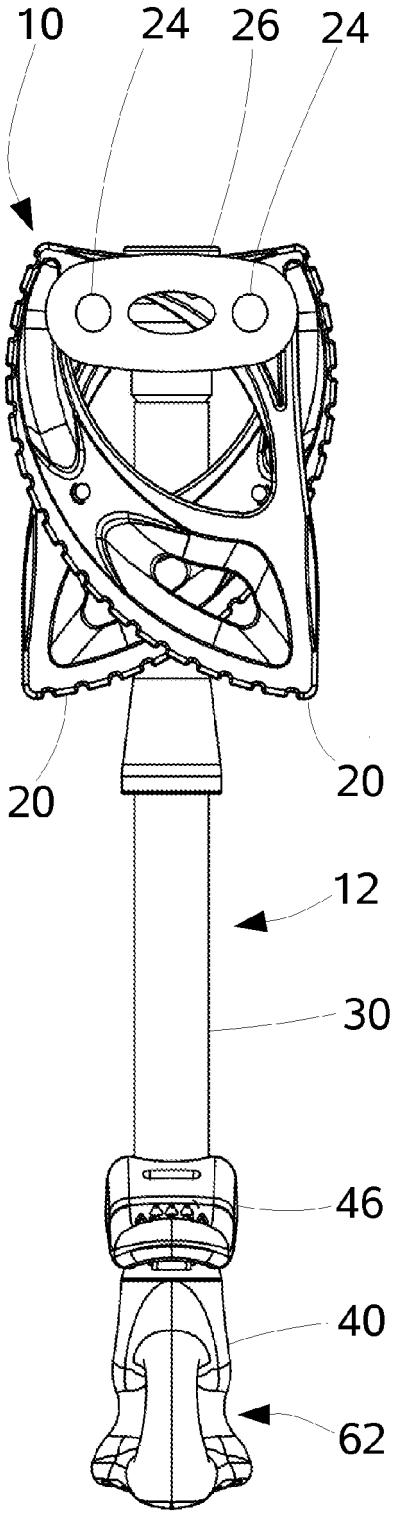

Fig 1

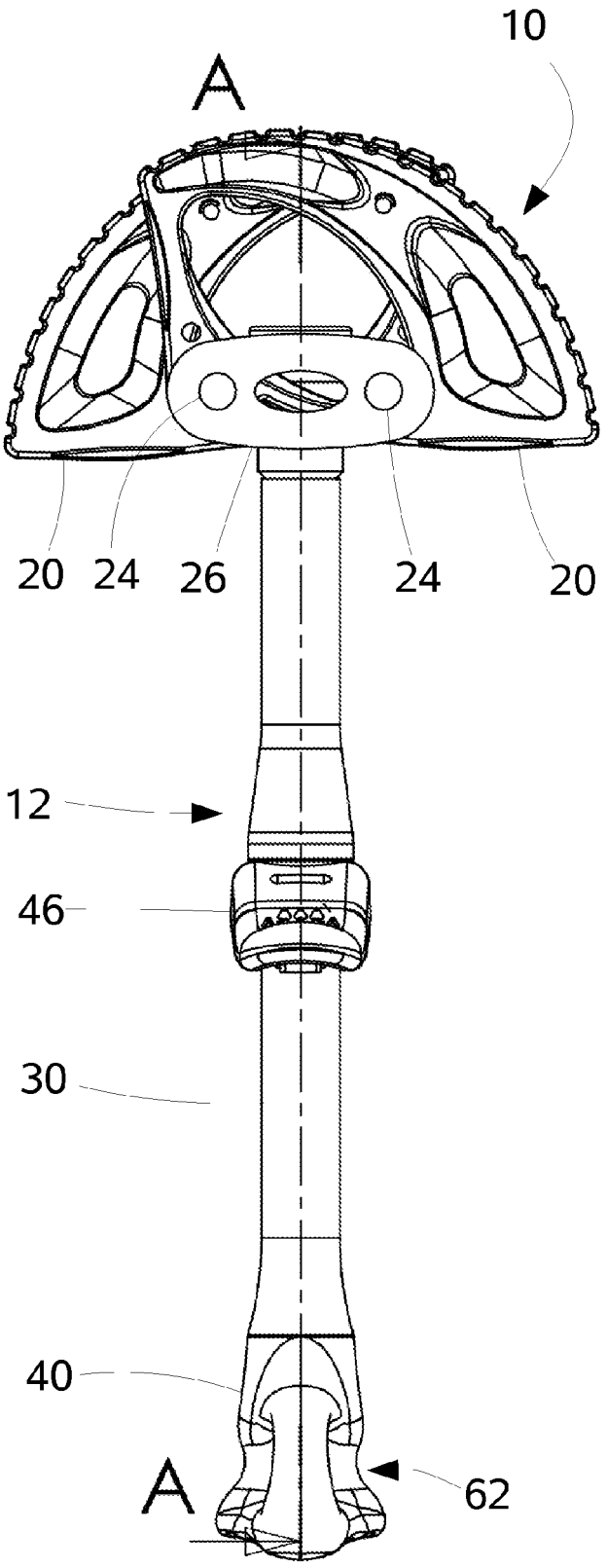

Fig 2

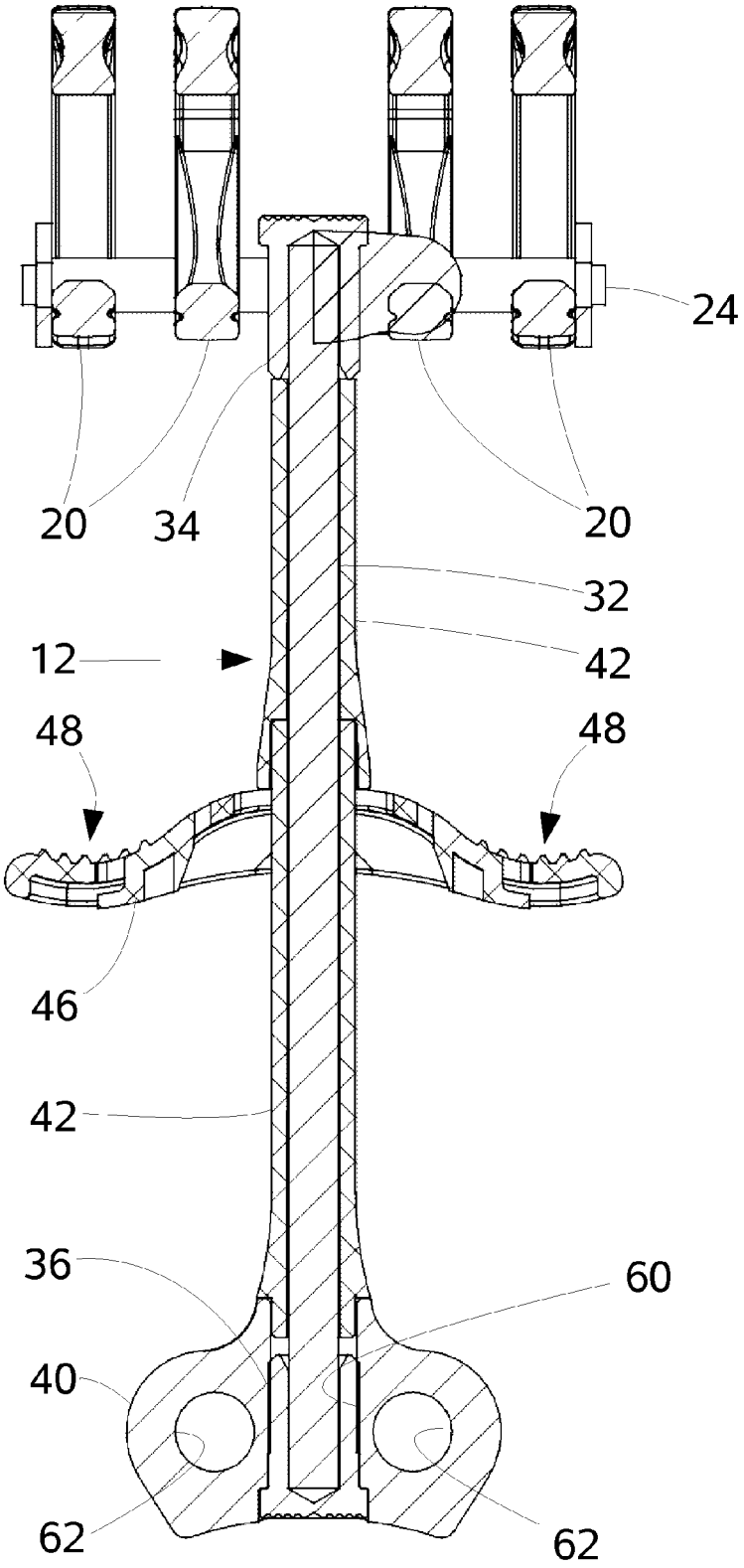

Fig 3

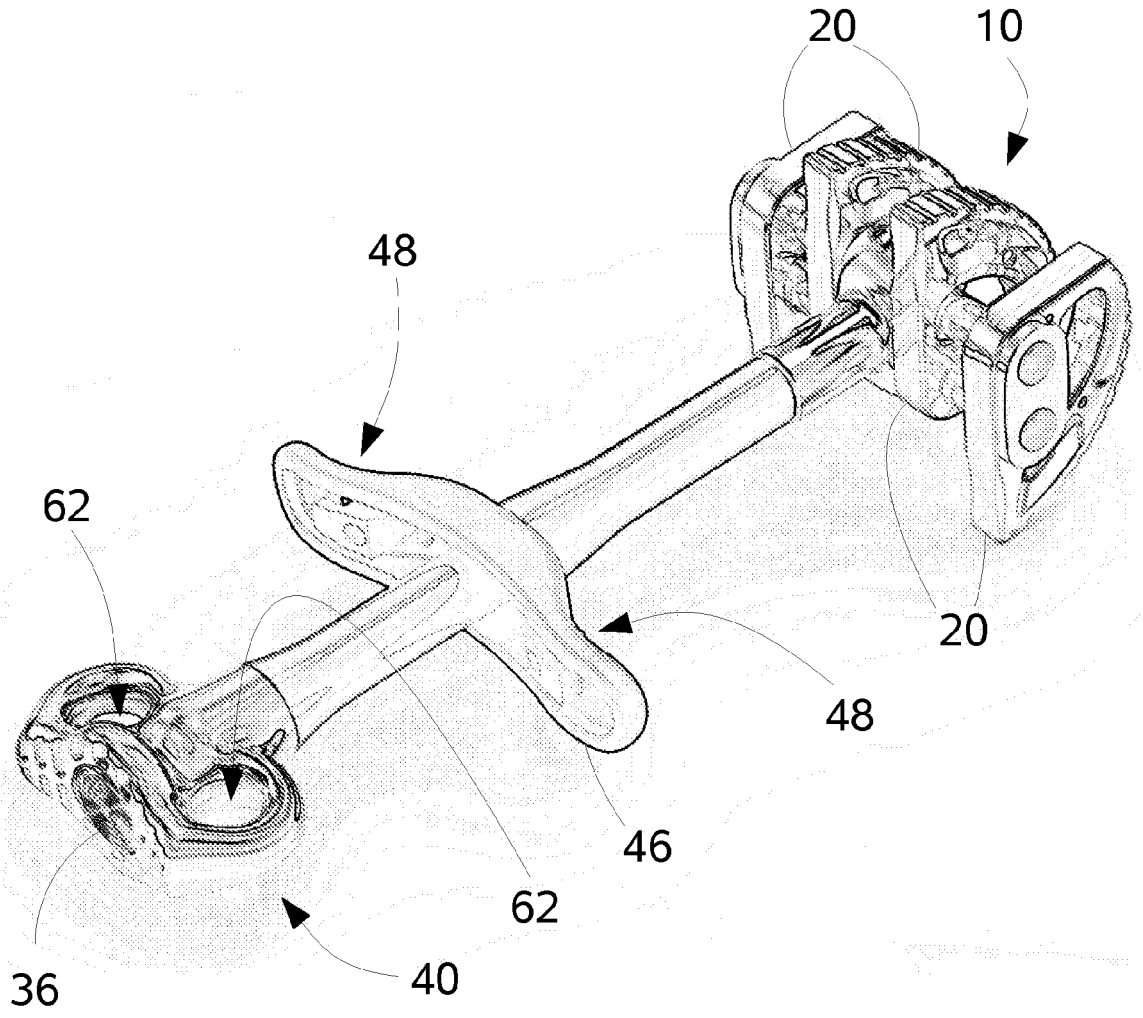

Fig 4

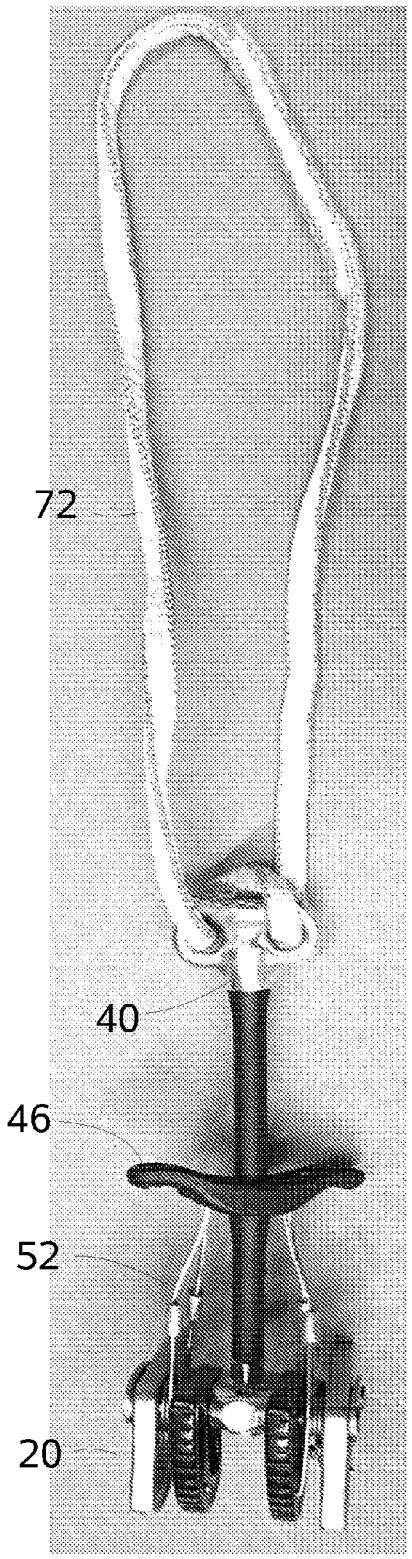

Fig 5

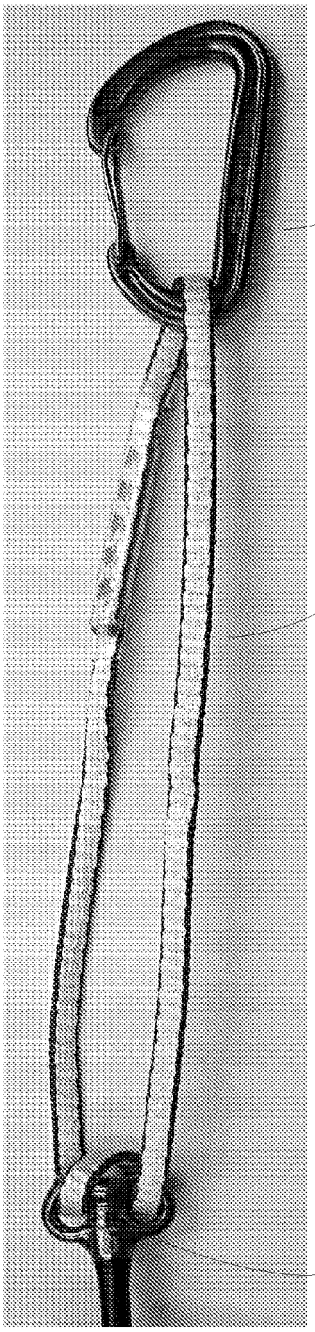

Fig 6

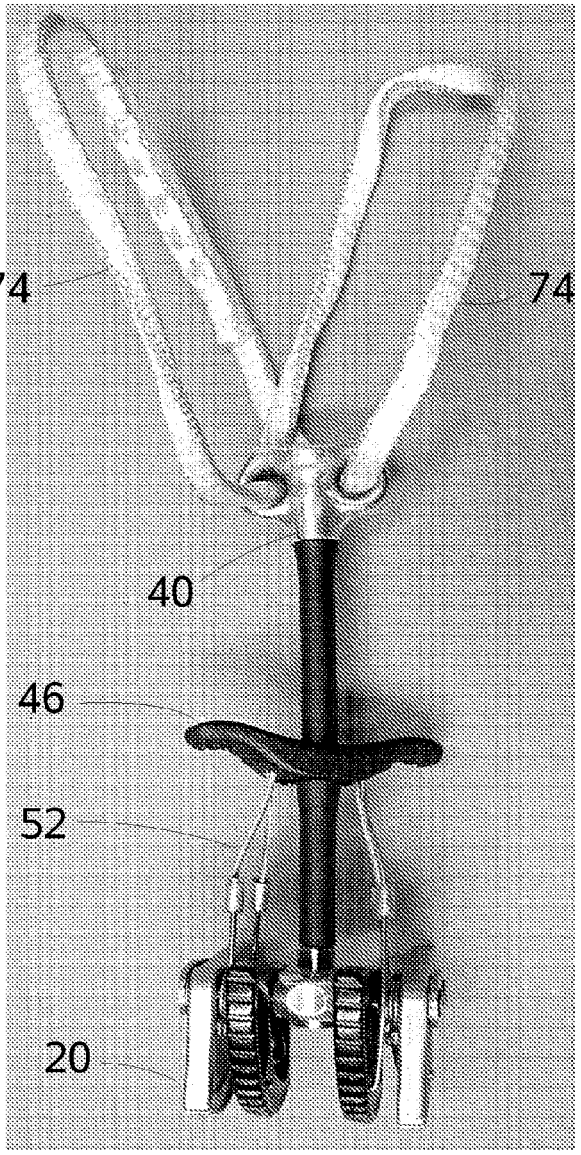

Fig 7

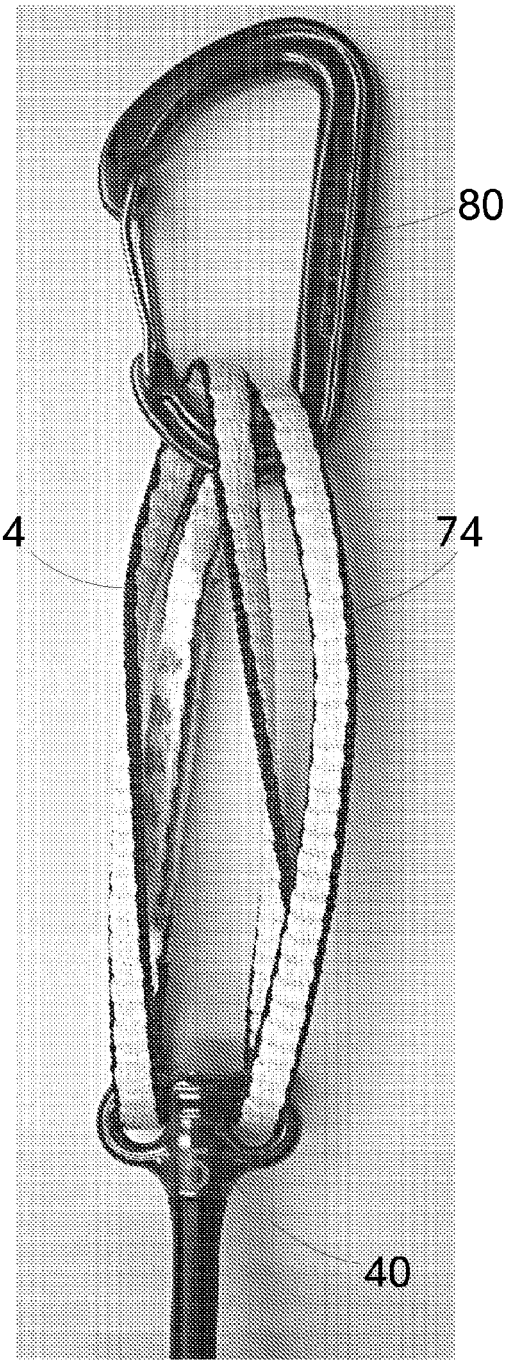

Fig 8

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EUROPEAN SEARCH REPORT

Application Number
EP 11 15 2652

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

A63B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 May 2011	Jones, Mark

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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