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Rogelja

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[54] **DESCENDER**

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[51] **Int. Cl.**[7] **A63B 29/00**

[52] **U.S. Cl.** **182/193**; 182/192; 182/5; 188/65.5

[58] **Field of Search** 182/5, 192, 193, 182/191; 188/65.2–65.5

[56] **References Cited**

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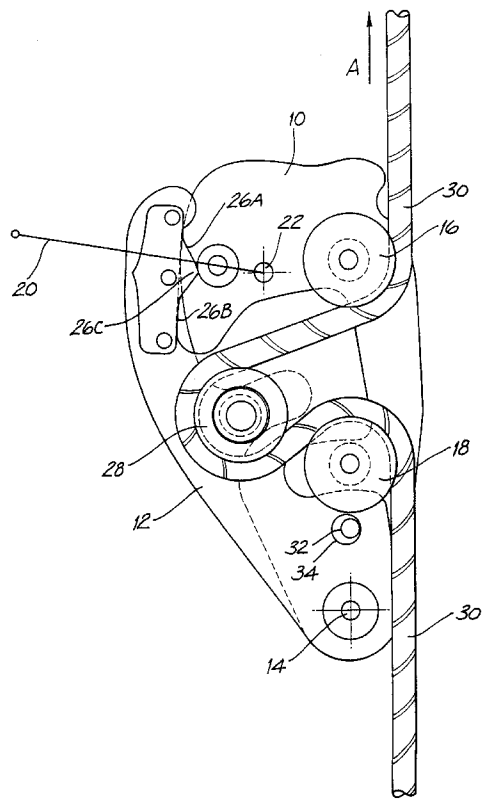
Primary Examiner—Alvin Chin-Shue
Attorney, Agent, or Firm—Browdy and Neimark

[57] **ABSTRACT**

A descender is disclosed which includes a base plate **10**, including first and second sheaves (**16**, **18**) and an arm defining a third sheave **28**. The descender also includes means, for biasing the arm to rotate about the pivot away from the base, and stop means for preventing the arm from pivoting further than a predetermined angle away from the base. Further provided are second adjustable stop means for restricting the distance the arm can travel towards the base when the biasing means is overcome and the arm pivoted towards the base. In use, with a rope passing below the first sheave, above and around the third sheave and above the second sheave, the resistance force applied to the rope is a maximum when the arm is pivoted so that the third projection is closest to the longitudinal axis. The descender is operable in two modes:

- a first mode in which the descender operates as a descender for controlling the rate of descent of a person sliding down the rope, in which mode the adjustable second stop means can be used to control the rate of descent; and
- a second mode wherein the descender is used with substantially no tension on the rope passing through the descender as a belay in which mode the biasing means keep the arm and base apart to allow rope to be fed through the descender relatively freely.

8 Claims, 6 Drawing Sheets



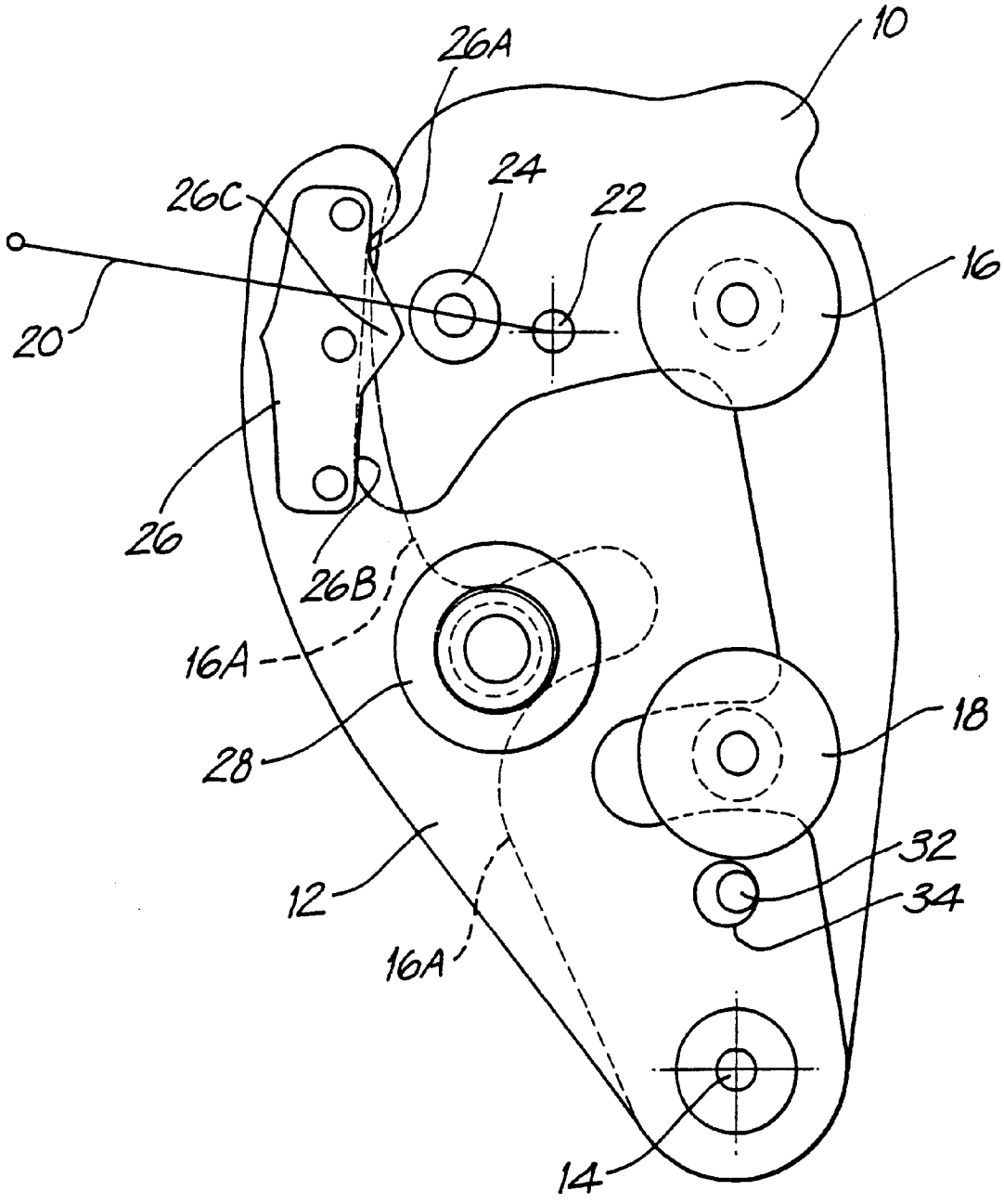


FIG. 1

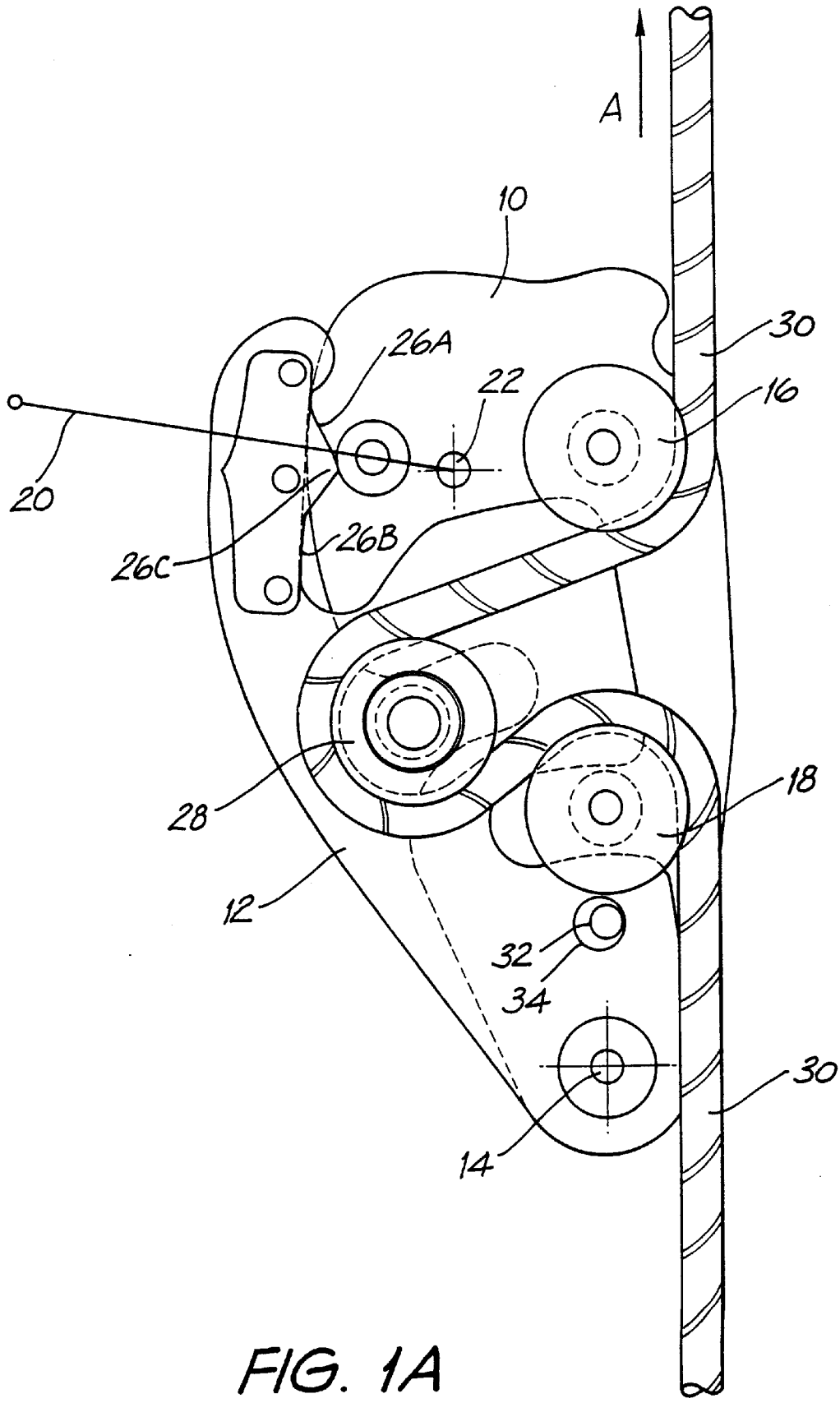


FIG. 1A

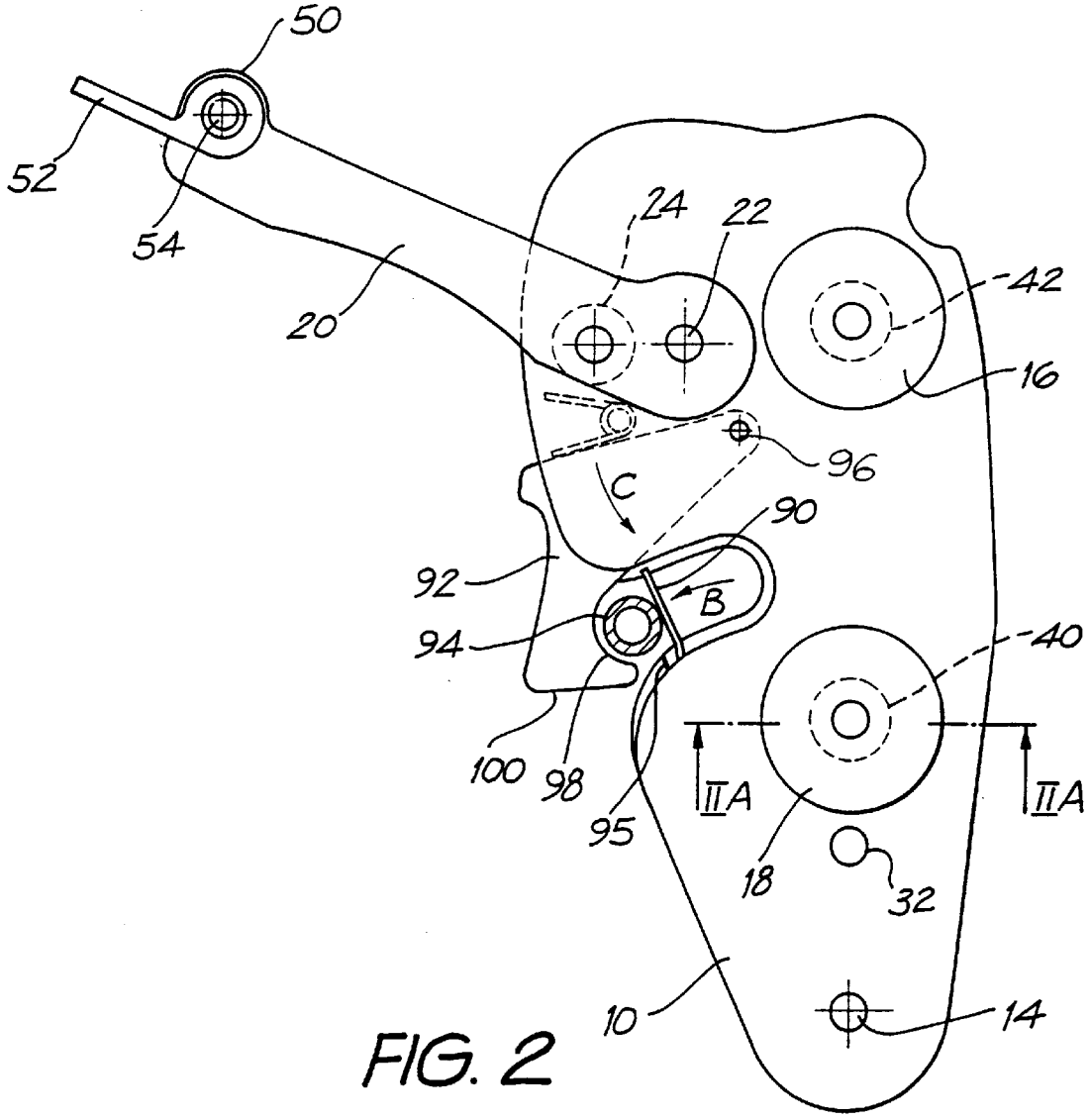

50
52
54
20
24
22
42
16
96
C
90
92
B
94
40
100
98
95
IIA
IIA
18
32
10
14

FIG. 2

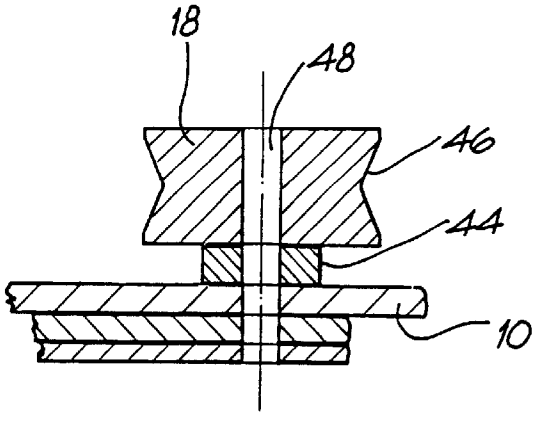

18
48
46
44
10

FIG. 2A

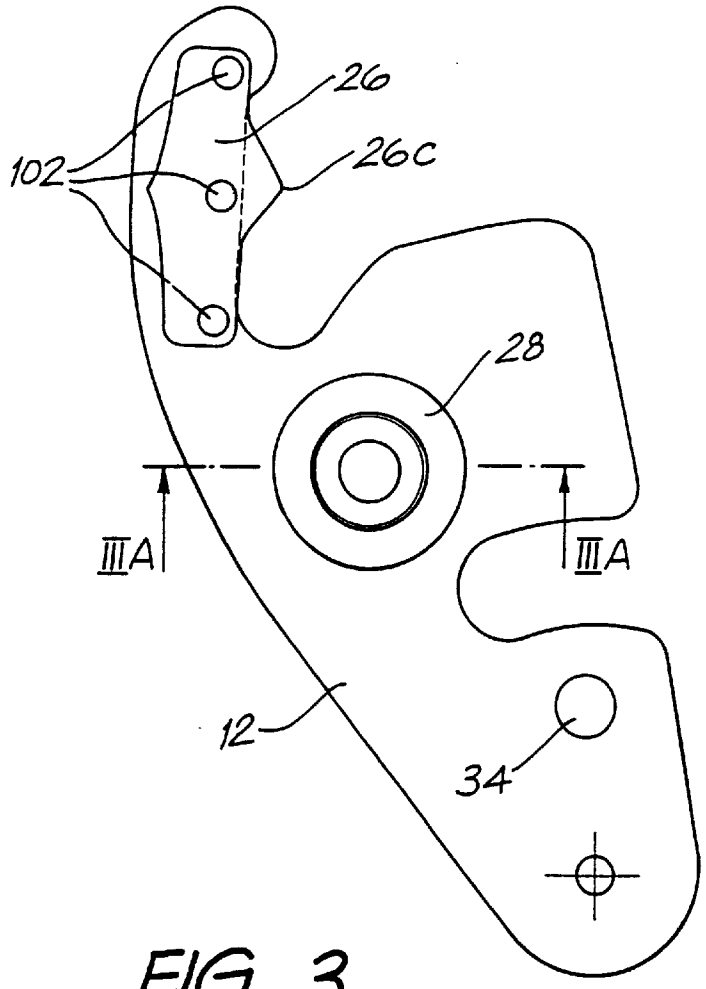


FIG. 3

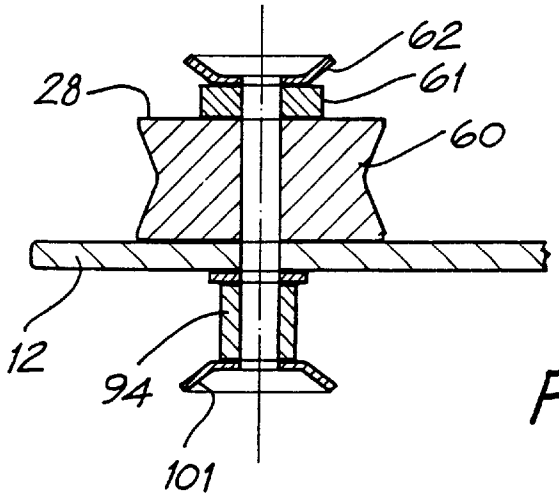


FIG. 3A

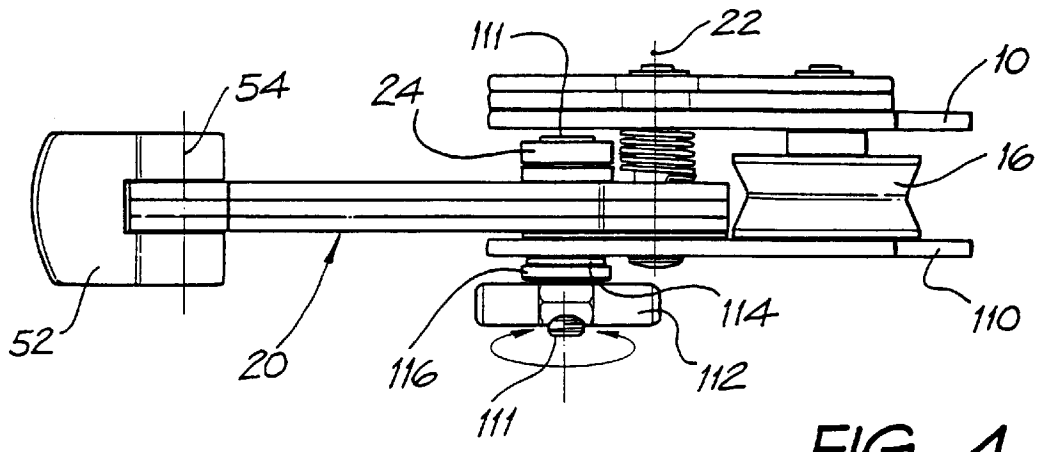

111
22
10
54
24
16
52
20
116
114
110
112
111

FIG. 4

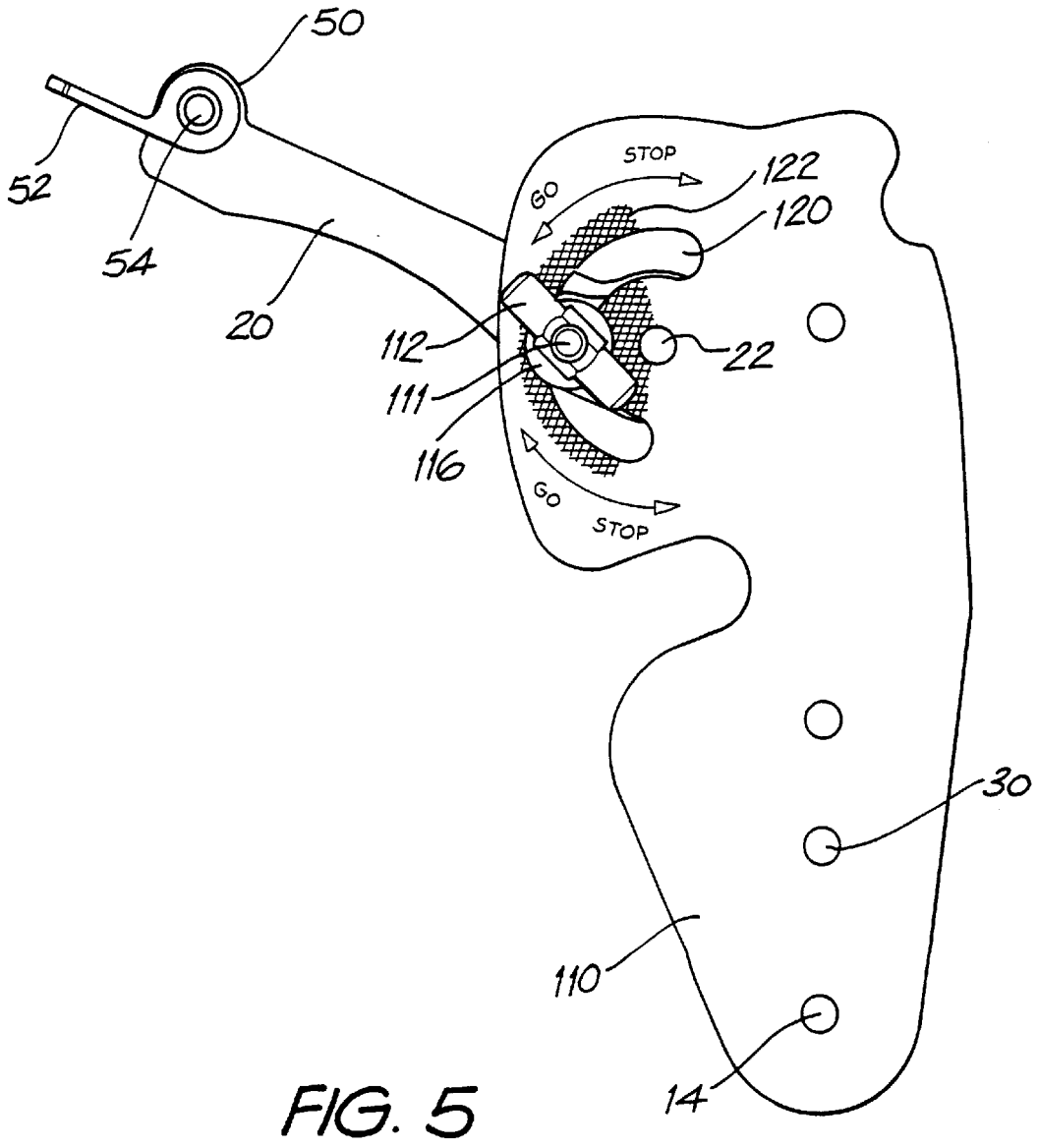

50
52
54
20
STOP
GO
122
120
112
22
111
116
GO
STOP
30
110
14

FIG. 5

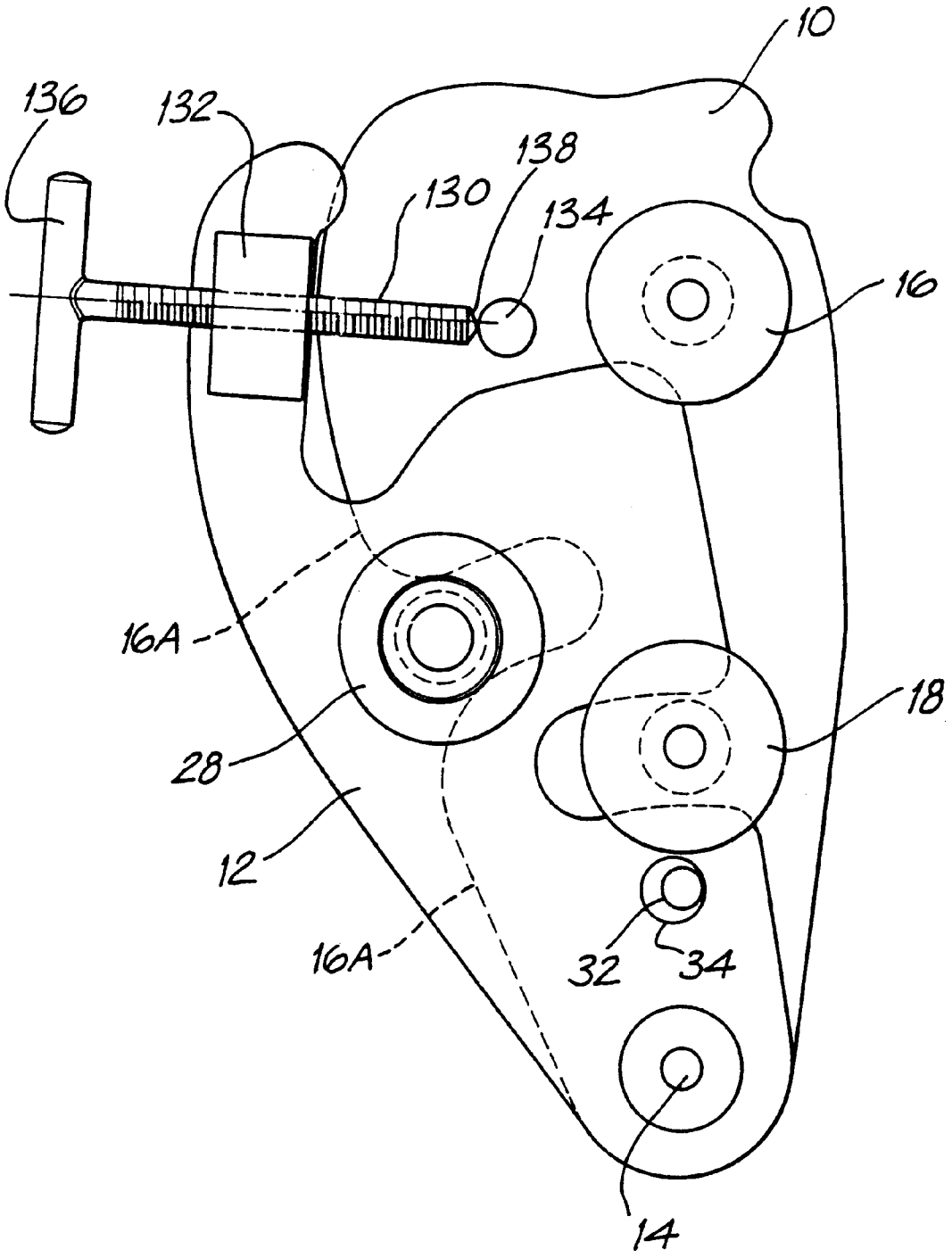


FIG. 6

DESCENDER

The present application relates to a descender for use in abseiling and belaying and in particular to an improved descender of the type which incorporates a self-acting brake.

Abseiling is a technique used to descend steep surfaces such as cliff faces and is often used by persons involved in activities such as mountain climbing, canyoning and caving. In order to abseil down a cliff face, one end of a rope is made fast at the top of the cliff and the person making descent then slides down the rope. The rope is passed either around the body of the person or, more usually, through a descender attached to a harness worn by the person such that the passage of the rope around the body or through the descender provides sufficient friction to slow the rate of descent to a safe speed.

A descender comprises rope engaging services around and between which the rope travels along a tortuous path, to provide frictional engagement between the rope and the descender. The rate of descent is normally controlled by holding the free or tail end of the rope to control the tension on the rope where it emerges from the descender and thereby to control the degree of friction engagement between the rope and descender which in turn controls the rate of descent.

Descenders used in abseiling vary greatly in performance and complexity, there being a variety of relatively simple devices which rely on frictional engagement between the rope and metal rings or racks about which the rope is wrapped, and a number of more complex descenders which incorporate a braking mechanism which allows friction between the rope and descender to be varied other than by simply controlling the free or tail end of the rope. The earliest of these more complex devices have a handle or lever which when operated tended to increase the friction between the descender and the rope. This type of descender was not a great improvement over the more simple devices as the brake was not self engaging and therefore, if the user was knocked unconscious, he or she would fall in the same way as a user of the earlier devices.

A number of devices now include automatic braking mechanisms in which a handle is operated by a person using descender to control their speed of descent and if the handle is released a brake actuates and prevents a user falling uncontrollably. Australian Patent Application No 16132/95 discloses such a descender which provides an automatic locking system for the descender operated by a lever, in which operation of the lever by a person using descender releases a braking means and allows the person to descend, and in which should the person using descender release the lever, the braking system will automatically apply and prevent the person falling uncontrollably.

A similar type of descender is disclosed in U.S. Pat. No. 4,596,314.

There are two problems associated with the descenders of the type shown in AU 16132/95. The first problem is that the descender cannot be used for belaying. Belaying is a well known technique, used in climbing. A climber (the belayee) will descend or climb a cliff face, or the like, while roped to the cliff face via pitons. A belayer will hold the rope and allow the belayee only as much rope as he or she requires in order to move a short distance up or down the cliff face. Thus, if the belayee falls their fall will be arrested by the rope and the belayer. However, descenders such as that shown in AU 16132/95 cannot be used for belaying.

A second disadvantage of the descender described in AU 16132/95 is that the rate of descent cannot be preselected by a person using the device as a descender.

It is an object of the present invention to alleviate one or more of the abovementioned disadvantages.

Thus, according to the present invention there is provided a descender for use in abseiling, or belaying, comprising:

a base having a connection means for connecting the descender to a harness or the like;

an arm pivotally mounted on the base at a pivot axis extending generally normal to the base;

the base having first and second spaced projections for engaging a rope, the projections both extending generally parallel to the pivot axis;

the arm having a third projection for engaging a rope, the projection extending generally parallel to the pivot axis, the projection being located so that when the arm is pivoted towards the base the projection is located to one side of a longitudinal axis passing through the first and second spaced projections on the base and is spaced further from the pivot axis than the second projection, but closer to the pivot axis than the first projection, characterised by;

means, for biasing the arm to rotate about the pivot away from the base, and stop means for preventing the arm from pivoting further than a predetermined angle away from the base; and

second stop means for restricting the distance the arm can travel towards the base when the biasing means is overcome and the arm pivoted towards the base, said second stop means being adjustable

a retention plate,

the arrangement being such that, in use, with a rope passing below the first projection, above and around the third projection and above the second projection, the resistance force applied to the rope is a maximum when the arm is pivoted so that the third projection is closest to the longitudinal axis, the descender being operable in two modes:

a first mode in which the descender operates as a descender for controlling the rate of descent of a person sliding down the rope, in which mode the adjustable second stop means can be used to control the rate of descent; and

a second mode wherein the descender is used as a belay with substantially no tension on the rope passing through the descender, such that rope can be fed through the descender, in which mode the biasing means keep the arm and base apart to allow rope to be fed through the descender relatively freely, but in which mode sudden increases in tension in the rope, cause the biasing means to be overcome and the pivot arm to be pulled towards the base thus locking the rope between the first and second projections and preventing uncontrolled descent.

Thus, the present invention provides a descender which can be used either as a belay or as a descender.

When used as a belay the device allows a rope to run freely through it provided that movements are slow. If the rope starts to move quickly through the descender which would happen if the belayee fell, the arm is pulled towards the base and the device automatically locks. When used as a descender, the adjustable second stop means can be used to control rate of descent.

The automatic braking occurs when pressure is placed on the rope between fixed end sheaves (defined by the first and second projections) and the pivotable centre sheave, defined by the third projection.

In a preferred embodiment, the biasing means comprise a spring acting on a protrusion defined on the arm and the stop means is a catch defined on the base, the catch being movable to allow the descender to be opened.

In one embodiment, the adjustable stop means comprises:

a lever pivoted on the base, said lever being associated with a cam and defining a cam surface;

a cam follower being located on the arm, said cam and cam surface being configured such that when the cam is positioned at either end of the cam surface, the arm can pivot closer to the base than when the cam is in a more central location on the cam surface than when the cam is located at either end of the cam follower, so that in use the resistance force applied to the rope is a maximum when the cam is disposed at or close to either end of the cam surface and a minimum when the cam is disposed between the ends of the cam surface, such that by manipulating the lever the resistance to movement may be set by locating the cam on a particular area on the cam follower and wherein if the handle is not locked in position, sudden movements of the rope through the descender cause the pivot arm to be pulled towards the base thus locking the rope between the first and second projections the lever is lockable in position. This allows the rate of descent to be preset.

In a preferred embodiment, the lever includes an extension arm which is hinged to the lever which can be folded to the lever for storage and extended for use to increase the effective length of the lever.

In an alternative embodiment, the adjustable stop means comprise a stop defined on the base and a threaded rod defining an end which end is arranged to abut the stop when the arm is pivoted towards the base, the rod being mounted in an internally threaded block fixed to the arm so that turning the rod when the end abuts the stop, causes the end to move and hence causes the arm to move relative to the base.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described, by way of example only, and with reference to the accompanying drawings, in which:

FIG. **1** is a schematic plan view of a first embodiment of a descender, with a retention plate removed;

FIG. **1A** is a plan view similar to that of FIG. **1**, which illustrates a rope passing through the descender of FIG. **1**;

FIG. **2** illustrates a base plate of the descender and a number of components associated with, or attached to, that base plate;

FIG. **2A** is a cross-sectional view along line IIA—IIA of FIG. **2**;

FIG. **3** illustrates an arm of the descender;

FIG. **3A** is a cross-sectional view on line IIIA—IIIA of FIG. **3**;

FIG. **4** is an end view of a lever of the descender and associated components; and

FIG. **5** shows a retention plate and the lever of FIG. **4**; and

FIG. **6** illustrates a second embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to the drawings, FIG. **1** is a plan view of a first embodiment of a descender which includes a base plate **10** and an arm **12**. In FIG. **1**, the parts, **16A** of the outer edge of the base plate which are hidden from view by the arm, are shown in phantom, as are parts of the perimeter of the arm which are hidden from view by sheaves.

The arm **12** is mounted above the base plate by means of a pivot **14**, so that the arm is free to rotate relative to the base plate about that pivot. First and second spaced sheaves, **16** and **18**, respectively, are mounted on the base plate. The sheaves are non-rotatable. The sheaves are configured so that parts of the arm **12** can be interposed below the sheaves, between the sheaves and the base **10**, as will be explained later with particular reference to FIG. **2A**.

A lever **20** is also mounted to the base plate by means of a pivot **22**. In FIGS. **1** and **1A**, the lever is represented by line **20**, to avoid obscuring other components of the descender. A cylindrical bearing **24** which defines a cam, is attached to the lever **20**, adjacent the pivot. A cam surface/cam follower **26** is riveted to the arm. When the cam **24** is in contact with the cam surface **26**, pivoting the lever **20** about the pivot **22** moves the bearing surface **24** relative to the cam surface **26** and the arm is, in consequence, moved about the pivot **14**, to move the arm towards, or away from, the base **10**. Consequently sheave **28**, which is mounted on the arm **12**, moves towards, or away from, sheave **18**. As can be seen in FIG. **1**, the centre **26C** of the cam surface **26**, is closer to the pivot **22**, than the ends **26A**, **26B** of the cam surface. Thus when the cam is located at the centre of the cam surface **26C**, the arm **12** is further away from the base than when the cam moves to either end **26A** or **26B** of the cam surface.

A spring and stop arrangement, not illustrated in FIG. **1**, is provided which acts on sheave **28** to cause the sheave to move away from sheaves **16** and **18**, which in turn causes the arm to rotate anti-clockwise, as illustrated, about pivot **14**, away from the base, with the stop preventing arm **12**, and hence sheave **28** from moving more than a predetermined angle about the pivot **14** away from the base **10**. Thus, in the absence of any other forces, the arm will be held at a predetermined angle relative to/distance from, the base.

The arm can be locked to the base plate **10** by passing a bolt, or similar device, through small, aligned, holes **30** and **32** in the base plate and retention plate respectively and larger hole **34** in the arm which allows limited movement of the arm about the pivot. This feature is particularly useful if children are using the descenders to prevent them being opened in use which would be dangerous.

FIG. **1A** shows similar a view to FIG. **1** but in which a rope **30** has been threaded through the descender. The descender is shown as it would be oriented in use when attached to a persons harness, attachment means for doing this normally being provided close to the pivot pin **14**. Tension in the rope caused by the weight of the person attached to descender tends to pull the spool **28** towards spool **16** thus compressing the rope between spools **16** and **28** and slowing the rate of descent. Moving the lever **20** to cause the cam **24** to move away from either end **26A** or end **26B** of the cam follower towards the centre **26C** of the cam follower, forces the arm **12** to move away from the base **10** thus increasing the distance between sheaves **18** and **28** and allowing the rope to pass more freely between the spools, thus increasing the rate of descent. The rate of descent can thus be controlled by the lever **20**. The fact that the central position of the lever **26C** provides the fastest rate of descent makes the device inherently safe, since once the lever is above or below the centre **26C** the speed of descent is automatically reduced regulating a safe descent rate If the lever is accidentally knocked the likelihood is that it will be knocked, towards one of the ends thus slowing the rate of descent.

The device can also be used as a belay for use in descending or ascending a mountain, cliff face or the like in which case part of the rope will be securely attached to a

mountain or cliff face and a person also attached to the rope, the belayer, will feed a limited amount of rope to the belayee as the belayee climbs up or down. The belayer, who may be on the cliff face above or below the belayee or standing at the top or bottom of the cliff face, wears the descender attached to a harness. The spring and stop mechanism keeps the arm **12** apart from the base **10**, thus keeping sheaves **28** and **16** apart and allowing the rope to run relatively freely through the descender so that rope is supplied as the belayee/climber requires it hence the belayee can climb freely. If the belayer is also on the cliff face the belayer does not need to use their hands to feed rope to the belayee and can use both hands to grip the cliff face. If the belayer falls the increased tension in the rope will easily overcome the biasing spring and the arm will move towards the base to slow, and regulate, the rate of descent.

To lower the belayee, the belayer can simply operate the lever **20** to control the descent of the belayee.

The device can also be used to lower objects or people down cliffs controlled from the bottom of the cliff by turning the device upside down so that in FIG. **1***a* the arrow A will be pointing to the ground and applying tension to the lower end of the rope to pull spool **28** towards spool **18** to slow the rate of descent of the object or person when required.

Having described the general features and principal of operation of the descender, some specific features of the descender particularly relating to the construction of the descender will now be described in more detail with reference to FIGS. **2** to **5**.

FIG. **2** shows a base plate **10** with sheaves **16** and **18** and lever **20** attached. As can be seen from FIG. **2** and FIG. **2**A the spools are generally circular in plan view having a reduced diameter portion **44** adjacent the base **10**, and a wider cylindrical part **46** whose sides define a shallow V-shaped profile or channel **46**. The cut out portion **44** allows parts of the arm **12** to pass under the main part of the sheave **46**. The V shaped profile/channel of the wider part of the sheave **46** is configured to receive the rope **30**. As shown in FIG. **2**A the sheave includes a central longitudinal bore **48** which can receive a rivet or the like to secure the sheave between the base plate **10** and the retention plate, not shown in FIG. **2**A.

FIG. **2** also shows that one end of the lever **50** has an extension portion **52** mounted to it which can be rotated about pivot **54** to extend the effective length of the lever.

Also shown in FIG. **2** is a spring and stop means assembly for biasing the arm for belaying, and for "opening" and "closing" the descender. The spring and stop means assembly comprises a spring **90**, and a catch **92** which are mounted on the underside of the base **10** and a rod **94** which depends from the lower face of the arm **12**. The spring is a resilient length of springy steel which is fixed to the base, pushes against a stop **95**, and when pushed away from the stop **95** by rod **94**, acts to push rod **94** anti-clockwise about pivot **96** on which the catch is mounted, in the direction of the arrow B. The catch is mounted on the underside of base **10**, and partly covered by a plate **115**, seen in FIG. **4**. It is lightly biased to turn in the direction of the arrow C. The inside surface **98** of the catch is configured with a curve of a short radius so as to retain the rod, so that if the rod is pushed in the direction B the catch will not move. To move the catch it is necessary to push on surface **100**. That arrangement prevents the descender from accidentally springing open. The descender is opened to allow rope to be fed into the descender and around sheave **28**, for use.

The configuration of the surface **100** and location of pivot **96** are such that as the arm is closed, rod **94** pushes the catch clockwise about pivot **96** to open the catch automatically.

FIG. **3** shows the arm **12** in more detail, and in particular shows the cam follower **26** which is a piece of hardened steel secured to the arm by means of three rivets **102**.

FIG. **3**A shows the sheave **28** in more detail. The major part **60** of the sheave adjacent the arm **12** is generally cylindrical with the sides of the cylinder having a generally V-shaped profile **60** thus defining a shallow channel to receive the rope. The upper part of the sheath **61** defines a cylindrical portion having a reduced diameter compared to the major part of the sheath which is adapted to locate in a cut out portion of the retention plate to allow the arm and base to close together when assembled. The uppermost part of the sheave defines a wider flange portion **62**. On the opposite side of the arm to the sheave is cylindrical rod **94**, which terminates in a flange **101**.

FIG. **4** shows an end view of the descender illustrating the lever **20** sandwiched between base plate **10** and a retention plate **110**. The lever is formed from three sheets of steel sandwiched together although the lever could be made in one piece. In particular, FIG. **4** shows the cam **24** disposed on the underside of the handle as oriented in FIG. **4**. The pivot axis **22** of the lever is defined by a rivet/bolt. The cam **24** is disposed on the lower end of a threaded bolt **111**. The bolt passes through the lever **20** and a crescent shaped aperture in the retention plate, seen in FIG. **5**. A wing nut **112** is mounted on the upper end of the bolt **111**. Between the wing nut and the upper surface of the retention plate, there is a metal washer **116** and a leather washer **114**. The wing nut can be tightened on the rod to compress the leather washer between the nut **112** and the plate **110**, and lock the lever to prevent the same from moving.

Referring now to FIG. **5**, which illustrates the retention plate **110**, and lever in particular, omitting other features, an arcuate cut out portion **120** is defined in the retention plate through which the threaded rod **111** extends such that the lever can be locked in position anywhere on the arc **120**. A roughened portion **122** exists around the cut out **120** to improve the grip of the leather washer on the plate **110**.

Because the lever can be locked in position the rate of descent can be preset by an operator. The preset rate of descent can be overridden by operation of the lever.

The spring and stop arrangement allow the descender to be used for belaying by keeping the arm and base apart and preventing locking of the rope when movement of the rope through the descender is slow.

FIG. **6** illustrates an alternative embodiment in which the lever and cam/cam surface arrangement shown in FIG. **1** is replaced with a threaded rod **130** mounted in a threaded block **132** on the arm **12** and a cooperating stop **134** mounted on the base **10**. Turning a handle **136** on the rod moves end **138** of the rod. Thus the handle can be used to preset an angle between arm **12** and base **10** when the end **138** contacts the stop **134**. This embodiment is in all other respects the same as the first embodiment, except that no arcuate slot **120** is provided in the retention plate **110**.

It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive.

What is claimed is:

1. A descender for use in abseiling, or belaying, comprising:

a base having a connection means for connecting the descender to a harness;

an arm pivotally mounted on the base at a pivot axis extending generally normal to the base;

the base having first and second spaced projections for engaging a rope, the projections both extending generally parallel to the pivot axis;

the arm having a third projection for engaging a rope, the third projection extending generally parallel to the pivot axis, the third projection being located so that when the arm is pivoted towards the base the third projection is located to one side of a longitudinal axis passing through the first and second spaced projections on the base and is spaced further from the pivot axis than the second projection, but closer to the pivot axis than the first projection, characterised by;

biasing means, for biasing the arm to rotate about the pivot away from the base, and stop means for preventing the arm from pivoting further than a predetermined angle away from the base; and

second stop means for restricting the distance the arm can travel towards the base when the biasing means is overcome and the arm pivoted towards the base,

a retention plate,

whereby in use said descender being operable with a rope passing below the first projection, above and around the third projection and above the second projection, a resistance force applied to the rope is a maximum when the arm is pivoted so that the third projection is closest to the longitudinal axis, the descender being operable in two modes:

a first mode in which the descender operates as a descender for controlling the rate of descent of a person sliding down the rope, in which mode the second stop means can be used to control the rate of descent; and

a second mode wherein the descender is used with substantially no tension on the rope passing through the descender as a belay such that rope can be fed through the descender, in which mode the biasing means keep the arm and base apart to allow rope to be fed through the descender relatively freely but in which mode sudden increases in tension in the rope, cause the biasing means to be overcome and the pivot arm to be pulled towards the base thus locking the rope between the first and second projections and preventing uncontrolled descent.

2. A descender as claimed in claim **1**, characterised in that the biasing means comprise a spring acting on a protrusion defined on the arm and the stop means is a catch defined on the base, the catch being movable to allow the descender to be opened.

3. A descender as claimed in claim **1**, characterised in that the second stop means comprises:

a lever pivoted on the base, said lever being associated with a cam and defining a cam surface; and

a cam follower being located on the arm, said cam and cam surface being configured such that when the cam is positioned at either end of the cam surface, the arm can pivot closer to the base than when the cam is in a more central location on the cam surface than when the cam is located at either end of the cam follower, so that when operable the resistance force applied to the rope is a maximum when the cam is disposed at or close to either end of the cam surface and a minimum when the cam is disposed between the ends of the cam surface, such that by manipulating the lever the resistance to movement may be set by locating the cam on a particular area on the cam follower and wherein if the handle is not locked in position, sudden movements of the rope through the descender cause the pivot arm to be pulled towards the base thus locking the rope between the first and second projections.

4. A descender as claimed in claim **3** characterised in that locking means are provided to lock the lever in position so that a rate of descent can be preset.

5. A descender as claimed in claim **4** characterised in that the lever includes an extension arm which is hinged to the lever and can be folded to the lever for storage and extended for use to increase the effective length of the lever.

6. A descender as claimed in claim **1** characterised in that the second stop means comprise a stop defined on the base and a threaded rod defining an end which end is arranged to abut the stop when the arm is pivoted towards the base, the rod being mounted in an internally threaded block fixed to the arm so that turning the rod when the end abuts the stop, causes the end to move and hence causes the arm to move relative to the base.

7. A descender for use in abseiling, or belaying, comprising:

a base having a connection means for connecting the descender to a harness;

an arm pivotally mounted on the base at a pivot axis extending generally normal to the base;

the base having first and second spaced projections for engaging a rope, the projections both extending generally parallel to the pivot axis;

the arm having a third projection for engaging a rope, the third projection extending generally parallel to the pivot axis, the third projection being located so that when the arm is pivoted towards the base the third projection is located to one side of a longitudinal axis passing through the first and second spaced projections on the base and is spaced further from the pivot axis than the second projection, but closer to the pivot axis than the first projection, characterised by;

a protrusion defined on the arm and a spring means acting on the protrusion for biasing the arm to rotate about the pivot away from the base, and a stop means comprising a catch defined on the base for preventing the arm from pivoting further than a predetermined angle away from the base, the catch being pivotable to allow arm of the descender to be moved beyond the predetermined angle and

second stop means comprising a stop defined on the base and a threaded rod defining an end which end is arranged to abut the stop when the arm is pivoted towards the base, the rod being mounted in an internally threaded block fixed to the arm so that turning the rod when the end abuts the stop causes the arm to move relative to the base, said second stop means restricting the distance the arm can travel towards the base when the biasing means is overcome and the arm is pivoted towards the base,

a retention plate,

whereby in use said descender being operable, with a rope passing below the first projection, above and around the third projection and above the second projection, a resistance force applied to the rope is a maximum when the arm is pivoted so that the third projection is closest to the longitudinal axis, the descender being operable in two modes:

a first mode in which the descender operates as a descender for controlling the rate of descent of a

person sliding down the rope, in which mode the adjustable second stop means can be used to control the rate of descent; and

a second mode wherein the descender is used with substantially no tension on the rope passing through the descender as a belay such that rope can be fed through the descender, in which mode the biasing means keep the arm and base apart to allow rope to be fed through the descender relatively freely but in which mode sudden increases in tension in the rope, cause the biasing means to be overcome and the pivot arm to be pulled towards the base thus locking the rope between the first and second projections and preventing uncontrolled descent.

8. A descender for use in abseiling, or belaying, comprising:

a base having a connection means for connecting the descender to a harness;

an arm pivotally mounted on the base at a pivot axis extending generally normal to the base;

the base having first and second spaced projections for engaging a rope, the projections both extending generally parallel to the pivot axis;

the arm having a third projection for engaging a rope, the third projection extending generally parallel to the pivot axis, the third projection being located so that when the arm is pivoted towards the base the third projection is located to one side of a longitudinal axis passing through the first and second spaced projections on the base and is spaced further from the pivot axis than the second projection, but closer to the pivot axis than the first projection, characterised by;

a protrusion defined on the arm and a spring means acting on the protrusion for biasing the arm to rotate about the pivot away from the base, and a stop means comprising a catch defined on the base for preventing the arm from pivoting further than a predetermined angle away from the base, the catch being pivotable to allow arm of the descender to be moved beyond the predetermined angle and

a second stop means,

a retention plate,

whereby in use said descender being operable, with a rope passing below the first projection, above and around the third projection and above the second projection, a resistance force applied to the rope is a maximum when the arm is pivoted so that the third projection is closest to the longitudinal axis, the descender being operable in two modes:

a first mode in which the descender operates as a descender for controlling the rate of descent of a person sliding down the rope, in which mode the second stop means can be used to control the rate of descent; and

a second mode wherein the descender is used with substantially no tension on the rope passing through the descender as a belay such that rope can be fed through the descender, in which mode the biasing means keep the arm and base apart to allow rope to be fed through descender relatively freely but in which mode sudden increases in tension in the rope, cause the biasing means to be overcome and the pivot arm to be pulled towards the base thus locking the rope between the first and second projections and preventing uncontrolled descent and wherein the second stop means comprising:

a lever pivoted on the base, said lever being associated with a cam and defining a cam surface; and

a cam follower being located on the arm, said cam and cam surface being configured such that when the cam is positioned at either end of the cam surface, the arm can pivot closer to the base than when the cam is in a more central location on the cam surface than when the cam is located at either end of the cam follower, so that in use the resistance force applied to the rope is a maximum when the cam is disposed at or close to either end of the cam surface and a minimum when the cam is disposed between the ends of the cam surface, such that by manipulating the lever the resistance to movement may be set by locating the cam on a particular area on the cam follower and wherein if the handle is not locked in position, sudden movements of the rope through the descender cause the pivot arm to be pulled towards the base thus locking the rope between the first and second projections.

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