Description

FALL ARREST DEVICE

[0001] This invention relates to a fall arrest device.

[0002] It is known, for example from WO2005044383 to provide a fall arrest device which protects a user against a fall with the aid of cam members response to the application of the weight of the user to the fall arrest device and which operates in both directions. Bi-directional operation has the advantage that it is not necessary to mount the device on a cable or the like in a particular direction, with serious consequences if the device is mounted incorrectly. However, the reliance of the fall arrest device on the weight of a falling person to activate the device is not effective in all situations. For example, where the fall arrest device is used on an incline, under which conditions the full weight of the user may not be applied to the device in the event of a fall, the fall arrest device may not activate with the result that the user continues to slide down an inclined surface either until the end of the incline is reached or the incline becomes a vertical fall and the fall arrest device is activated.

[0003] ~~It is therefore an object~~Embodiments of the present invention seek to provide a fall arrest device which may overcome~~s~~, or at least ameliorate~~s~~, the above disadvantage and which ~~is~~ may be more effective on inclined surfaces.

[0004] According to an aspect of the present invention there is provided a fall arrest device comprising: a guide for a track member which, in use, passes through the device; a cam member including a cam portion; and ~~clutch means~~a centrifugal clutch assembly responsive to at least one of the relative speed and relative acceleration of the fall arrest device and the track member and adapted to determine when the relative speed and/or acceleration is at least a predetermined value, the ~~clutch means~~centrifugal clutch assembly including ~~means connecting~~a trigger arm operatively connected to the cam member so as to move the cam portion of the cam member toward the guide so as to lock the track member between the cam member and the guide when at least the predetermined value is attained, wherein the or

each cam member includes a re-set handle for re-setting the cam member to an inactive position after the device has been activated to lock the track member between the cam member and the guide.

[0005] The device may include two guides and cam members, the cam members being adapted and arranged to lock the track member against movement in either of two opposing directions. In such a case the clutch means may

Claims

1. A fall arrest device comprising: a guide (3) for a track member (7) which, in use, passes through the device; a cam member (9) including a cam portion; and clutch means (21) responsive to at least one of the relative speed and relative acceleration of the fall arrest device and the track member and adapted to determine when the relative speed and/or acceleration is at least a predetermined value, the clutch means including means (19) connecting to the cam member so as to move the cam portion of the cam member toward the guide so as to lock the track member between the cam member and the guide when at least the predetermined value is attained.
2. A device as claimed in claim 1 and including two guides (3) and cam members (9), the cam members being adapted and arranged to lock the track member (7) against movement in either of two opposing directions.
3. A device as claimed in claim 2, wherein the clutch means (21) comprises a single bi-directional clutch means.
4. A device as claimed in claim 2, wherein the clutch means (21) comprises a pair of clutch means responsive to movement in opposing directions.
5. A device as claimed in any preceding claim, wherein the or each guide (3) is substantially triangular with the apex of the triangle innermost relative to the device.
6. A device as claimed in any preceding claim and including a spring-biased retainer (5) to retain the track member (7) in position.
7. A device as claimed in any preceding claim and including a back plate (1) on which other components of the device are mounted.
8. A device as claimed in claim 7, wherein the or each cam member (9) is pivotably mounted on a pivot pin (11) extending from the back plate (1).
9. A device as claimed in claim 7, wherein the cam member (9) is mounted on the pivot pin (11) by way of a biasing assembly (59) for biasing the cam member away from the track member (7).
10. A device as claimed in claim 8 or 9 when dependent on claim 6, wherein the pivot pin (11) is provided on that side of the retainer (5) remote from the guide (3).
11. A device as claimed in any preceding claim, wherein the or each cam member

(9) includes a re-set handle (13) for re-setting the cam member (9) to an inactive position after the device has been activated to lock the track member (7) between the cam member and the guide (3).

12. A device as claimed in any preceding claim, wherein the or each cam member (9) is protected by a cover plate (15).
13. A device as claimed in claim 12, wherein the cover plate (15) is movable to permit mounting and demounting the device relative to the track member (7).
14. A device as claimed in any preceding claim, wherein the connecting means (19) comprises a trigger arm.
15. A device as claimed in claim 14, wherein the or each trigger arm (19) passes through the respective guide (3).
16. A device as claimed in claim 14 or 15, wherein the or each trigger arm (19) is profiled in the region of the cam member (9) so as to engage with the cam member such that movement of the trigger arm in a first direction causes the cam member to rotate from its inactive position to its active position in which the track member (7) is locked between the cam member and the guide (3).
17. A device as claimed in claim 16, wherein, when the cam member (9) is in its active position in which the track member (7) is locked between the cam member and the guide (3), but the device is stationary and not under load, the cam member is re-settable to its inactive position with a re-set handle (13) forming part of the cam member.
18. A device as claimed in claim 16 or 17, wherein the cam member (9) is internally profiled to engage with and re-set the trigger arm (19) by moving the trigger arm in a second direction, opposite to the first direction.
19. A device as claimed in any one of claims 14 to 18, wherein the trigger arm (19) is formed with a recess (51) which has an arcuate surface.
20. A device as claimed in claim 19, wherein the arcuate surface aligns with an edge of an arcuate slot (53) formed in the back plate (1).
21. A device as claimed in claim 20, wherein the cam member (9) is formed with a stop pin (57) which engages in the arcuate slot (53) provided in the back plate (1) and also engages with the recess (51) in the trigger arm (19).
22. A device as claimed in any preceding claim, wherein activation of the or each cam member (9) is effected by way of a clutch arrangement (21).

23. A device as claimed in claim 22, wherein the clutch arrangement (21) includes a rotatable wheel (23) adapted to engage with the track member (7) as it passes through the device.
24. A device as claimed in claim 23, wherein the wheel (23) incorporates an elastomeric ring (27) for engaging with the track member (7).
25. A device as claimed in claim 23 or 24, wherein the wheel (23) or the ring (27) is profiled to enhance engagement with the track member (7).
26. A device as claimed in any one of claims 22 to 25, wherein the clutch arrangement (21) includes electronic or electromechanical means to determine the speed and/or acceleration of the fall arrest device relative to the track member (7).
27. A device as claimed in claim 26, wherein the electronic or electromechanical means comprises means for determining the rotational speed of the wheel (23).
28. A device as claimed in claim 26 or 27, wherein electromechanical means is used to activate the or each cam member (9).
29. A device as claimed in claim 28, wherein the electromechanical means comprises a solenoid.
30. A device as claimed in any one of claims 23 to 25, wherein the clutch arrangement (21) comprises a centrifugal clutch assembly including a rotatable inertia device having an inertia reel (25) positioned to at least one side of the wheel (23).
31. A device as claimed in claim 30, wherein an inertia reel (25) is positioned to each side of the wheel (23).
32. A device as claimed in claim 30 or 31, wherein the or each inertia device is rotatable about an axis transverse to the axis of the track member (7).
33. A device as claimed in claim 30, 31 or 32, wherein the or each inertia reel (25) rotates with the wheel (23).
34. A device as claimed in any one of claims 30 to 33, wherein the centrifugal clutch assembly (21) includes at least one slip disc (30) provided with means (35) for engaging with the respective inertia reel (25) when the relative speed and/or acceleration of the fall arrest device attains at least the predetermined value.

35. A device as claimed in claim 34, wherein the centrifugal clutch assembly (21) includes two slip discs (30), each responsive to a different direction of movement of the track member (7) relative to the fall arrest device.
36. A device as claimed in claim 34 or 35, wherein the engagement means comprises a pin (35) provided in a peripheral region of the slip disc (30) and connected to the respective trigger arm (19).
37. A device as claimed in any one of claims 30 to 36, wherein the inertia reel (25) includes at least one actuating member (37) for engaging with the engagement means (35) of the at least one slip disc (30).
38. A device as claimed in claim 37, wherein the actuating member (37) is pivotally mounted on the inertia reel (25).
39. A device as claimed in claim 37 or 38, wherein the or each actuating member (37) includes an arcuate arm (39) which is received in a corresponding arcuate recess (41) formed in the inertia reel (25).
40. A device as claimed in claim 39, wherein a compression spring (43) is provided in the recess (41) to urge the actuating member (37) away from the recess and tending to rotate the actuating member such that a free end of the actuating member is urged radially inwardly.
41. A device as claimed in any one of claims 37 to 40, wherein the free end of the actuating member (37) is formed with an engagement face (49) which extends substantially in a radial direction for engaging with the engagement means (35) of the respective slip disc (30).

CLAIMS

1. A fall arrest device comprising:

a guide for a track member which, in use, passes through the device;

a cam member including a cam portion; and

a centrifugal clutch assembly responsive to at least one of the relative speed and relative acceleration of the fall arrest device and the track member and adapted to determine when the relative speed and/or acceleration is at least a predetermined value, the centrifugal clutch assembly including a trigger arm operatively connected to the cam member so as to move the cam portion of the cam member toward the guide so as to lock the track member between the cam member and the guide when at least the predetermined value is attained,

wherein the or each cam member includes a re-set handle for re-setting the cam member to an inactive position after the device has been activated to lock the track member between the cam member and the guide.

2. A device as claimed in claim 1 and including two guides and two cam members, the cam members being adapted and arranged to lock the track member against movement in either of two opposing directions.

3. A device as claimed in claim 2, wherein the centrifugal clutch assembly comprises a single bi-directional inertia device.

4. A device as claimed in claim 2, wherein the centrifugal clutch assembly comprises a pair of inertia devices responsive to movement in opposing directions.

5. A device as claimed in claim 1, wherein the or each guide is substantially triangular with the apex of the triangle innermost relative to the device.

6. A device as claimed in claim 1 and including a spring-biased retainer to retain the track member in position.

7. A device as claimed in claim 1 and including a back plate on which other components of the device are mounted.

8. A device as claimed in claim 7, wherein the or each cam member is pivotably mounted on a pivot pin extending from the back plate, and wherein the cam member is mounted on the pivot pin by way of a biasing assembly for biasing the cam member away from the track member.

9. A device as claimed in claim 8 and including a spring-biased retainer to retain the track member in position, wherein the pivot pin is provided on that side of the retainer remote from the guide.

10. A device as claimed in claim 1, wherein the or each cam member is protected by a cover plate, and wherein the cover plate is movable to permit mounting and demounting the device relative to the track member.

11. A device as claimed in claim 1, wherein the or each trigger arm passes through the respective guide, wherein the or each trigger arm is profiled in the region of the cam member so as to engage with the cam member such that movement of the trigger arm in a first direction causes the cam member to rotate from its inactive position to its active position in which the track member is locked between the cam member and the guide, wherein when the cam member is in its active position in which the track member is locked between the cam member and the guide, but the device is stationary and not under load, the cam member is re-settable to its inactive position with a re-set handle forming part of the cam member, and wherein the cam member is internally profiled to engage with and re-set the trigger arm by moving the trigger arm in a second direction, opposite to the first direction.

12. A device as claimed in claim 1, wherein the trigger arm is formed with a recess which has an arcuate surface, wherein the arcuate surface aligns with an edge of an arcuate slot formed in the back plate, and wherein the cam member is formed with a stop pin which engages in the arcuate slot provided in the back plate and also engages with the recess in the trigger arm.

13. A device as claimed in claim 1, wherein activation of the or each cam member is effected by way of a clutch arrangement.

14. A device as claimed in claim 13, wherein the clutch arrangement includes a rotatable wheel adapted to engage with the track member as it passes through the device, wherein the wheel incorporates an elastomeric ring for engaging with the track member, wherein the wheel or the ring is profiled to enhance engagement with the track member, and wherein the clutch arrangement includes a solenoid adapted to determine the speed and/or acceleration of the fall arrest device relative to the track member.

15. A device as claimed in claim 14, wherein the solenoid is adapted to determine the rotational speed of the wheel.

16. A device as claimed in claim 14, wherein the solenoid is adapted to activate the or each cam member.

17. A device as claimed in claim 14, wherein the centrifugal clutch assembly includes a rotatable inertia device having an inertia reel positioned to at least one side of the wheel, wherein an inertia reel is positioned to each side of the wheel, wherein the or each inertia device is rotatable about an axis transverse to the axis of the track member, and wherein the or each inertia reel rotates with the wheel.

18. A device as claimed in claim 17, wherein the centrifugal clutch assembly includes at least one slip disc provided with a pin configured and arranged to engage the respective inertia reel when the relative speed and/or acceleration of the fall arrest device attains at least the predetermined value, wherein the centrifugal clutch assembly includes two slip discs, each responsive to a different direction of movement of the track member relative to the fall arrest device, and wherein the pin is provided in a peripheral region of the slip disc and connected to the respective trigger arm.

19. A device as claimed in claim 17, wherein the inertia reel includes at least one actuating member for engaging with the pin of the at least one slip disc.

20. A device as claimed in claim 19, wherein the actuating member is pivotally mounted on the inertia reel, wherein the or each actuating member includes an arcuate arm which is received in a corresponding arcuate recess formed in the inertia reel, wherein a compression spring is provided in the recess to urge the actuating member away from the recess and tending to rotate the actuating member such that a free end of the actuating member is urged radially inwardly, and wherein the free end of the actuating member is formed with an engagement face which extends substantially in a radial direction for engaging with the pin of the respective slip disc.