Aug. 11, 1970 C. D. FOUNTAIN 3,523,591

CLIMBING SAFETY DEVICE

Filed Jan. 6, 1969 2 Sheets-Sheet 1

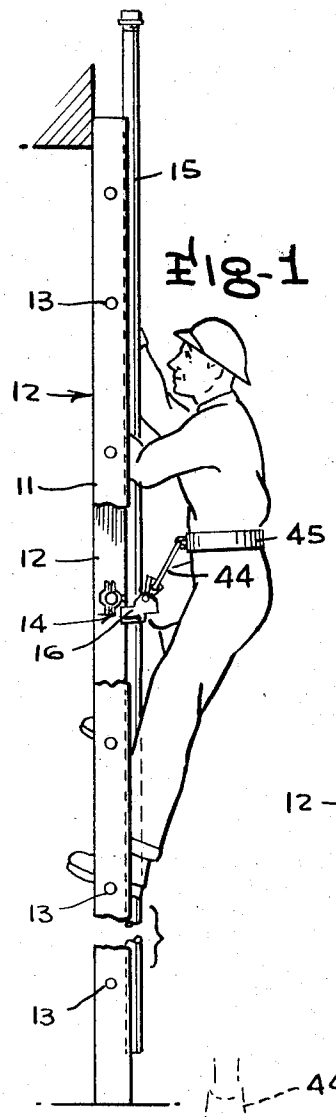


FIG-1

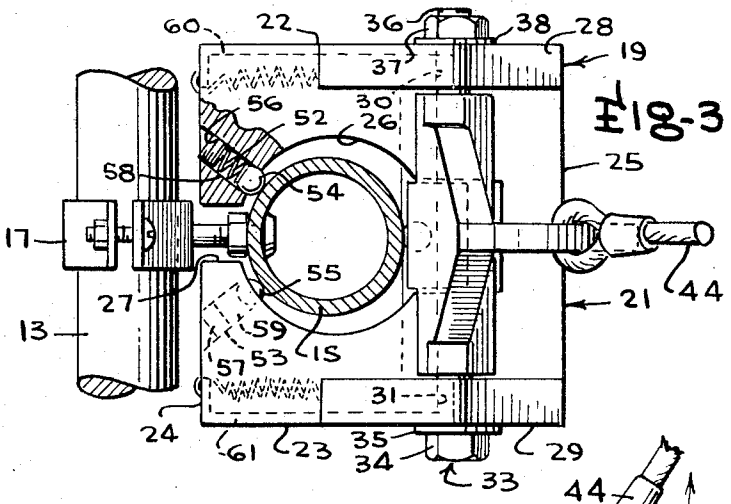


FIG-3

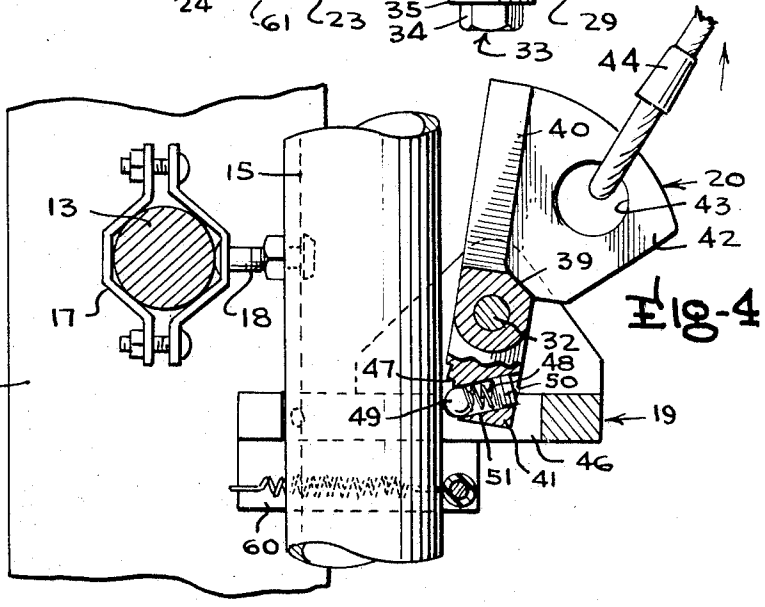


FIG-4

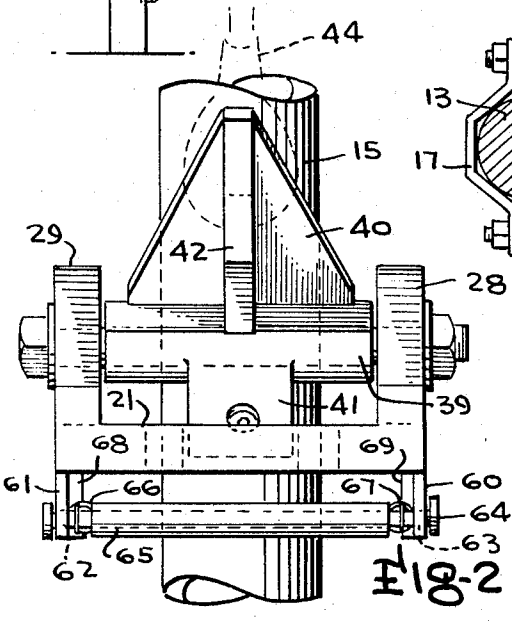


FIG-2

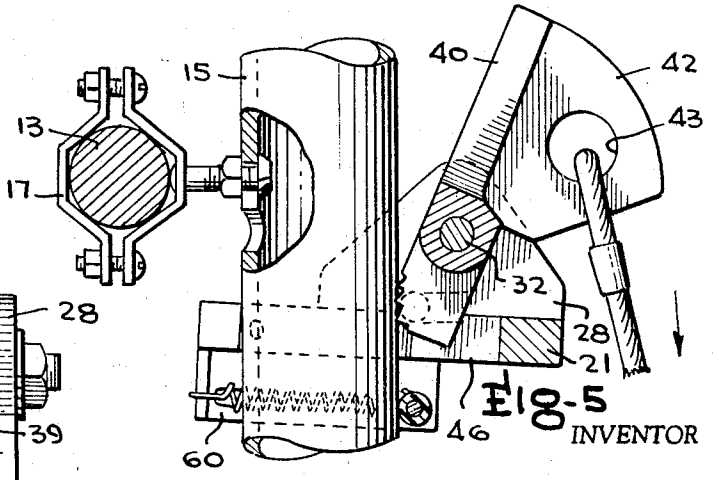


FIG-5

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Aug. 11, 1970 C. D. FOUNTAIN 3,523,591

CLIMBING SAFETY DEVICE

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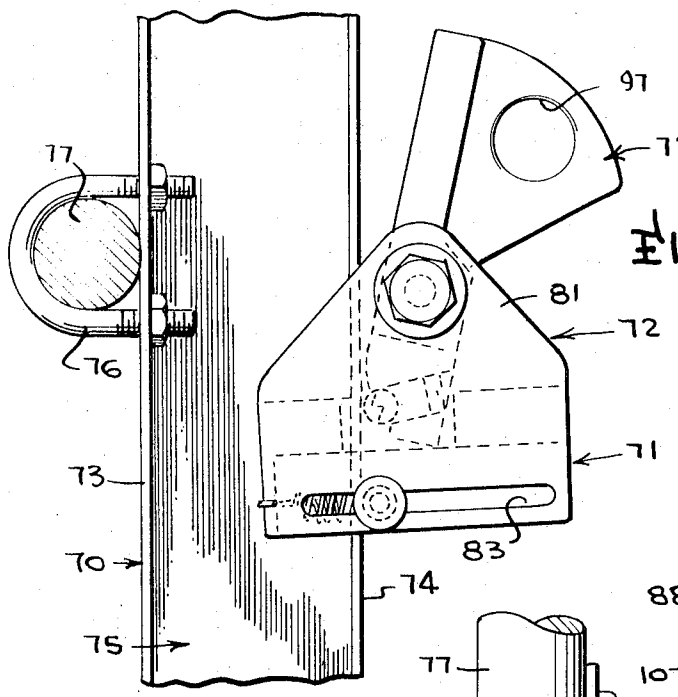


FIG-6

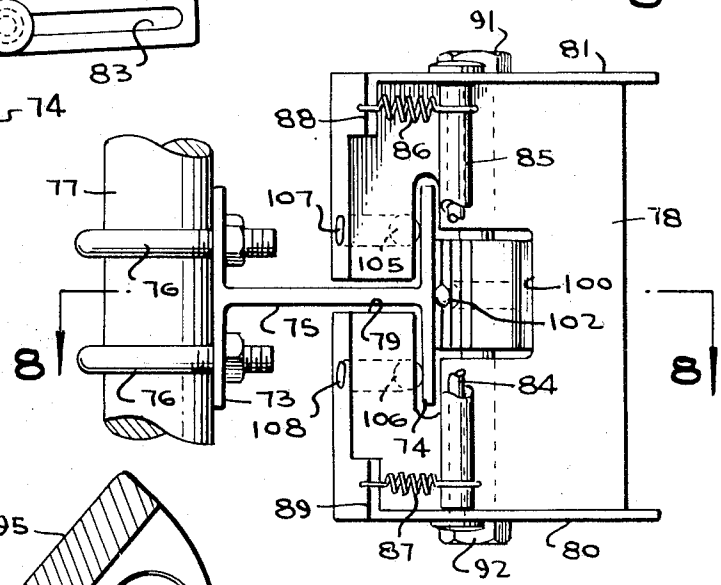


FIG-7

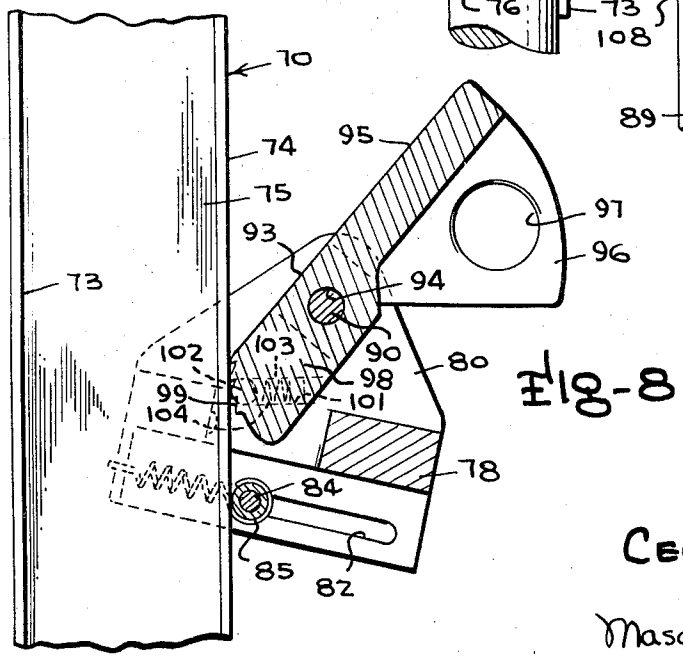


FIG-8

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3,523,591

CLIMBING SAFETY DEVICE

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Int. Cl. E06c 7/18
U.S. Cl. 182—8 10 Claims

ABSTRACT OF THE DISCLOSURE

A climbing safety device suitable for use with a vertically disposed climbing member, such as a ladder, for preventing the fall of the user thereof, as the user ascends or descends along the vertically disposed climbing member, including a locking member secured to the user and operatively connected for sliding movement along a vertically disposed guide means, which is operative to grip and thus lock onto the guide means under certain predetermined downward movements of the user to arrest his fall.

This invention relates to a climbing safety device, and more particularly to a device adapted to be worn by a climber which will arrest his descent under predetermined downward movements of the user.

In the prior art, there are various types of climbing safety devices intended for use by individuals in ascending or descending vertically disposed climbing members such as ladders and the like, for preventing the fall of the individual under circumstances where the individual loses his footing or grip on the member being climbed. Many of such devices have been found to be suitable to various degrees in arresting the fall of the climber. However, many of the devices in the prior art also have been found to be either complicated in construction, insufficiently effective to instantaneously arrest the fall of the clibmber when he loses his footing or grip, or cumbersome to the extent of interfering with or impeding the motion of the climber while ascending or descending at a normal rate.

Accordingly, it is the principal object of the present invention to provide a novel climbing safety device.

Another object of the present invention is to provide a novel climbing safety device suitable for use by individuals ascending or descending a vertically disposed climbing member.

A still further object of the present invention is to provide a novel safety climbing device suitable for use by an individual climbing a vertically disposed member such as a ladder, which is effective to instantaneously arrest the fall, and support the weight of the individual when he has accidentally lost his footing or grip on the member being climbed.

Another object of the present invention is to provide an improved climbing safety device suitable for use by an individual for ascending or descending a vertically disposed climbing member, which cooperates with a stationary guide means disposed coextensively with and adjacent to the vertically disposed climbing member, and which is adapted to be connected to the body of the individual.

A further object of the invention is to provide a noval climbing safety device suitable for use by an individual for ascending or descending along a vertically disposed climbing member which is adapted to permit normal ascent or descent but will instantaneously arrest any sudden or abrupt downward movement of the individual.

A still further object of the present invention is to provide a novel climbing safety device suitable for use by an individual in ascending or descending along a vertically disposed climbing member which is simple in construction, inexpensive to manufacture, and reliable in performance.

Other objects and advantages of the invention will become more apparent to those persons skilled in the art to which the invention pertains, from the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a side elevational view of an embodiment of the invention illustrated in its normal operating environment;

FIG. 2 is an enlarged rear view of the embodiment illustrated in FIG. 1;

FIG. 3 is an enlarged top view of the embodiment illustrated in FIG. 1, having a portion thereof broken away;

FIG. 4 is a side elevational view of the embodiment shown in FIG. 1, illustrating the embodiment in the unlocked position and having portions thereof broken away;

FIG. 5 is another enlarged side elevational view of the embodiment shown in FIG. 1, illustrating the embodiment in the locked position, having portions broken away;

FIG. 6 is a side elevational view of a second embodiment of the invention disposed in the unlocked position;

FIG. 7 is a bottom view of the embodiment shown in FIG. 6, illuntrating the embodiment in the locked position; and

FIG. 8 is a cross-sectional view taken along line 8—8 in FIG. 7.

Briefly described, the present invention relates to a climbing safety device suitable for use with a vertically disposed member for preventing the fall of the user thereof as the user ascends or descends along the vertically disposed member, generally including a rigid vertical guide means disposed adjacent the vertically disposed member, and locking means including a connecting member operatively connected to the guide means for sliding movement vertically thereon, the connecting member having an opening for receiving at least a portion of the guide means therethrough, lever means mounted on the connecting member having one end thereof engageable with the guide means in gripping relation and an opposite end thereof connectable to the user and pivotable downwardly during predetermined downward movements of the user to pivot the gripping end of the level means into gripping relation with the guide means, and yieldable means interposed between the lever means and the guide means for urging the gripper end of the lever means out of gripping relation with the guide means.

Referring to FIGS. 1 through 5 of the drawings, there is illustrated a first embodiment of the invention. The embodiment illustrated in FIGS. 1 through 5 is adapted to be used with a vertically disposed climbing member such as a ladder **10**. The ladder is of a conventional construction, including a pair of spaced side rails **11** and **12** interconnected by means of a plurality of vertically spaced rungs **13**. The climbing safety device **14** consists of two major components including a guide rail **15** and a locking unit **16**. The guide rail **15** consists of a rigid tubular member secured to the rungs of the ladder by means of a plurality of fastener assemblies **17** having bolt portions **18** rigidly secured to the tubular member **15**. The guide rail is disposed coextensively with the ladder, and is secured to the rungs **13** of the ladder intermediate the side rails **11** and **12**.

The locking device **16** includes a connecting member **19** operatively connected to the guide rail **15** for sliding movement along the length thereof, and a lever member **20** pivotally connected to the connecting member **19** and engageable with the guide rail **15** to grip the guide rail in locking relation. The connecting member **19** includes a substantially square shaped plate **21** having side edges

22 and 23, a front edge 24, and a rear edge 25. As best illustrated in FIG. 3, the plate 21 is provided with a vertical opening 26 for receiving the guide rail 15 therethrough. As shown, the diameter of the opening 26 is larger than the outside diameter of the guide rail 15 to permit the connecting member 19 to move freely along the guide rail. The plate 21 also is provided with a slot 27 extending between the opening 26 and the front edge 24 for accommodating the bolts 18 as the connecting member is moved vertically along the guide rail 15 .The connecting member also is provided with a pair of transversely spaced, vertical brackets 28 and 29 having horizontally aligned openings 30 and 31 for receiving the shank 32 of an elongated bolt 33 therethrough. As illustrated in FIGS. 3 through 5, the axis of the openings 30 and 31 is disposed rearwardly of the guide rail 15. The bolt 33 includes a head portion 34 engaging a washer 35 secured against the outer surface of the bracket 29, a threaded end 36 extending through the opening 30 in bracket 28, and a nut 37 threaded on the threaded end 36 of the shank and engaging a washer 38 secured against the bracket 28.

The lever member 20 is mounted on the shank portion 32 of the bolt 33 between the brackets 28 and 29 for pivotal movement in a vertical plane. The lever member includes a tubular portion 39 which is pivotally supported on the shank portion 32 of the bolt, an upper arm portion 40 and a lower arm portion 41 aligned with the upper arm portion 40. The upper arm portion 40 is provided with a rearwardly projecting flange 42 having an opening 43 for securing a linking member 44 secured to a belt 45 worn about the waist of the user, as illustrated in FIG. 1. The lower arm portion 41 has a length greater than the vertical distance between the axis of the bolt shank 32 and the upper surface of plate 21, and is received within a recess 46 in the plate 21 which communicates with the circular opening 26. The lower front end of the arm portion 41 also is provided with a coarse gripping surface 47 which is engageable with the guide rail 15 when the lever member 20 is pivoted in a clockwise direction relative to FIGS. 4 and 5, to grip the guide rail 15 and thus lock the locking device to the guide rail 16.

The lower or gripping arm portion 41 of the lever member is provided with an elongated opening 48 having a restricted outlet disposed in the gripping surface 47. Disposed in the opening 48, is a ball bearing 49 extending through the restricted outlet and projecting outwardly from the surface 47, which is engageable with the guide rail. The opening 48 is at least partially threaded and is provided with a retainer screw 50 mounted through the rear end, and a spring 51 interposed between the ball bearing 49 and the retainer screw 50 for urging the ball bearing partially through the restricted outlet of the opening 48 to engage the guide rail 15 and thus retain the surface 47 of the lever arm portion 41 out of engagement with the guide rail 15. It will be noted, however, that upon pivoting the lever member in a clockwise direction relative to FIGS. 4 and 5, the ball bearing 49 will be retracted against the action of the spring 51 to permit the gripping surface 47 to engage the front portion of the guide rail 15.

Formed in the front edge 24 of the plate 21 are openings 52 and 53 which are disposed substantially radially relative to the vertical axis of the guide rail 15, and which communicate through restricted outlets with the opening 26. The openings 52 and 53 are angularly spaced and are provided with ball bearings 54 and 55 extending through the restricted outlets into the opening 56 and which are engageable with the guide rail 15. The openings 52 and 53 also are partially threaded and are provided with retainer screws 56 and 57, and springs 58 and 59 interposed between the ball bearings and retainer screws thereof for urging the ball bearings 54 and 55 to project through the restricted outlets of openings 52 and 53 to yieldingly engage the guide rail 15. As best illustrated in FIG. 3, the ball bearings 49, 54 and 55 are circumferentially spaced relative to the guide rail 15 and yieldingly engage the guide rail to maintain it in spaced relation relative to the plate 21 of the connecting member. The yieldable engagement of the ball bearings 49, 54 and 55 permits the locking device 16 to slide freely along the length of the guide rail 15 during normal rates of ascent and descent of the user of the device.

The plate 19 of the connecting member also is provided with a pair of transversely spaced, depending flanges 60 and 61 which are disposed on opposite sides of the opening 26. The depending flanges 60 and 61 are provided with aligned elongated guideways 62 and 63 disposed parallel with the bottom surface of the plate 21. Received within and slideable along the lengths of the guideways 62 and 63 is a guide pin 64 having a tubular roller bearing 65 rotatably mounted thereon, as best illustrated in FIG. 2. The roller bearing 65 is urged into engagement with guide rail 15 by means of a pair of springs 66 and 67 interconnecting the ends of the guide pin 64 and inturned flanges 68 and 69 disposed at the forward ends of depending flanges 60 and 61. The roller bearing 65 is adapted to yieldingly engage the guide rail 15 to maintain the plate 21 in a substantially horizontal position during normal rates of ascent and descent of the user of the device.

In the use of the embodiment illustrated in FIGS. 1 through 5, when the user is ascending or descending on the ladder 10 at a normal climbing rate, the plate 21 of the connecting member will be maintained in a horizontal position by the roller bearing 65, and the spring urged ball bearings 49, 54 and 55 will maintain the connecting member in spaced relation relative to the guide member and the gripping arm portion 41 of the lever member 20 out of engagement with the guide rail and retracted in the recess 46 in the plate member. Under such conditions, the locking device will freely move along the guide rail 15 in the unlocked position.

Whenever, however, there is any sudden downward movement of the user as when he loses either his footing or grip on the ladder and tends to fall, the level member will be pivoted in a clockwise direction relative to FIGS. 4 and 5 so that the gripping surface 47 of arm portion 41 will be forced into gripping relation with the guide rail 15, as illustrated in FIG. 5, locking the connecting member to the guide rail and arresting the fall of the user. As soon as the user is able to retain his footing or grip on the ladder and moves his body to the normal climbing position against the ladder, the lever member will be pivoted in a counterclockwise direction relative to FIGS. 4 and 5, to move the gripping surface 47 out of engagement with the guide rail, and thus unlock the locking device. Thereafter, the spring urged ball bearings 49, 54 and 55 will retain the connecting member of the locking device in spaced relation to the guide rail, and will permit the locking device to move freely along the guide rail.

FIGS. 6 through 8 illustrate a second embodiment of the invention which is substantially similar to the embodiment illustrated in FIGS. 1 through 5, the essential difference residing in the cross-sectional configuration of the guide rail. In this embodiment, there is included a guide rail 70 and a locking device 71 operatively connected to the guide rail 70 and including a connecting member 72 and a lever member 73. The guide rail 70 consists of an I-beam including a pair of substantially parallel flanges 73 and 74 and a connecting web section 75. The guide rail is adapted to be secured rigidly to a ladder by means of a plurality of U-bolts 76. The guide rail 70 is disposed coextensively along the ladder against the rungs 77 intermediate the side rails of the ladder. Each of the U-bolts is adapted to straddle a rung of the ladder, having threaded leg portions extending through openings in the flange 73 of the guide rail. The guide rail is held

rigidly against the rungs of the ladder by means of siutable nuts threaded on the legs of the U-bolts, as best illustrated in FIGS. 6 and 7.

The connecting member **72** includes a horizontally disposed plate **78** having a vertical T-shaped opening **79** for receiving the flange section **74** and the rearward end of the web section **75** of the guide rail **70** therethrough, to permit the connecting member to slide freely along the length of the guide rail. The connecting member further is provided with a pair of transversely spaced, vertically disposed brackets **80** and **81** mounted on the sides of the plate **78** above and below the plate, as illustrated in FIGS. 6 and 8. The lower ends of the brackets **80** and **81** are provided with aligned guideways **82** and **83** which are disposed parallel to the bottom surface of plate **78**. Slidably mounted in the guideways is a guide pin **84** on which there is rotatably mounted a roller bearing **85**. As best illustrated in FIG. 7, the roller bearing **85** is yieldingly urged into engagement with the flange section **74** of the guide rail by means of springs **86** and **87** interconnecting the roller bearing **85** and inturned flanges **88** and **89** provided on the brackets **80** and **81**. The spring biased roller bearing **85** yieldingly engages the flange **74** of the guide rail to maintain the plate **78** in a substantially horizontal position to permit the connecting member to slide freely along the length of the guide rail.

The upper ends of the brackets **80** and **81** are provided with aligned openings for receiving a pivot pin **90** therein. The pivot pin is retained in the aligned openings in the brackets **80** and **81** by means of threaded nuts **91** and **92** threaded on the ends of the pivot pin **90** and engaging the outer surfaces of the brackets **80** and **81**.

The lever member **73** is provided with an intermediate portion **93** having a transverse opening **94** for receiving the pivot pin **90** therethrough to pivotally mount the lever member on the connecting member for pivotal movement in a vertical plane. The lever member also is provided with an upper arm portion **95** having a vertical flange **96** with an opening **97** for securing a linking member to be attached to the belt of the user. The lever member also is provided with the lower arm portion **98** having a gripping surface **99** engageable with the flange **74** of the guide rail in gripping relation to lock the locking device **72** to the guide rail. The lower arm portion of the lever member has a length greater than the distance from the axis of the pivot pin **90** to the upper surface of the plate **78**, and is received in a recess **100** in the plate **78** when the aligned arm portions of the lever member are disposed in a substantially vertical position and the lower arm portioin **98** thereof is in the retracted position, as illustrated in FIG. 6.

The lower arm portion **98** of the lever member is provided with an opening **101** having a restricted outlet in the gripping surface **99** through which a ball bearing **102** projects to engage the flange **74** of the guide rail. The opening **101** is threaded to receive a retainer screw **103**. Interposed between the ball bearing **102** and the retainer screw **103** is a spring **104** for urging the ball bearing **102** through the restricted outlet of the opening **101** and beyond the gripping surface **99** of the lower arm portion of the lever member. As best illustrated in FIG. 6, during normal rates of ascent or descent of the climber, the plate **78** of the connecting member **72** will be retained in substantially a horizontal position and the lower arm portion **98** of the lever member will be retained by the ball bearing **102** and the spring **103** in the retracted position out of gripping relation with the flange **74** of the guide rail. Cooperating with the ball bearing **102** and associated spring **103** are ball bearings **105** and **106** having associated springs which are mounted in openings **107** and **108** in the plate **78** of the connecting member. As best illustrated in FIG. 7, the openings **107** and **108** are spaced from the slot of the T-opening **79**, and the ball bearings **105** and **106** extend into the opening **79** and engage the flange **74** of the guide rail. The spring urged ball bearings **102**, **105** and **106** cooperate with the roller bearing **85** to maintain the locking device in the position as illustrated in FIG. 6.

The embodiment illustrated in FIGS. 6 through 8, operates essentially in the same manner as the embodiment of the invention illustrated in FIGS. 1 through 5. During normal rates of ascent and descent of the climber, the locking device **72** will assume a position as illustrated in FIG. 6, with the lower arm portion **98** of the lever member in the retracted position out of gripping relation with the guide rail. Whenever the user moves suddenly downwardly, as when he loses his grip or footing on the ladder, the user's body will cause the lever member **73** to pivot in a clockwise direction relative to FIGS. 6 and 8 to cause the ball bearing **102** to retract and the gripping surface **99** to engage the flange **74** of the guide rail in gripping relation, thus locking the locking device **72** to the guide rail and arresting any further downward movement of the climber. As soon as the climber has had an opportunity to retain his grip or footing on the ladder and lifts his body upwardly, the lever member **73** will be caused to rotate in a counterclockwise direction relative to FIGS. 6 and 8, to retract the lower arm portion **98** of the lever member out of gripping relation with the flanges **74** normal operating position, as illustrated in FIG. 6, to permit the climber to continue to ascend or descend at a normal rate of travel.

Having thus described my invention, I claim:

1. A climbing safety device suitable for use with a vertically disposed member for preventing the fall of the user thereof as the user ascends or descends along said vertically disposed member comprising rigid vertical guide means disposed adjacent said vertically disposed member and locking means including a connecting member operatively connected to said guide means for sliding movement vertically thereon, said connecting member having an opening for receiving at least a portion of said guide means therethrough, lever means mounted on said connecting member having one end thereof engageable with said guide means in gripping relation and an opposite end thereof connectable to said user and pivotable downwardly during predetermined downward movements of said user to pivot the gripping end of said lever means into gripping relation with said guide means and yieldable means interposed between said lever means and said guide means for urging said gripper end of said lever means out of gripping relation with said guide means.

2. A climbing safety device according to claim **1**, wherein said opening in said connecting member is T-shaped and receives therethrough a T-shaped portion of said guide means.

3. A climbing safety device according to claim **1**, wherein said yieldable means for urging said lever means out of gripping relation with said guide means comprises a spring biased bearing element interposed between the gripping end of said lever means and said guide means.

4. A climbing safety device according to claim **3**, wherein said spring biased element comprises a ball bearing engageable with said guide means and a spring element interposed between said ball bearing and the gripping end of said lever means.

5. A climbing safety device according to claim **1**, wherein said connecting member is provided with a recess communicating with said opening therein for receiving said gripping end of said lever member when said gripping end is in the retracted position out of gripping relation with said guide means.

6. A climbing safety device according to claim **1**, wherein said opening in said connecting member has a circular configuration and said guide means has a circular configuration of smaller diameter than the diameter of said opening.

7. A climbing safety device according to claim **6**, including yieldable means spaced about said guide means and interposed between said connecting member and said

guide means for maintaining said connecting member spaced from said guide means.

8. A climbing safety device according to claim 7, wherein said yieldable means comprises spring biased elements.

9. A climbing safety device according to claim 8, wherein said spring biased elements comprise ball bearings engageable with said guide means.

10. A climbing safety device according to claim 6, wherein said connecting member is provided with a recess communicating with said opening therein for receiving

said gripping end of said lever member when said gripping end is in the retracted position out of gripping relation with said guide means.

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