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Sweet

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[54] **ROPE GRAB SAFETY DEVICE**

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[51] **Int. Cl.** **A62b 1/14**

[58] **Field of Search** 182/5, 18, 6, 7, 11, 191, 182/192, 193; 188/65.2, 65.1

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[57] **ABSTRACT**

A safety device comprising a bracket having means for attachment to a person working at elevated locations and for slidable mounting on a vertically extending safety line. A roller movable upwardly and downwardly in guide tracks on the bracket is so positioned in relation to a safety line extending through a channel on the bracket that upward movement of the roller in response to rapid downward sliding of the bracket along the safety line caused by the person's falling deflects the safety line laterally outwardly and wedges it against a friction surface on a safety line retainer member attached to the bracket above the roller.

11 Claims, 6 Drawing Figures

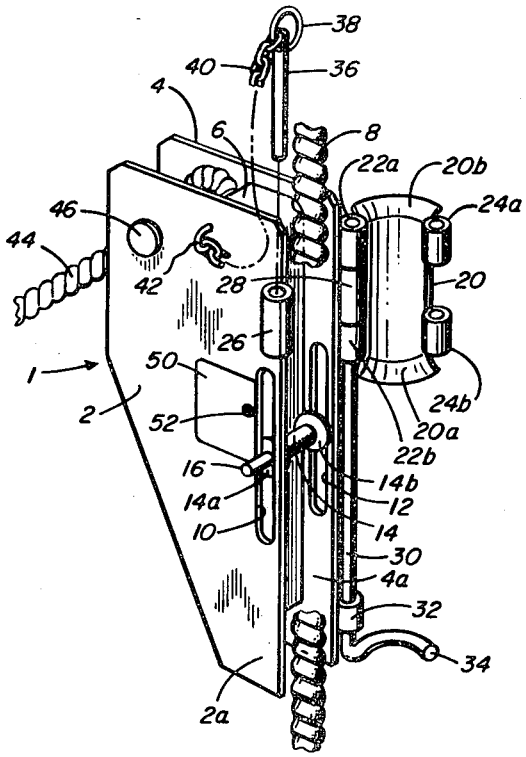
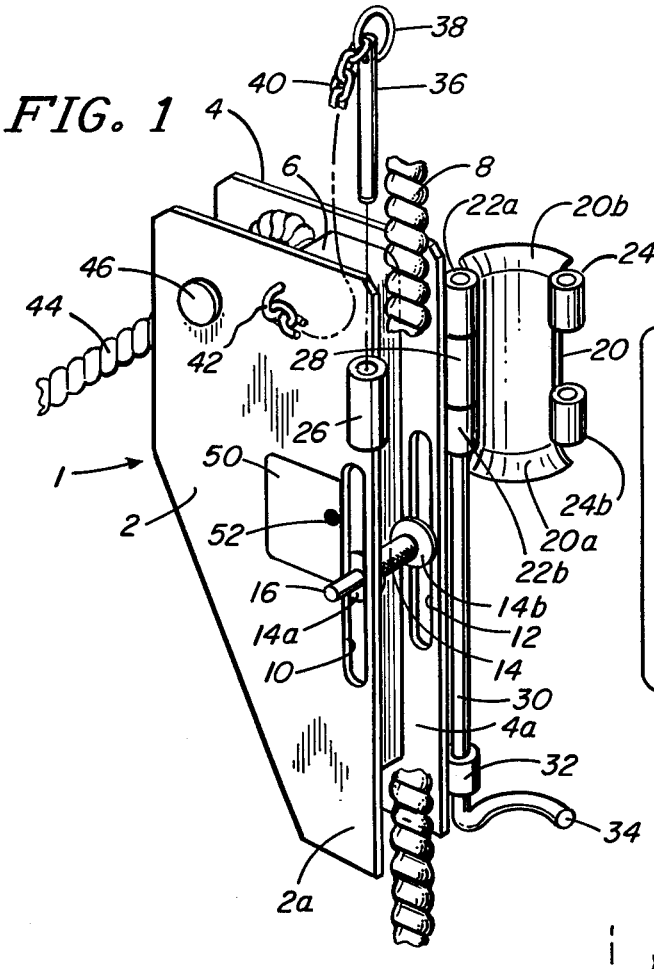


FIG. 1



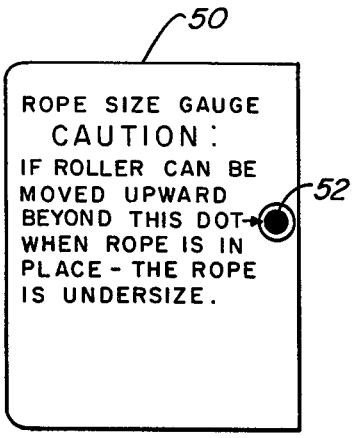


FIG. 6

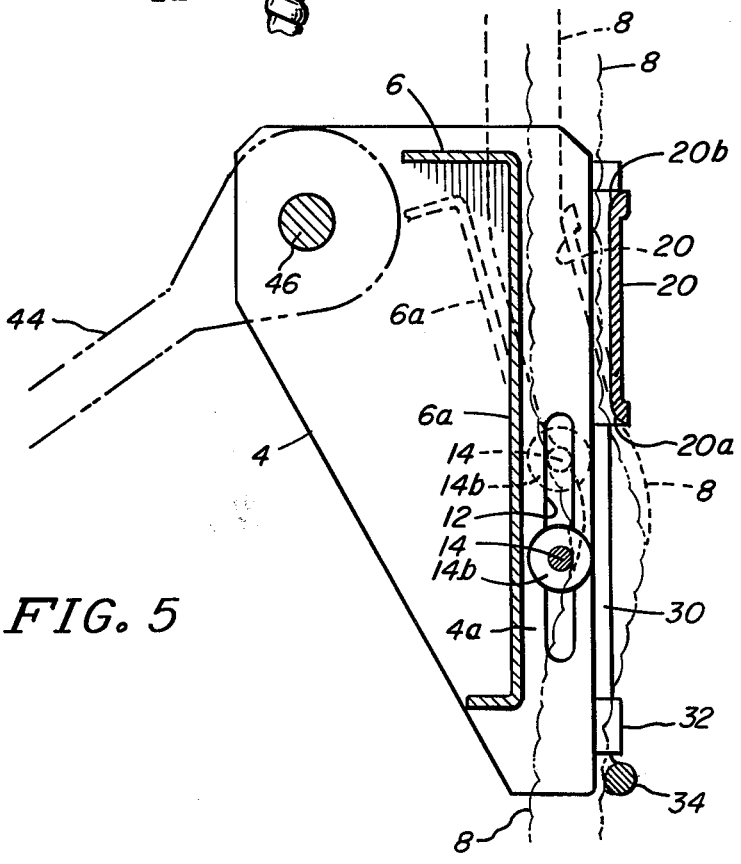


FIG. 5

FIG. 4

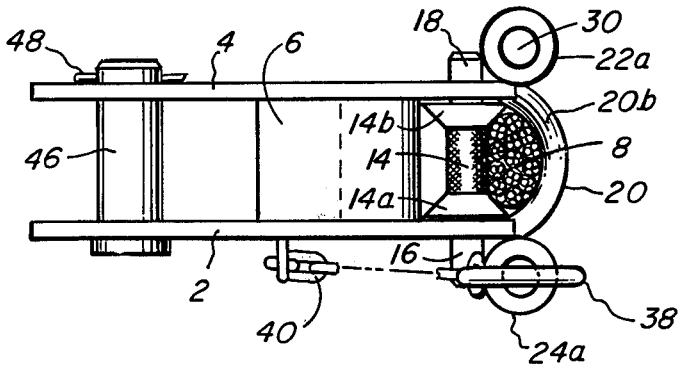


FIG. 2

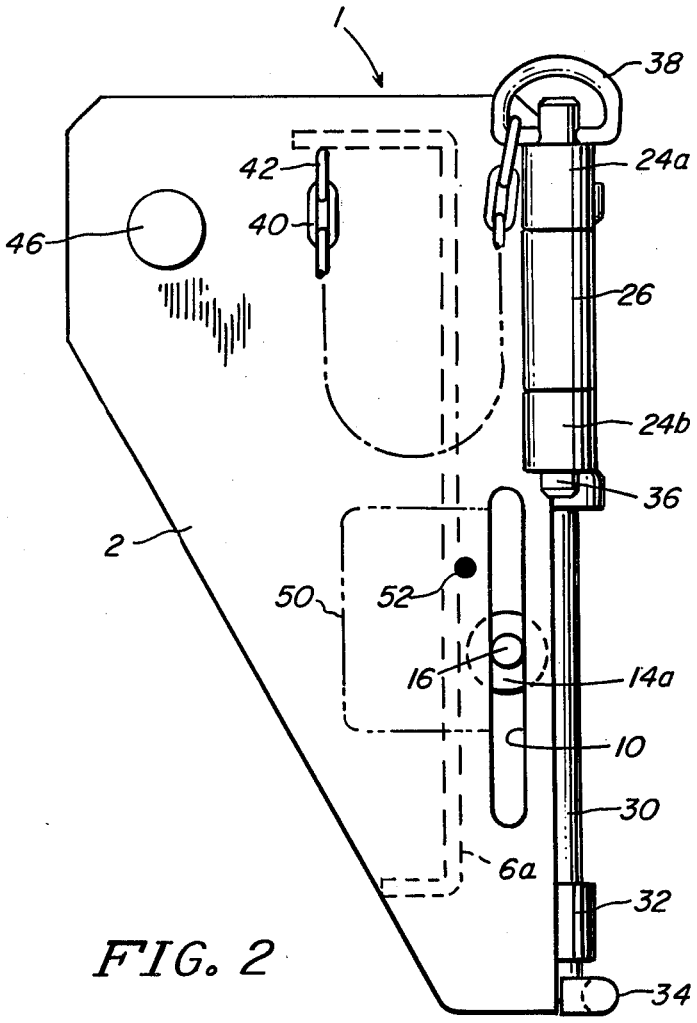
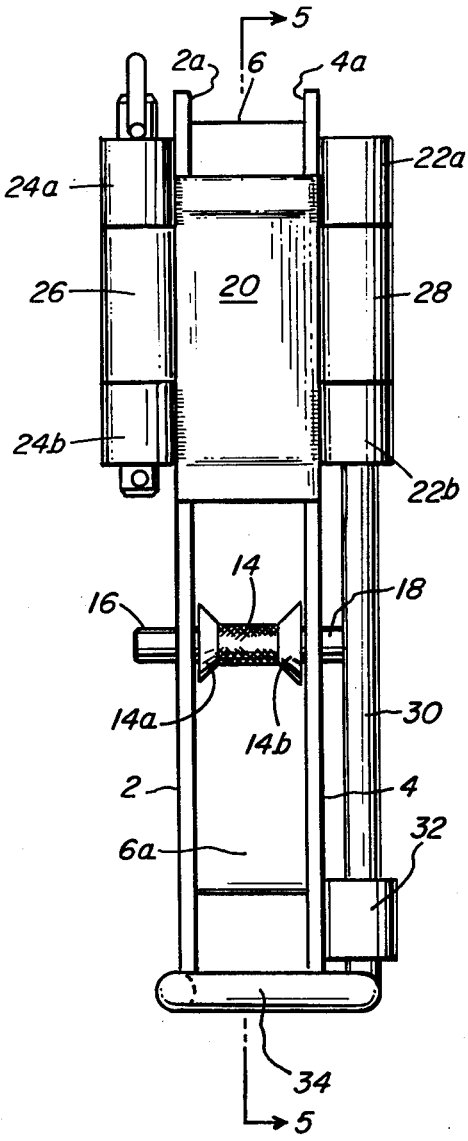


FIG. 3



ROPE GRAB SAFETY DEVICE

BRIEF SUMMARY OF THE INVENTION

This invention is directed to an improved rope grab, safety device which can be quickly and easily installed for sliding movement on a safety line to desired vertical positions of use, and which will automatically operate to firmly grab the safety line to catch and support a person to whom it is attached, if the person should fall from an elevated position along the safety line.

These basic objectives and advantages are realized by providing a mounting bracket with a safety line channel within which a roller is positioned for vertical movement so as to deflect a safety line extending through the channel laterally away from the vertical. A safety line retainer member which extends across the channel to hold the safety line therein is formed with a friction surface at its bottom end at a location above and laterally offset from the roller in the direction of safety line deflection. With the roller in contact with the safety line, downward movement of the mounting bracket along the safety line under free fall conditions will cause the roller to move upwardly to a position where it will deflect and wedge the safety line tightly against the aforesaid friction surface.

A particularly secure and positive gripping action of the device on a safety line is achieved by providing a second friction surface on the upper end of the aforesaid retainer member. This second friction surface is brought into frictional engagement with the safety line by the canting of the mounting bracket to an inclined position as a reaction to the wedging of the safety line between the roller and the bottom friction surface on the retainer member.

As a particularly advantageous feature of my improved rope grab device, I provide a second retainer member which is spaced vertically below the first, aforementioned retainer member to keep the safety line in contact with the roller, and to provide an open space between the two retainer members through which the safety line may be freely deflected by the roller. These two retainer members are preferably connected by a vertically extending hinge pin rotatably mounted on the bracket adjacent to the safety line channel so as to permit the two retainer members to be rotated together between open and closed positions relative to the safety line channel. This greatly facilitates the mounting of the bracket on a safety line, and the placement of the safety line within the bracket channel.

These and other objects and advantages of my invention, including the use of a built-in rope size gauge on the mounting bracket, will become readily apparent as the following description is read in conjunction with the accompanying drawings wherein like reference numerals have been used to designate like elements throughout the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the rope grab device of this invention;

FIG. 2 is a front, elevation view of the rope grab device of FIG. 1;

FIG. 3 is an end view of the rope grab device;

FIG. 4 is a top, plan view of the rope grab device;

FIG. 5 is a vertical, section view of the rope grab device taken along lines 5—5 of FIG. 3; and

FIG. 6 is a view of a rope size gauge which is provided on the device.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, I have shown in FIG. 1 a perspective view of a preferred embodiment of my improved rope grab device wherein the mounting bracket is generally indicated by reference numeral 1. Mounting bracket 1 is comprised of a pair of upright, side plates 2 and 4 connected by a spacer plate 6 having a vertically extending segment 6*a*. With mounting bracket 1 in its upright position of use as shown in FIG. 1, spaced apart, vertically extending wall segments 2*a* and 4*a* on the forward ends of side plates 2 and 4 define therebetween a vertical channel through which a safety line 8 extends. Safety line 8 may be a rope, cable or other type of strong line which is normally supported in a vertical position on a building or other upright structure on which a person may be working at an elevated level. Safety line or rope 8 is guided and contained within the channel defined between bracket wall segments 2*a* and 4*a* in the manner shown in FIGS. 1, 4 and 5.

Guide tracks, preferably in the form of vertical slots 10 and 12 are formed in wall segments 2*a* and 4*a*. These guide tracks serve to guide and support a roller 14 for vertical movement up and down along the safety line channel. Roller 14 extends between opposed, parallel guide tracks 10 and 12 in the manner shown with its end stub shafts 16 and 18 extending through the guide track slots 10 and 12. Stop collars 14*a* and 14*b* on the opposite ends of roller 14 bear against the inside faces of wall segments 2*a* and 4*a* and serve to guide and position roller 14 between these wall segments. Roller 14 is preferably knurled to improve its frictional engagement with safety line 8, with which it is in contact. Roller 14 is positioned in the safety line guide channel between wall segments 2*a* and 4*a* at a location where it will be in the free hanging, vertical path of safety line 8. Thus, roller 14 will normally deflect safety line 8 laterally outwardly, away from the vertical in the manner shown in FIG. 5.

For the purpose of containing safety line 8 within the mounting bracket channel, and to provide friction surfaces to grip safety line 8, I provide a retainer member 20 on the upper end of mounting bracket 1. Upper, retainer member 20 preferably takes the form of an elongated, cylindrical segment as shown, and serves to contain safety line 8 within the aforesaid channel on bracket 1 when it is positioned across the safety line channel on the forward ends of wall segments 2*a* and 4*a* as shown in FIGS. 2, 3 and 4. Retainer member 20 is oriented vertically in a direction parallel to the roller guide slots 10 and 12 on the forward ends of wall segments 2*a* and 4*a*.

For a purpose hereinafter explained, friction surfaces 20*a* and 20*b* are formed on the bottom and top ends of retainer member 20. These two friction surfaces are preferably of arcuate shape and flare outwardly away from the safety line guide channel in the manner shown most clearly in FIG. 5.

Retainer member 20 is preferably hingedly attached to the forward end of wall segment 4*a* by means of a first pair of vertically spaced hinge sleeves 22*a* and 22*b* affixed, as by welding, to one side thereof. A second pair of vertically spaced hinge sleeves 24*a* and 24*b* are

attached to the opposite side of retainer member **20.** These hinge sleeves cooperate with a pair of hinge sleeves **26** and **28** affixed to the forward ends of wall segments **2***a* and **4***a* to permit the opening and closing movement of retainer member **20** with respect to the safety line channel formed between wall segments **2***a* and **4***a*. This is accomplished by an elongated hinge pin **30** which extends through fixed hinge sleeve **28** and is secured to retainer member hinge sleeves **22***a* and **22***b* for rotation therewith. Hinge pin **30** extends vertically adjacent to the safety line channel on mounting bracket **1** and is rotatably supported at its lower end within a hinge sleeve **32** affixed to the bottom of wall segment **4***a*. A second retainer member in the form of a hook-like segment of a ring **34** is formed on the bottom end of hinge pin **30** for rotation therewith. Lower retainer member **34** functions in its closed position as shown in FIGS. **2, 3** and **5** to hold safety line **8** in contact with roller **14.** Lower, safety line retainer member **34** is vertically spaced downwardly from upper retainer member **20** below its friction surface **20***a* to define a completely open space therebetween opposite roller **14** through which safety line **8** may be freely deflected laterally by roller **14** as it moves upwardly and downwardly in the safety line channel of mounting bracket **1.**

For the purpose of holding upper and lower retainer members **20** and **34** in their closed positions across the safety line channel of bracket **1,** I provide a locking pin **36** which may be removably inserted through sleeves **24***a*, **26** and **24***b* as shown in FIGS. **2** and **3.** A pull ring **38** on the top end of lock pin **36** permits this pin to be easily removed by pulling it upwardly as illustrated in FIG. **1,** after which retainer members **20** and **34** may be rotated with hinge pin **30** to the open position shown in FIG. **1.** Chain **40** connected between pull ring **38** and a retainer ring **42** affixed to side plate **2** secures lock pin **36** to mounting bracket **1.**

A lanyard **34** is used to attach mounting bracket **1** to a workman by means of a belt buckle or coupling, or other appropriate means in a manner well known in the art. Lanyard **34** is looped at its inner end, as illustrated in phantom line in FIG. **5** and secured to mounting bracket **1** by means of a pin **46** extending therethrough. A roll pin or cotter pin **48** shown in FIG. **4** holds lanyard pin **46** in place after it has been inserted through the looped end of lanyard **34** and through aligned apertures in side plates **2** and **4.**

A rope size gauge plate or label **50** is affixed to the outer face of side plate **2,** and has an indicator mark in the form of a dot **52** thereon. This size gauge is used in a manner hereinafter explained to check the size of a rope for safe, satisfactory operation with my improved rope grab device.

In operation lanyard **44** is affixed to a workman, and bracket **1** is mounted on safety line **8.** With lock pin **36** removed and retainer members **20** and **34** swung to the open position shown in FIG. **1,** this latter step is readily accomplished by simply abutting mounting bracket **1** against safety line **8** to position the safety line within the guide channel formed between wall segments **2***a* and **4***a*. Retainer members **20** and **34** are then rotated with hinge pin **30,** to which they are connected as a unitary assembly to their closed positions across the safety line channel as shown in FIGS. **2, 3** and **4.** Lock pin **36** is then inserted in place through hinge sleeves **24***a*, **26** and **24***b* to secure these retainer members in their closed positions. It will be appreciated that hinge sleeves **24***a* and **24***b* cooperate with stationary hinge sleeve **26** and removable lock pin **36** to provide releasable locking means for the retainer member assembly.

With bracket **1** so mounted on safety line **8** in the upright position shown, roller **14** will be in the normal, vertical path of safety line **8,** and will deflect it laterally. As illustrated in FIG. **5,** with roller **14** in its downward, release position, safety line **8** will assume the shape shown in phantom lines wherein it will be deflected laterally from the vertical, but will not be urged tightly against either bottom or top friction surfaces **20***a* and **20***b* of retainer member **20.**

In order to ensure that safety line **8** is of a satisfactory size for safe operation with my improved rope grab device, roller **14** is moved upwardly within guide slots **10** and **12** to the point where it urges safety line **8** against bottom friction surface **20***a* of retainer member **20.** Indicator dot **52** is so positioned on gauge plate **50** that if roller **14** can be moved upwardly beyond this indicator dot as it urges rope or safety line **8** against friction surface **20***a*, the safety line is undersized. It will be appreciated that a safety line of a certain minimum diameter is required in order to ensure that roller **8** will be able to wedge the safety line against friction surface **20***a* when it reaches the top of guide slots **10** and **12.**

Mounting bracket **1** can be easily moved upwardly and downwardly on safety line **8** to a desired vertical position by a workman to which it is attached by simply moving roller **14** to the bottom end of guide slots **10** and **12.** This releases all frictional contact of surface **20***a* with safety line **8,** and permits the mounting bracket **1** to be freely moved up and down on the safety line. It will thus be appreciated that the particular hinged mounting of retainer members **20** and **34** on bracket **1,** and the positioning and operation of roller **14** relative to the bottom friction surface **20***a* on retainer **20,** permits bracket **1** to be initially mounted at any desired vertical location along a safety line **8,** and also to be adjusted vertically up and down on the safety line subsequently without opening retainer members **20** and **34** or removing bracket **1** from the safety line.

It is of course understood that the primary function of my improved rope grab device is to quickly and effectively catch and support a person attached to mounting bracket **1** in the event of an accidental fall. If the person falls, mounting bracket **1** travels rapidly down safety line **8** thereby causing roller **14** to move upwardly in guide slots **10** and **12.** This upward, reaction movement of roller **14** is assured by maintaining contact between roller **14** and safety line **8.** Such contact is established and maintained by positioning roller **14** within the vertical path of safety line **8,** and by utilizing lower retainer member **34** as shown to hold safety line **8** against the roller. As roller **14** approaches upper retainer member **20** under free fall conditions of mounting bracket **1** downwardly along safety line **8,** it restricts safety line **8** by wedging it against bottom friction surface **20***a* on retainer member **20.** In FIG. **5** I have illustrated in dotted lines the position to which rope **8** will be deflected by roller **14** as it reaches the upper end of guide slots **10** and **12.** In such a position of roller **14** and rope **8,** rope **8** will be tightly wedged between the roller and friction surface **20***a*, thereby stopping the downward travel of mounting bracket **1** along safety line or rope **8.** The rounded, downwardly and outwardly flared shape of friction surface **20***a* pro-

vides a friction surface against which safety line **8** may be wedged by the upward movement of roller **14** without damage to the rope. The aforesaid wedging action against safety line **8** is assured by locating friction surface **20***a* above roller **14** at a location laterally offset therefrom in the direction of deflection of safety line **8.**

The sudden gripping of safety line **8** between roller **14** and friction surface **20***a* will cause mounting bracket **1** to cant or rotate from the vertical substantially about the gripping points of roller **14** and friction surface **20***a*. In FIG. **5** I have illustrated in dotted lines the inclined positions to which retainer member **20** and bracket spacer plate segment **6***a* will be rotated by the stopping action of roller **14.** The canting of mounting plate **1** in this manner will bring upper friction surface **20***b* of retainer member **20** into contact with rope **8,** thereby producing additional frictional drag on the rope. At this point, rope or safety line **8** will generally assume the position shown in dotted lines in FIG. **5.** This combination of wedging action by roller **14** against friction surface **20***a*, and frictional drag produced by upper friction surface **20***b* provides a very positive, secure gripping action of the rope grab device on safety line **8.**

I anticipate that various modifications can be made in the size, shape and structural arrangement of the component parts of my improved rope grab device disclosed herein, without departing from the spirit and scope of my invention as defined by the following claims.

What is claimed is:

1. A rope grab, safety device for restrainably engaging a vertically extending safety line comprising:

a mounting bracket having spaced apart, vertically extending wall segments defining therebetween a vertical channel through which a safety line extends when the bracket is mounted in its upright position of use;

means on said mounting bracket for securing it to a workman;

a pair of vertically extending guide tracks formed in said wall segments parallel to each other in opposed, spaced apart relation;

a roller extending between said wall segments and having end extremities positioned in said guide tracks, whereby said roller may travel up and down in said guide tracks, said roller being positioned in said channel at a location where it will be in the free hanging, vertical path of a safety line extending therethrough, whereby said roller will normally deflect the safety line laterally from the vertical; and

a safety line retainer member extending across said channel between said wall segments and cooperating therewith to contain a safety line within said channel, said retainer member having a friction surface at the bottom end thereof at a location above and laterally offset from said roller in the direction in which a safety line is deflected by said roller, whereby the upward movement of said roller in response to the downward travel of said bracket on a safety line under free fall conditions will cause the deflected safety line to be wedged against said retainer friction surface by the roller.

2. A rope grab device as defined in claim **1** wherein:

said safety line retainer is an elongated member oriented vertically in a direction parallel to said roller guide tracks.

3. A rope grab device as defined in claim **1** wherein:

said friction surface on said retainer member is of arcuate shape, and flares downwardly and outwardly at the bottom end of said retainer, to thereby provide a smooth, rounded friction surface positioned and oriented for wedging contact by the deflected safety line under the upward, wedging action of the roller.

4. A rope grab device as defined in claim **1** wherein:

said retainer member is an elongated closure member extending across said channel; and

a second friction surface is formed at the top end of said retainer member, said second friction surface being brought into frictional engagement with a safety line extending through said bracket channel as said bracket is handed from the vertical by the wedging action of said roller against said friction surface at the bottom end of said retainer member.

5. A rope grab device as defined in claim **1** wherein:

a second, lower safety line retainer member extends across said channel between said wall segments at a downwardly spaced location from said retainer member below said friction surface thereon to define a completely open space therebetween opposite said roller through which a safety line may be freely deflected laterally by said roller as it moves upwardly and downwardly in said channel.

6. A rope grab device as defined in claim **5** wherein:

said second retainer member is a hook-like segment of a ring.

7. A rope grab device as defined in claim **5** wherein:

said first-mentioned retainer member, and said second, lower retainer member are connected by an elongated hinge pin as a unitary assembly, said hinge pin extending vertically and being rotatably mounted on one of said wall segments within hinge sleeves affixed to said one wall segment adjacent to said channel, whereby said retainer members may be rotated together between open and closed positions relative to said channel to facilitate the mounting of said bracket on a safety line and the placement of a safety line in said channel.

8. A rope grab device as defined in claim **1** wherein

a rope size gauge in the form of an indicator mark is placed on said bracket at a predetermined vertical position along one of said roller guide tracks such that the movement of said roller upwardly in said guide tracks beyond said mark with resulting deflection of a safety line outwardly towards said friction surface will indicate that the safety line is too small for satisfactory operation in conjunction with the rope grab device.

9. A rope grab device for restrainably engaging a vertically extending safety line comprising:

a mounting bracket having spaced apart, vertically extending wall segments defining therebetween a vertical channel for a safety line;

means on said mounting bracket for securing it to a workman;

a roller extending between said wall segments and supported on said bracket for movement upwardly and downwardly in said channel, said roller being positioned in said channel at a location where it will be in the normal, vertical path of a safety line freely hanging in said channel, whereby said roller will deflect the safety line laterally from the vertical;

an upper, safety line retainer member extending across said channel between said wall segments and cooperating therewith to contain a safety line within said channel, said upper retainer member having a friction surface thereon located above and laterally outwardly from said roller in the direction of safety line displacement by said roller, whereby the upward movement of said roller in response to the downward travel of said bracket on a safety line under free fall conditions will cause the deflected safety line to be wedged against said retainer friction surface by the roller; and

a lower safety line retainer member extending across said channel between said wall segments at a downwardly spaced location from said upper retainer member below said friction surface to define a completely open space therebetween opposite said roller through which a safety line may be freely deflected laterally by said roller as it moves upwardly and downwardly in said channel.

10. A rope grab device as defined in claim **9** wherein:

said upper and lower retainer members are connected by a vertically extending hinge pin rotatably mounted on one of said wall segments adjacent to said safety line channel, whereby said upper and lower retainer members may be rotated together between open and closed positions relative to said channel to facilitate the mounting of said bracket on a safety line and the placement of a safety line in said channel.

11. A rope grab device as defined in claim **10** wherein:

releasable, cooperative locking means on the other one of said wall segments and on said upper retainer member hold said retainer members in said closed position across said safety line channel.

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