

(19)



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Office européen des brevets



(11)

EP 0 727 006 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

08.04.1998 Bulletin 1998/15

(21) Application number: **93917821.6**

(22) Date of filing: **19.08.1993**

(51) Int Cl.⁶: **E06C 7/18, A62B 35/04**

(86) International application number:
PCT/FI93/00327

(87) International publication number:
WO 94/04786 (03.03.1994 Gazette 1994/06)

(54) **A SAFETY DEVICE AND CARRIAGE THEREFOR**

SICHERHEITSVORRICHTUNG UND GLEITER DAFÜR

DISPOSITIF DE SECURITE ET CHARIOT POUR CELA

(84) Designated Contracting States:
DE FR GB SE

(30) Priority: **19.08.1992 FI 923709**

(43) Date of publication of application:
21.08.1996 Bulletin 1996/34

(73) Proprietor: **JITA-PIPE OY**
FIN-57710 Savonlinna (FI)

(72) Inventor: **IMMONEN, Jukka**
FIN-57710 Savonlinna (FI)

(74) Representative: **Nyberg, Bengt**
DR. LUDWIG BRANN PATENTBYRA AB,
P.O. Box 17192
104 62 Stockholm (SE)

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Description

The invention relates to a safety device preventing a person from falling when climbing on a ladder. By the pressure of a spring mechanism, the safety device stops in a rail fixed to the ladder and prevents from falling when the person is suspended in the safety device. More particularly, the invention relates to a safety device and a carriage of the kind defined in the independent claims.

In fire ladders and other access ladders a rail is used as safety device to which a carriage is fixed that moves in the rail and reacts upon dropping by stopping in the rail and thus preventing the safety device user from falling. Safety carriages are known from, among others, the Finnish publication 61133 and application 842035. In these examples, the safety carriage hits the rail or an obstacle formed in the profile. Among others, T-profiles and square profiles and corresponding C-profiles are used, the profile of which is open at a point allowing the safety carriage to be guided off the rail.

The disadvantage of these carriages and profiles is the carriage tendency to slip off the profile in stress situations. The C- or the square profiles yield by stress just so much that the opening tends to widen thus allowing the carriage to come out. In T- and I-profiles, as per publication DE-2626425, the profile side brackets easily bend outward due to great force transmitted over the carriage wheels. Then the carriage can protrude so much that the locking does not function anymore. In using above said carriage and rail types, the wall thickness must be sufficient.

EP-A-0418405 discloses a safety device of the kind with which the present invention is concerned. When in the stopped position the carriage of this safety device transmits the forces to the rail flanges defining the rail opening through a pair of wheels having a common axis, so that a localised load is applied to the rail flanges. This safety device accordingly has the disadvantage mentioned above.

US-A-3933220 discloses a safety device in which the stopping of the carriage is effected by pushing a pair of wedge elements into a slot in a tubular safety rail. To be able to withstand the wedging forces without expansion of the slot, the tube forming the rail has to have a substantial wall thickness and thus a substantial weight.

With a carriage and a corresponding rail type according to the invention as set out in the claims a decisive improvement of the safety device properties is achieved and, with respect to safety, the disadvantages of present devices are eliminated.

According to the invention, the profile is either a C- or a square profile, in each profile there is a gap for the carriage. At the gap edges the profile has rims bent to the profile inside. In stress situations the C- and square profiles have the tendency to spread out thus enlarging the gap in the profile front edge. This is taken advantage of by fitting the carriage portion, which falls inside the profile, with two brackets which take, with the

carriage locked, support from the profile gap flank and, simultaneously, also from the bent gap rims, thus preventing the carriage, when stopped, to get off the profile and allowing the use of thinner profile material.

In the following the invention is more closely defined according to the enclosed drawing, where

Fig. 1 is a carriage in a rail profile,

Fig. 2 is a rail profile,

Fig. 3 is a stopped carriage, the rail a reduced cross-section of a situation as per figure 1,

Fig. 4 is a carriage viewed diagonally.

Fig. 1 shows a carriage 4 in rail profile 1. The carriage moves up and down in the rail while belt loop 5 is being pulled off the rail. The user suspends him/herself in the belt, one end of which is in belt loop 5. When carriage 4 is pulled from loop 5 on moving up or down in the ladder direction, the carriage does not stop in the collision brackets 2 arranged on the profile back wall.

Fig. 2 shows a rail profile 1, on the inside back wall of which curved brackets 2 are hammered by a tool at suitable intervals. In this profile type holes 13 are made between the brackets in the back wall for fastening the rail to the ladder. The rail profile design tapers towards the front wall, where the profile is open. At the edges of the produced gap the profile has rims 3 bent to the profile inside. The inner walls of these bent rims 3 are marked by ref.no 12.

Figure 3 shows a cross-section of a situation as per figure 1, where carriage 4 is stopped in rail 1. Carriage wheel 6, which can move in the carriage frame, is stretched toward belt loop 5 by spring 14 around pin 7 in carriage 4, whereupon carriage wheel 6 has hit the front wall of the rail and, accordingly, carriage 4 has then moved against the rail back wall by the impact of spring 14. Since the carriage motion has been down, its lower collision edge 10 has then hit bracket 2 and stopped the carriage. Carriage 4 remains stopped as long as the frame is being pulled down. The carriage is released on pulling belt loop vertically off the rail with respect to the rail.

In normal carriage working position, on pulling belt loop 5 by quite small forces vertically off the rail, the carriage wheel pair 6 is, due to spring 14, the first to touch the rail 1 front wall on both sides of the gap. The carriage moves easily up and down due to rolling of the wheel pair. Further, in this case the carriage is held by bracket pairs 9, which move parallel with the rail and drag, upon need, along the rail front edge and the inner surfaces of the bent rims 3 in the profile gap but do not disturb the carriage motion to any significant extent.

Figure 4 shows a carriage with an elongated hole 8 for the wheel pair axle and a pin 7 for fixing spring 14. At both carriage ends there are collision edges 10 which hit the brackets 2 upon collision. Further, at both ends of the carriage there is a pair of brackets 9 adjusted to the rail profile 1 so that suitable clearance is left be-

tween their inner surfaces 11 and the inner surfaces 12 of bent rims 3. The rail 1 wall thickness and stiffness is so adjusted that in situations of stress of the rail, due to falling, the rail profile gap can expand, whereat bent rims 3 take support from the bracket pairs 9 of carriage 4 and prevent further extension of the profile gap. This support also results in an increased friction between the carriage and the rail in the locked situation. Since the carriage construction takes a portion of the strains on the rail, the rail can be made of quite a thin plate or its walls to a rather thin profile. The front edge as per fig. 2 has a strong tendency to spread out at the front edge gap, but also other square, circular or combination profiles tend to do the same.

The bracket pairs 9 can be replaced also by wheel pairs if one wants to secure perfect rolling of carriage in the profile front edge. Then the inner flanks of the wheel pairs are adjusted to function with the bent rims 3 and front edges 6 in the same way as parts 9 and their inner surfaces 11.

The invention is not restricted to the embodiment described herein but modifications are possible within the limits of the inventive concept determined in the patent claims.

Claims

1. A carriage (4) that moves in a safety rail (1) and stops in the said rail when the carriage (4) turns to a position deviating from its travel direction and a collision edge (10) on the carriage hits brackets (2) formed inside the rail on a back wall thereof, the carriage (4) having parts (9) by means of which the carriage takes support from a front wall of the rail (1) which front wall includes a pair of rims (3) which are bent inwardly towards the back wall and define a gap in the front wall, **characterized** in that said parts (9) are protruding parts formed at the ends of the carriage (4) as a pair of brackets which straddle the rims (3), and in that the inner surfaces (11) of the brackets are adjusted to support the rims (3) when the rims tend to spread and expand the gap on stopping of the carriage.
2. A carriage according to claim 1, **characterized** in that brackets (9) are sliding parts.
3. A carriage according to claim 1, **characterized** in that the bracket pair is comprised of two wheels or similar rollers.
4. A safety rail profile (1), with brackets (2) to stop carriage (1) motion and with an open front wall having inwardly bent rims (3) which form the edges of a gap in the rail profile (1) front wall, **characterized** in that counter faces (11) of the carriage (4) are adjusted to take the mutual expanding tendency of the profile

rims (3) in rail profile stress situations.

5. A safety rail according to claim 4, **characterized** in that the mutual distance of the inner surfaces (12) of rims (3) is adjusted to form a clearance with the corresponding surfaces (11) of carriage (4).
6. A safety device comprising a safety rail profile (1) and a carriage (4) which is movable in the safety rail profile, the rail profile having brackets (2) formed inside the rail profile on a back wall thereof to stop the carriage motion when the carriage (4) turns to a position deviating from its travel direction and a collision edge (10) thereof hits said brackets (2), and the carriage (4) having parts by means of which the carriage takes support from a front wall of the rail (1) which front wall includes a pair of rims (3) which are bent inwardly towards the back wall and define a gap in the front wall, **characterized** in that said parts (9) are protruding parts formed at the ends of the carriage as a pair of brackets which straddle the rims (3), and in that the inner surfaces (11) of the brackets are adjusted to support the rims (3) when the rims tend to spread and widen the gap under stress applied to the rail profile on stopping of the carriage (4).
7. A safety device according to claim 6, **characterized** in that brackets (9) are sliding parts.
8. A safety device according to claim 6, **characterized** in that the bracket pair is comprised of two wheels or similar rollers.
9. A safety device according to claim 6, **characterized** in that the mutual distance of the inner surfaces (12) of the rims (3) is adjusted to form a clearance with the corresponding surfaces (11) of brackets (9).

Patentansprüche

1. Ein Wagen (4), der in einer Sicherheitschiene (1) fährt und stoppt, wenn er von seiner Fahrtrichtung abweicht und mit seiner Kollisionskante (10) mit Anschlägen (2) zusammenstösst, die in die schiene auf eine seiner Hinterwände eingebaut sind, und der Wagen (4) hat Teile (9), um sich an die Vorderwand der Schiene (1) zu stützen, und diese Vorderwand schliesst ein Paar Ränder (3) ein, die nach innen gegen die Hinterwand gebogen sind und eine Lücke in die vorderwand formen, **gekennzeichnet** dadurch, dass die genannten Teile (9) überstehende Teile sind, geformt als ein Paar Konsolen in beiden Enden des Wagens (4), die in die Ränder 3 hineinpassen, und dass die Innenflächen (11) in der Weise angepasst worden sind, dass sie die Ränder (3) stützen, wenn sich diese Ränder beim Stoppen

des wagens zu öffnen und auszubreiten streben.

2. Ein Wagen gemäss Patentanspruch 1 **gekennzeichnet** dadurch, dass die Konsolen (9) gleitende Teile sind.
3. Ein Verfahren gemäss Patentanspruch 1 **gekennzeichnet** dadurch, dass das Konsolenpaar zwei Räder oder entsprechende Rollen einschliesst.
4. Ein Sicherheitsschienenprofil (1) mit Anschlägen (2), zum Stoppen die Fahrt des Wagens (4), und mit offener Vorderwand mit nach Innen gebogenen Rändern (3), die die Kanten der Lücke in der Vorderwand des Schienenprofils (1) formen, **gekennzeichnet** dadurch, dass die Ansatzflächen (11) des Wagens (4) angepasst sind, die gegenseitige Ausbreitungstendenz der Schienenränder (3) bei Beanspruchung des Schienenprofils zu empfangen.
5. Eine Sicherheitsschiene gemäss Patentanspruch 4 **gekennzeichnet** dadurch, dass der gegenseitige Abstand der Innenflächen (12) der Ränder (3) so angepasst sind, dass sie mit den entsprechenden Flächen (11) des Wagens (4) einen Freiraum formen.
6. Eine Sicherheitsvorrichtung bestehend aus einem Sicherheitsschienenprofil (1) und einen Wagen (4), der in dem Sicherheitsschienenprofil beweglich ist, der Schienenprofil mit Anschlägen (2) versehen, die in den Schienenprofil in eine seiner Hinterwände eingebaut sind um die Fahrt des Wagens zu stoppen, wenn der Wagen (4) von seiner Fahrtrichtung abweicht und mit seiner Kollisionskante (10) mit den genannten Anschlägen (2) zusammenstösst, und der Wagen (4) hat Teile um sich an eine Vorderwand der Schiene (1) zu stützen, welche Vorderwand ein Paar Ränder (3) einschliesst, die nach innen gegen die Hinterwand gebogen sind und eine Lücke in die Vorderwand formen, **gekennzeichnet** dadurch, dass die genannten Teile (9) überstehende Teile sind, geformt als ein Paar Konsolen in beiden Enden des Wagens, die in die Ränder (3) hineineinpassen, und dass die Innenflächen (11) in der Weise angepasst sind, dass sie die Ränder (3) stützen, wenn sich diese Ränder bei grosser Belastung, wenn der Wagen gestoppt wird, zu öffnen und auszubreiten streben.
7. Eine Sicherheitsvorrichtung gemäss Patentanspruch 6 **gekennzeichnet** dadurch, dass die Konsolen gleitende Teile sind.
8. Eine Sicherheitsvorrichtung gemäss Patentanspruch 6 **gekennzeichnet** dadurch, dass das Konsolenpaar zwei Räder oder entsprechende Rollen einschliesst.

9. Eine Sicherheitsvorrichtung gemäss Patentanspruch 6 **gekennzeichnet** dadurch, dass der gegenseitige Abstand der Innenflächen (12) der Ränder (3) so angepasst sind, dass sie mit den entsprechenden Flächen (11) der Konsolen (9) einen Freiraum formen.

Revendications

1. Un chariot (4) se déplaçant le long d'un rail de sécurité (1) et se bloquant sur ledit rail lorsque le chariot (4) se tourne en une position non conforme à sa direction d'avancement et que le bord pare-choc (10) du chariot heurte contre les saillies (2) pratiquées à l'intérieur du rail, sur sa paroi arrière, le chariot étant muni de pièces (9) à l'aide desquelles s'appuie contre la paroi avant du rail (1), celle-ci comprenant une paire de rebords tournés vers l'intérieur ou vers la paroi arrière et formant une ouverture dans la paroi avant; **caractérisé** en ce que les dites pièces (9) sont des pièces en saillie formant, aux bouts du chariot (4), des saillies resserrant les rebords (3), et en ce que les surfaces intérieures (11) de ces pièces en saillie sont réglées de façon à supporter les rebords (3) lorsqu'ils tendent à s'écarter, ce qui élargirait l'ouverture au moment où le chariot se bloque en place.
2. Un chariot conforme à la revendication 1, **caractérisé** en ce que les pièces en saillie (9) sont des pièces coulissantes.
3. Un chariot conforme à la revendication 1, **caractérisé** en ce que les paires de pièces en saillie consistent en deux roues ou galets similaires.
4. Un rail de sécurité en profilé (1) muni de saillies (2), qui arrêtent le mouvement du chariot (1), et d'une paroi avant, qui présente une ouverture à deux rebords tournés à l'intérieur (3) formant la bordure de cette ouverture pratiquée dans la paroi avant, **caractérisé** en ce que les contre-faces (11) du chariot (4) sont ajustées de façon à recevoir la force d'expansion mutuelle des rebords profilés (3) dans les situations où le rail profilé subit une contrainte.
5. Un rail de sécurité conforme à la revendication 4, **caractérisé** en ce que la distance entre les deux surfaces intérieures (12) des rebords (3) est ajustée de façon à former un dégagement avec les surfaces correspondantes (11) du chariot (4).
6. Un dispositif de sécurité comprenant un rail de sécurité en profilé (1) et un chariot (4) se déplaçant le long dudit rail en profilé. Le rail en profilé est muni de deux saillies (2) situées à l'intérieur du rail, sur sa paroi arrière, et destinées à bloquer le chariot en

place lorsqu'il se tourne en une position non conforme à sa direction d'avancement et que son bord pare-choc (10) heurte contre lesdites saillies (2). Le chariot (4) est muni de pièces à l'aide desquelles le chariot s'appuie contre la paroi avant du rail (1), cette paroi avant comprenant une paire de rebords (3) qui sont tournés à l'intérieur ou vers la paroi arrière et qui délimitent une ouverture pratiquée dans la paroi avant; **caractérisé** en ce que lesdites pièces (9) sont des pièces en saillie formant, aux bouts du chariot, des saillies resserrant les rebords (3) et en ce que les surfaces intérieures (11) de ces saillies sont ajustées de façon à supporter les rebords (3) lorsque ceux-ci tendent à s'écarter et à élargir l'ouverture lors de la contrainte appliquée sur le rail en profilé au moment où le chariot (4) se bloque en place.

7. Un dispositif de sécurité conforme à la revendication 6, **caractérisé** en ce que les pièces en saillie (9) sont des pièces coulissantes. 20
8. Un dispositif de sécurité conforme à la revendication 6, **caractérisé** en ce que les deux pièces en saillie sont des roues ou galets similaires. 25
9. Un dispositif de sécurité conforme à la revendication 6, **caractérisé** en ce que la distance entre les surfaces intérieures (12) des deux rebords (3) est ajustée de façon à former un dégagement avec les surfaces correspondantes (11) des pièces (9). 30

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