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Elevator pit barrier

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An elevator installation comprising a car (1) within a shaft (10), a buffer (16) mounted in a pit (12) of the shaft (10) and a barrier (20;30;40) located in the pit (12) surrounding or within an area wherein a vertical clearance between the pit floor (14) and the car (1) or equipment mounted thereon is less than a regulatory threshold value (C) when the car (1) fully compresses the buffer (16). Accordingly, the barrier (20;30;40) acts to physically deterrent personnel within the pit from inadvertent presence in the area of reduced vertical clearance.

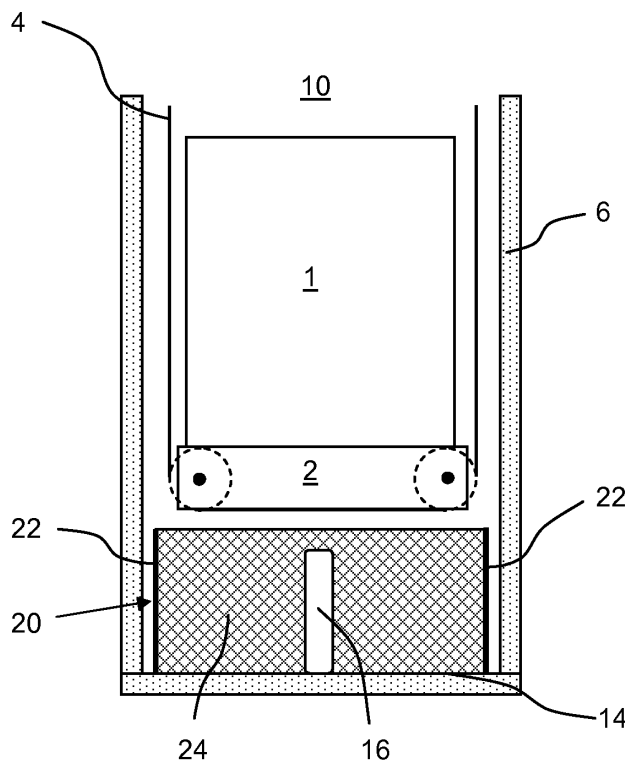


FIG. 4

Description

[0001] The present invention relates to elevators and, in particular, to a barrier located in the elevator pit to maintain the safety of personnel working in a pit of reduced depth.

[0002] There are increasing pressures on the elevator industry to reduce the space occupied by elevator installations within buildings. One solution would be to reduce the depth of the pit of the elevator shaft, however, regulations such as European Standard EN81-1:1998 specify that when an elevator car rests on its fully compressed buffers, there shall be a minimum free vertical clearance between the pit floor and the lowest parts of the car. There are exceptions to these rules such as for toeguards, roller guides, guide shoes and safety gear all of which are generally mounted on the outside periphery of the car. The situation is depicted in Figs. 1 to 3. In this example, the elevator car 1 is supported by means of an underslung pulley box 2 on ropes 4. The ropes 4 are driven by a traction sheave (not shown) to move the car 1 along guide rails (not shown) mounted to opposing shaft walls 6. A buffer 16 is mounted in the pit 12 of the shaft 10 to arrest the car 1 should it travel beyond its normal travel limit (i.e. the lowest landing). When the car 1 rests on the fully compressed buffer 16, as shown specifically in Fig. 3, a minimum free vertical clearance C exists between the pit floor 14 and the lowest part of the car 1, which in this instance is the pulley box 2. Although the toeguard 8 actually extends below the pulley box 2, as mentioned above, it can be explicitly excluded from consideration by the regulations.

[0003] The objective of the present invention is to reduce the pit depth and thereby the minimum free vertical clearance between the pit floor and the lowest parts of the car while maintaining the safety of any personnel working in the pit.

[0004] This objective is achieved by providing an elevator installation comprising a car within a shaft, a buffer mounted in a pit of the shaft and a barrier located in the pit surrounding or within an area wherein a vertical clearance between the pit floor and the car or equipment mounted thereon is less than a regulatory threshold value when the car fully compresses the buffer. Accordingly, the barrier acts to physically deterrent personnel within the pit from inadvertent presence in the area of reduced vertical clearance.

[0005] Preferably, the barrier is height-adjustable and biased to its highest position. Accordingly, the barrier can have a height greater than the reduced vertical clearance but will not be damaged if the car travels into it. Furthermore, even if a maintenance person were to get a hand for example trapped between the car and the barrier, the height-adjustability of barrier ensures that such entrapment will not cause personal injury.

[0006] The barrier may be flexible and preferably elastically deformable. Such a barrier may take the form of an inflated balloon.

[0007] Alternatively, the flexible and deformable barrier may comprise two flexible uprights interconnected by linkage means such as a net. Should the car descend into the barrier, the flexible uprights will automatically deform to a reduced height. Since this barrier contains no complicated moving parts it provides a relatively low cost solution.

[0008] Preferably, the flexible uprights are doubled-over so that if the car descends into the barrier each upright deforms outwards in mutually opposing directions. Accordingly, the greater the deformation of the uprights, the greater the area effectively protected by the barrier.

[0009] Alternatively, the barrier may comprise a pair of channels each retaining at least one slider, and linkage means secured to and interconnecting the sliders of the opposing channels. Accordingly, if the car descends into the barrier, the linkage means and sliders moved downwards in the channels against the biasing force.

[0010] The linkage means may have the form of rigid bars, wires, belts or a net.

[0011] The present invention is hereinafter described by way of specific examples with reference to the accompanying drawings in which:

Figure 1 is a partial, rear plan view of a pit of an elevator installation according to the prior art:

Figure 2 is a partial, side plan view of the pit of Fig. 1; Figure 3 corresponds with Fig. 2 illustrating the elevator car compressing the buffer;

Figure 4 is a partial, rear plan view of a pit of an elevator installation in accordance with a first embodiment of the present invention;

Figure 5 is a partial, side plan view of the pit of Fig. 4; Figure 6 is a partial, side plan view of a pit of an elevator installation in accordance with a second embodiment of the present invention;

Figure 7 corresponds with Fig. 6 illustrating the elevator car engaging the barrier;

Figure 8 corresponds with Fig. 6 illustrating the elevator car compressing the buffer;

Figure 9 is a plan view of a barrier according to a third embodiment of the invention;

Figure 10 is an exploded perspective view of the barrier of Fig. 9; and

Figure 11 is a sectional view of a barrier according to a fourth embodiment of the invention.

[0012] In the following description, for the avoidance of unnecessary repetition, features of the invention which are common to more than one embodiment have been assigned a common reference numeral and where appropriate share a common description.

[0013] Figs. 4 and 5 illustrate an elevator installation according to a first embodiment of the present invention. While the arrangements of the car 1 within the shaft 10 are identical to those previously described with respect to the prior art of Figs. 1 and 2 respectively, areas on the

pit floor 14 directly beneath the underslung pulley box 2 or other components mounted under the car are clearly marked with a tape 18 of diagonal stripes of contrasting colours (e.g. yellow and black or red and white). Preferably, words such as "DANGER LOW CLEARANCE" can be printed in the tape 18. Furthermore, a barrier 20 is also erected in the pit 12 directly beneath the underslung pulley box 2. The barrier 20 comprises a pair of opposing flexible uprights 22 mounted to the pit floor 14 with an interconnecting net 24. Accordingly, when maintenance personnel are in the pit 12, the tape 18 and the barrier 20 both act as visible warnings that the area under the pulley box 2 could potentially have a reduced vertical clearance. Moreover, the barrier 20 acts to physically deter personnel within the pit 12 from inadvertently working in the area of reduced vertical clearance.

[0014] If at any time the pulley box 2 should come into engagement with the barrier 20, the barrier 20 will be deflected due to the flexible nature of the uprights 22. Hence, even if a maintenance person were to get a hand for example trapped between the pulley box 2 and the barrier 20, the barrier is sufficiently flexible to accommodate the body part without causing damage.

[0015] Given the central location of the barrier 20 and the fact that it essentially spans the entire width of the pit 12, the maintenance personnel will inherently need to cross the barrier 20 occasionally; the barrier 20 is easily deformable to enable them to do so. However, these transitions across the barrier 20 make up only a small amount of the total time the maintenance personnel spend in the pit 12. The large majority of maintenance operations carried out in the pit 12 will actually require the person to face away from the barrier 20 which in turn generally means that their arms will also be projecting away from the barrier 20. In which case the person will only come into contact with the barrier if he backs into it and the normal reaction to that is to step slightly away and out of the reduced clearance area. Even the majority of work on the pulley box 2 is carried out from the side rather than underneath. Hence, a relatively low barrier, perhaps at knee height ($\approx 500\text{mm}$), would be sufficient to effectively deter personnel from inadvertent presence in the area under the pulley box 2.

[0016] Figs. 6 to 8 illustrate an alternative barrier 30 which is similar to the barrier 20 of the first embodiment but, in this instance, each of the uprights 32 is doubled-over with both ends secured to the pit floor 14. As shown specifically in Fig. 7, as the pulley box 2 descends upon the barrier 30, the doubled-over uprights 32 and the interconnected net 24 are deflected outwards. Accordingly, any person standing adjacent to the barrier 30 is also thrust away from the reduced clearance area under the pulley box 2. The car may continue to descend, and thereby further deform the barrier 30, until it rests on the fully compressed buffer 16, as shown in Fig. 8.

[0017] Since the barriers 20,30 of both embodiments effectively deter personnel from inadvertent presence in the area under the pulley box 2, the regulatory minimum

free vertical clearance C may now be determined as existing between the pit floor 14 and the car 1, rather than between the pit floor 14 and the underslung pulley box 2 (as in the prior art of Fig. 3), enabling a space saving within the elevator installation corresponding to the height S of the pulley box 2.

[0018] A further embodiment of the invention is illustrated in Figs. 9 and 10. In this embodiment, the barrier 40 comprises a pair of opposing uprights in the form of U-shaped channels 42. The channels 42 may be secured at their bases to the pit floor 14 as in the previously described embodiments, or, alternatively, they can be mounted on opposing side walls 6 of the shaft 10. Each channel 42 retains a plurality of sliders 46 connected to a net 44. The uppermost slider 46 in each channel 42 is biased upwards by a spring 48.

[0019] If at any time the pulley box 2 descends into the net 44, the net 44 will descend therewith against the biasing force of the spring 48.

[0020] Fig. 11 shows an alternative embodiment of the invention, wherein the upward bias of the net 44 is provided by a counterweight 50. The uppermost slider 46 within each channel 42 is attached by a wire or rope 54 which passes over a pulley 52 to the counterweight 50.

[0021] Although all of embodiments above describe the use of a barrier under the underslung pulley box 2, it will be appreciated that the barrier can be used to deter personnel from inadvertent presence in any area of the pit 12 which has the possibility of reduced clearance.

[0022] As previously described the area under the pulley box 2 is a relatively low maintenance intensive area. If, on the other hand, the reduced clearance area is within a high maintenance intensive sector of the pit 12, then a relatively high barrier, perhaps at shoulder height ($\approx 1500\text{mm}$), should be employed in or surrounding the reduced clearance area to positively prevent personnel from inadvertent presence in that area.

[0023] If the person needs to specifically work in a designated reduced clearance area, he can easily collapse the barrier to do so.

[0024] Although a net 24,44 has been used in the preferred embodiments to interconnect the uprights 22,32 or the channels 48, will be readily appreciated that this can easily be replaced by other linkage means such as wires or rods.

Claims

1. An elevator installation comprising a car (1) within a shaft (10) and a buffer (16) mounted in a pit (12) of the shaft (10)

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a barrier (20;30;40) located in the pit (12) surrounding or within an area wherein a vertical clearance between the pit floor (14) and the car (1) or equipment mounted thereon is less than a regulatory threshold value (C) when the car (1) fully compress-

es the buffer (16).

2. An elevator installation according to claim 1, wherein the barrier (20;30;40) is height-adjustable and biased to its highest position. 5
3. An elevator installation according to claim 2, wherein the barrier (20;30) comprises linkage means (24) interconnecting two flexible uprights (22;32). 10
4. An elevator installation according to claim 3, wherein the flexible uprights (32) are doubled-over.
5. An elevator installation according to claim 2, wherein the barrier (40) comprises linkage means (44) interconnecting sliders (46) retained in channels (42). 15
6. An elevator installation according to claim 5, wherein the uppermost slider (46) of each channel (42) is biased by a spring (48). 20
7. An elevator installation according to claim 5, wherein the uppermost slider (46) of each channel (42) is biased by a counterweight (50). 25
8. An elevator installation according to any of claims 5 to 7, wherein each channel is mounted to a shaft wall (6).
9. An elevator installation according to any preceding claim, wherein the barrier (20;30;40) has a height (H) of 500mm or greater. 30
10. An elevator installation according to claim 9, wherein the barrier height (H) is 1500mm or greater. 35

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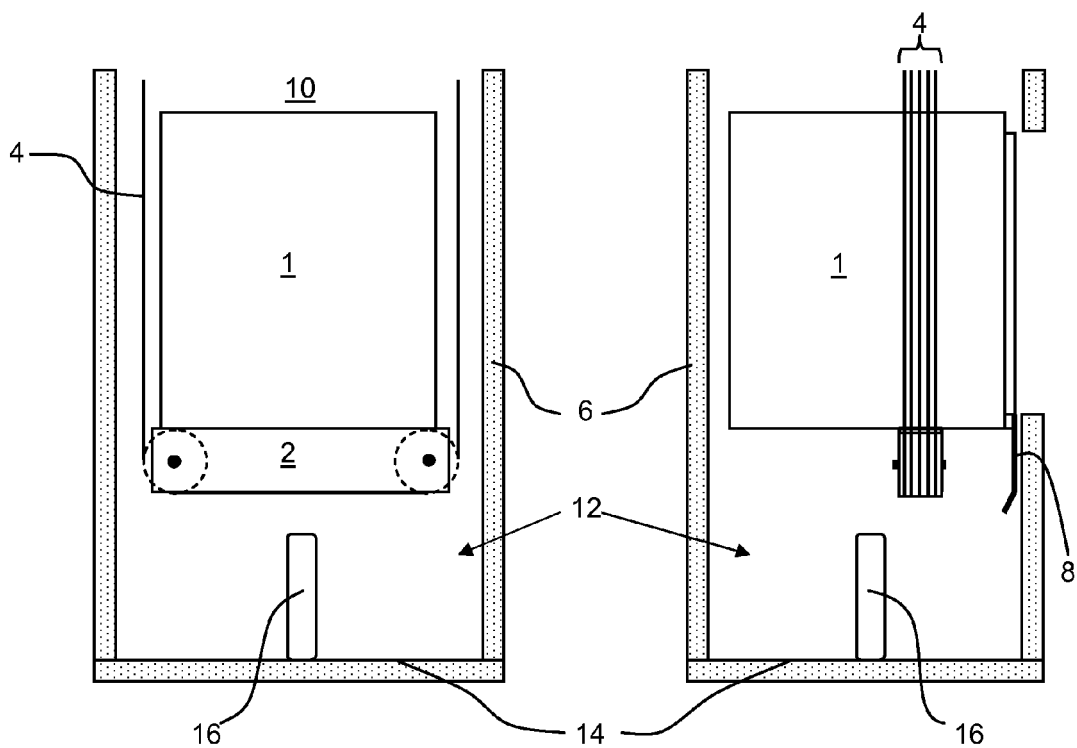


FIG. 1 (Prior art)

FIG. 2 (Prior art)

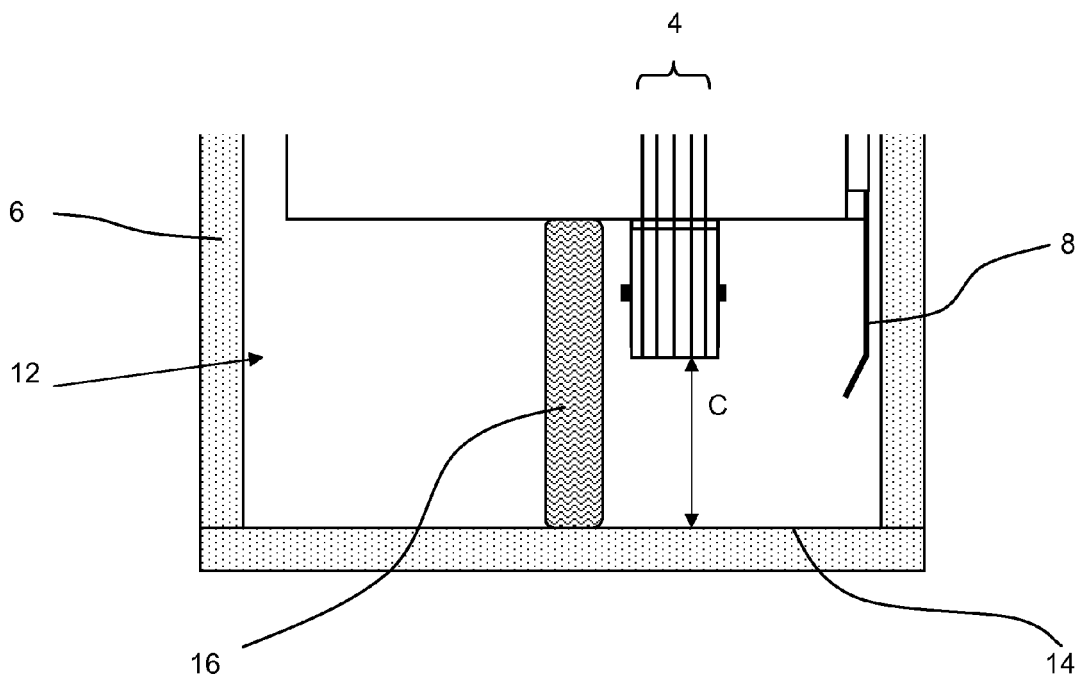


FIG. 3 (Prior art)

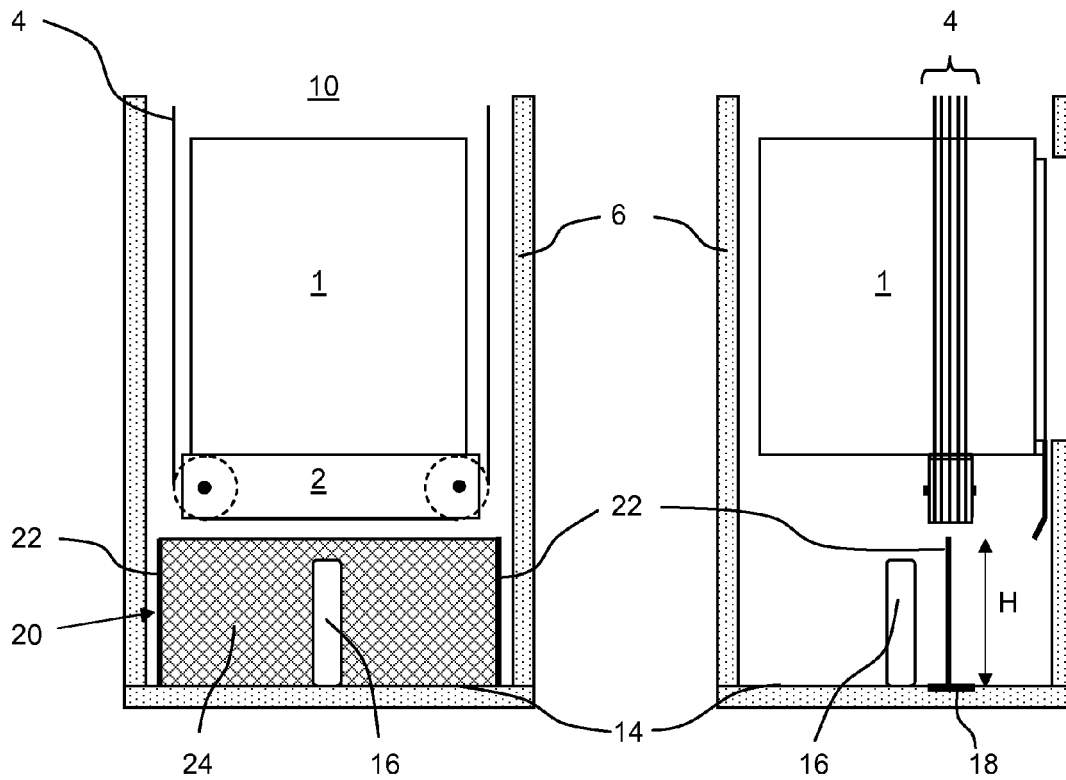


FIG. 4

FIG. 5

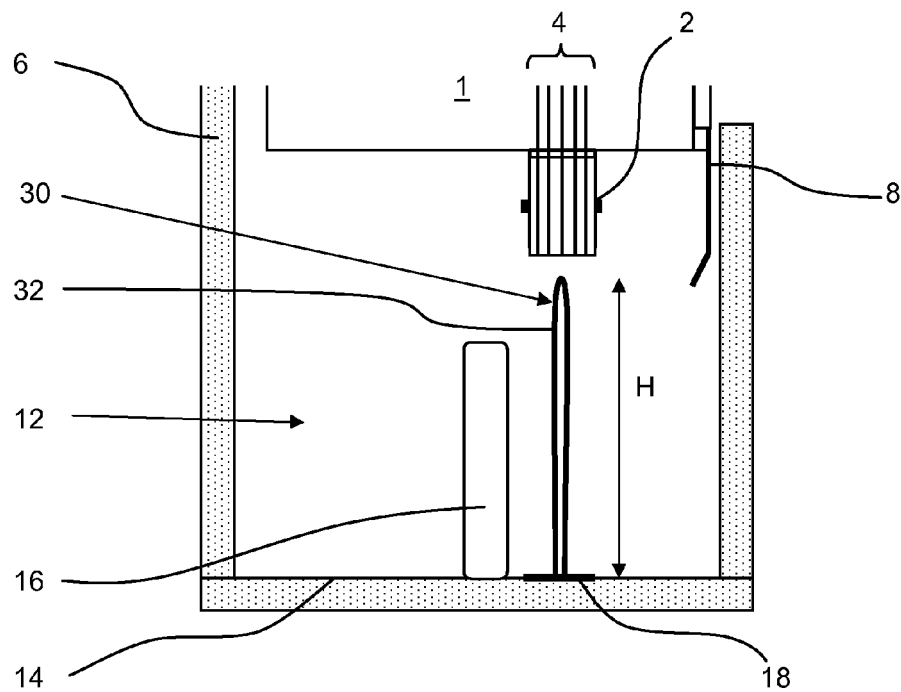


FIG. 6

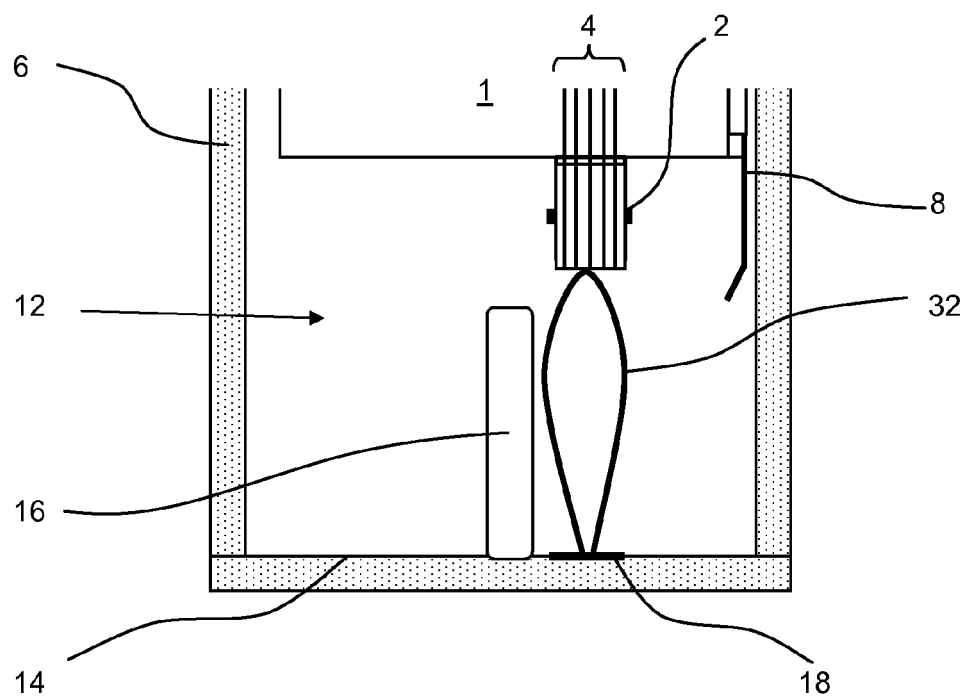


FIG. 7

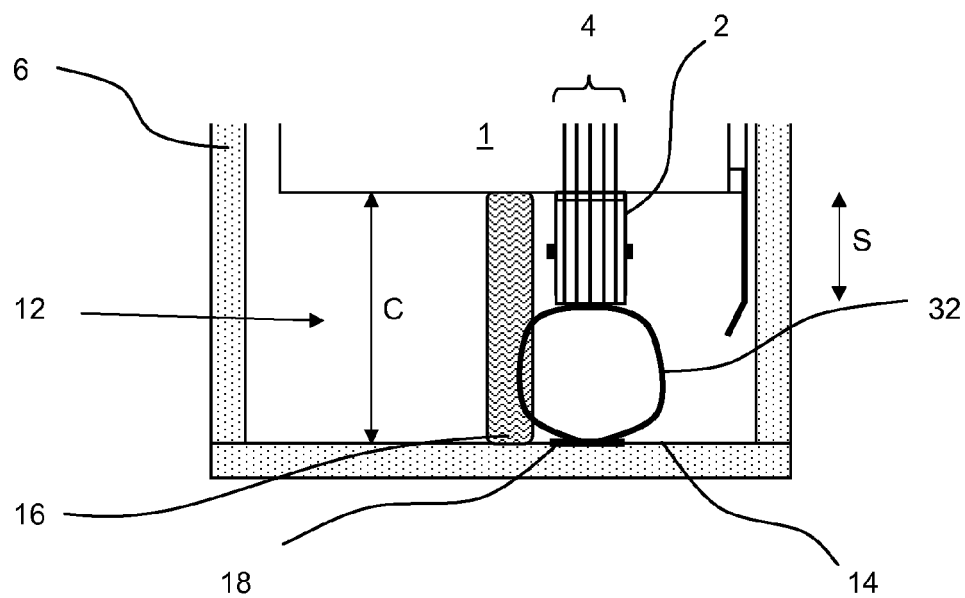


FIG. 8

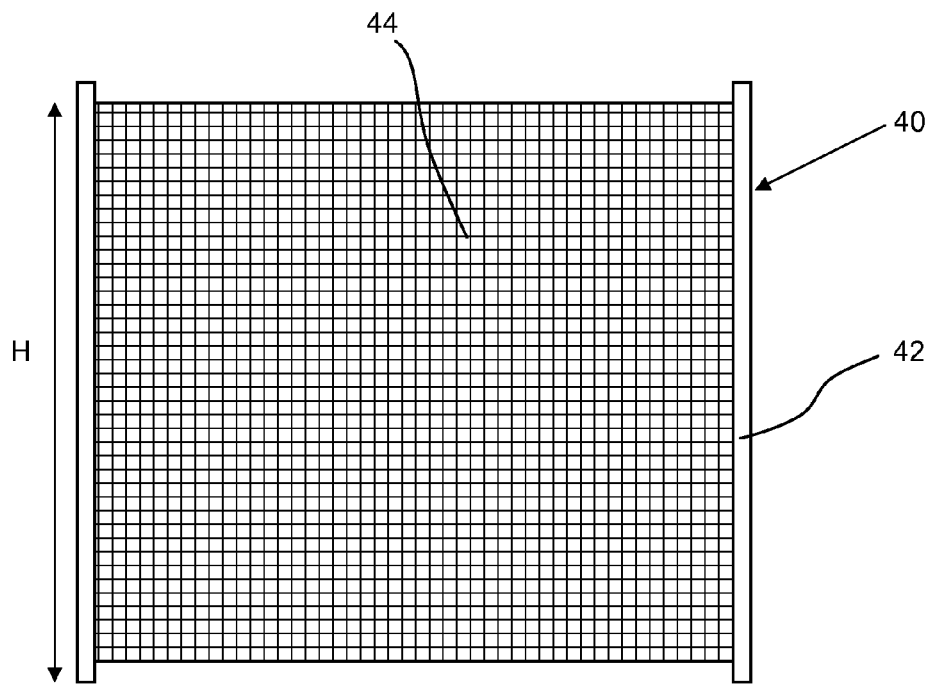


FIG. 9

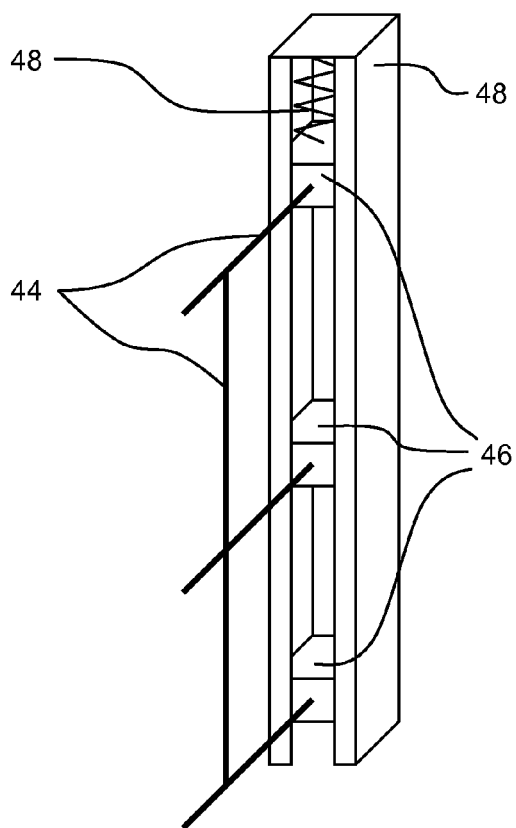


FIG. 10

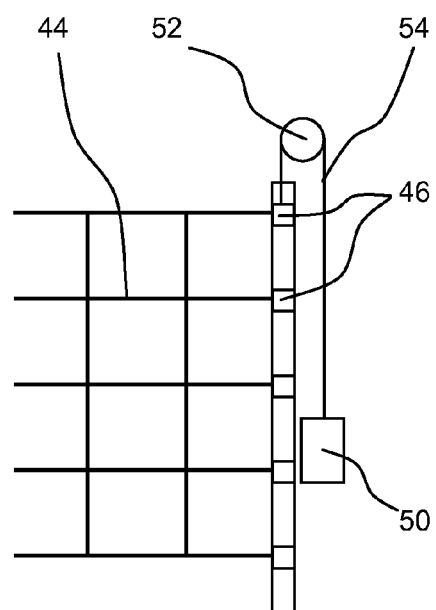


FIG. 11



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 11 7612

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	-----	3-8	
A	US 2006/042883 A1 (SCOTT GARY [CA]) 2 March 2006 (2006-03-02) * abstract *	1	
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A	-----		
A	WO 2005/058739 A2 (OTIS ELEVATOR CO [US]; GOTO YASUHIRO [JP]; AOISHI YOSHITO [JP]) 30 June 2005 (2005-06-30) * abstract *	1	

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B66B
Place of search		Date of completion of the search	Examiner
Munich		31 January 2008	ECKENSCHWILLER, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 11 7612

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82