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(54) **Safety device for elevator apparatuses and elevator apparatus comprising said safety device**

(57) The invention relates to a safety device for elevator apparatuses and an elevator apparatus comprising said safety device; comprising a crosshead (2) in solidarity with an upper area of at least two guides (12), close to an upper end of an elevator shaft (16), wherein said crosshead (2) allows supporting a safety device which, when it is an active position, allows maintaining a safety space between the upper end of the shaft (16) and a roof (14) of a car (13).

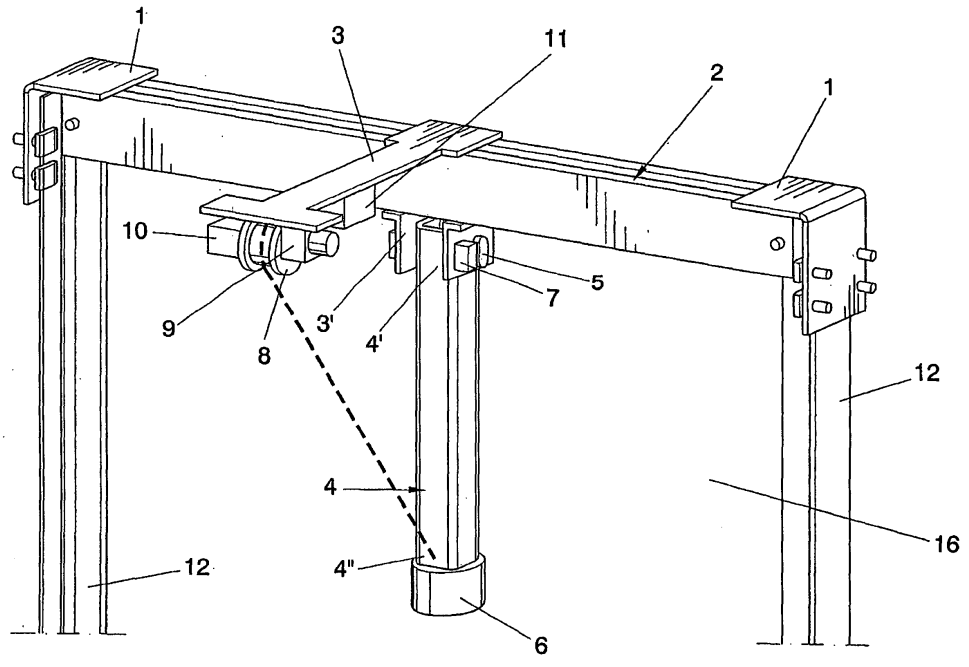

FIG. 2

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Description

Object of the Invention

[0001] A first aspect of the present invention relates to a safety device for elevator apparatuses, and a second aspect relates to an elevator apparatus comprising said safety device, being applicable in the industry of elevator apparatuses, and more specifically in the field of safety systems and devices, which allows providing a safety space between a car roof and an upper end of an elevator shaft, for conducting inspection and/or maintenance operations, as it prevents the car from moving closer to the ceiling of the shaft in the event that an uncontrolled situation occurs, all of this without reducing the surface area available for conducting said works or requiring their manual activation by an operator in a risk situation from the car roof.

Background of the Invention

[0002] Traditional elevator apparatuses usually comprise a room or chamber separate from the elevator shaft in which the car and the counterweight move, such that most of the components comprised by the elevator, such as the drive unit or control and safety devices, are located in said room, for which reason said space is known as the machine room.

[0003] However, recently, as a result of current architectural needs and requirements, demanding an optimal use of the space intended for the elevator or elevators within a building, elevators have been developed in the last few years which do not require a machine room.

[0004] The development of elevator apparatuses with no machine room has forced relocating components which were traditionally located in the machine in the elevator shaft, there being a tendency to locate a minimum of essential elements outside said shaft, which elements are usually located on one of the floors, usually in a panel placed against the door frame corresponding to the upper floor.

[0005] Elevator manufacturers thus aim their developments towards optimizing the shaft, i.e., the optimal distribution of the elevator components inside said shaft as well as the greatest possible reduction of the space occupied by said components in their operating position.

[0006] A result of arranging the elevator components inside the shaft is that it is necessary for an operator to enter said shaft to conduct the inspection and/or maintenance tasks for which the technician usually has to place himself or herself on the roof of the car, for the purpose of gaining access to components such as the drive unit, which is usually located at the upper end or part of the shaft, such that the roof of the car serves as a work platform for the operator while conducting the works.

[0007] The regulations in force with regard to elevator apparatuses in relation to safety rules for the construction and installation of elevators are in standard UNE-EN 81-1:2001, which establishes certain safety distances in the upper part of the elevator shaft for the purpose of contemplating any situation in which the car moves upwards from the last floor and the counterweight collides in the pit, completely compressing the shock absorber, all of this as a result of an out of control movement. Therefore, for the purpose of complying with said regulations, it is necessary to have a free safety space between the car roof and the upper end of the shaft, equivalent to a rectangular parallelepiped not smaller than 0.5 m x 0.6 m x 0.8 m supported on one of its faces.

[0008] The most recent advances for optimizing the shaft have consisted of reducing as much as possible the height of the pit of the shaft and the height of the last floor, i.e., the distance between the floor of the last stop and the ceiling of the elevator shaft. These embodiments result in the elevators not complying with all the safety requirements established in standard UNE-IN 81-1: 2001, therefore it is necessary to provide additional safety measures overcoming said deficiencies. To regulate the situation of the elevators in which it is not possible to comply with the requirements set forth above, a standard project prEN 81-21:2006 with new criteria to be complied with for this type of installation is being developed.

[0009] The solutions which have been adopted in said standard project prEN 81-21:2006 include limiting the travel of the car and/or the counterweight by means of safety devices installed either in the pit of the elevator shaft, in the upper part of the shaft, assembled on top of the roof of the car or directly fixed to walls of the shaft.

[0010] Patent no. US-6481534-B1 relates to a device for a space on the roof of a car for operators in elevator apparatuses, and describes a safety device which is assembled on the upper crosshead of the car frame. Said device consists of a brace manually lowerable towards the ceiling of the shaft at the time in which an operator is positioned on the car to conduct maintenance operations, such that it ensures a safety space in the event that the car moves upwards in an uncontrolled manner.

[0011] The drawbacks of the device described in the previous paragraph is that it requires the operator to place himself or herself on the car roof, being in a risk situation, to manually lower the device, in addition to the fact that given its location, the device hinders the works of the operator as it is exactly in a central area of the available surface area, with the consequent nuisance that this involves.

[0012] On the other hand, patent application PCT no. WO-2005026033-A1 describes safety devices for conducting inspection tasks in elevator apparatuses, which are assembled in the upper part of the car for the purpose of allowing the access to said space for conducting the inspection tasks.

[0013] The invention described in this document consist of combining two safety elements or measures, on one hand a lowerable balustrade which during the usual operation of the elevator is in a horizontal, withdrawn or

retracted position, whereas while the inspections tasks are conducted said balustrade must be manually lifted and deployed by an operator, with the drawbacks that this entails, as set forth above.

[0014] On the other hand, the invention described in this document comprises a device carrying out a pivoting movement by means of which it extends towards a projection of a mechanical stop which is installed in the elevator shaft. The drawbacks of this device include, in addition to the fact that the activation or deployment thereof is not automated, that it requires installing auxiliary elements in elevator shaft, not offering the resistance and safety levels necessary in this type of installation, from a mechanical point of view, against abrupt or uncontrolled movements of the car.

[0015] The aforementioned safety devices, which reflect the currently existing devices for such purpose offering equivalent solutions, have the drawback that once assembled on top of the car they occupy a large part of the surface area available for the maintenance personnel, in addition to hindering and bothering while the maintenance operations are conducted, requiring in any case a manual lowering or activation which must be carried out from the actual car roof, i.e., from the actual risk position which is intended to be covered with the safety device, with the consequent risk that this entails.

Description of the Invention

[0016] A first aspect of the present invention relates to a safety device for elevator apparatuses, which allows providing a minimal but sufficient safety space between a roof of a car and an upper end of an elevator shaft for an operator to conduct inspection and/or maintenance tasks in said safety space.

[0017] When the safety device of the invention is in an active position, it prevents the car from moving closer to the upper end of the elevator shaft in the event that the car exceeds a certain height limit as a result of an uncontrolled movement thereof, with the consequent risk of a fatal accident that this entails in the event that there is an operator on the car roof, conducting inspection and/or maintenance operations on said car roof.

[0018] The safety device for elevator apparatuses proposed by the invention comprises a crosshead, which can consist of a support structure, which is fixed to and is in solidarity with an upper area of at least two guides, which preferably consist of two car guides although they can also be two counterweight guides or one car guide and one counterweight guide, close to an upper end of an elevator shaft.

[0019] Said crosshead is configured to support a safety device configured to maintain a safety space between said upper end of the elevator shaft and a roof of a car when the device is in an active position.

[0020] The crosshead can be assembled at any height corresponding to the upper area of the guides, which allows a positional adjustment in height and the adaptation of the device to different car and/or elevator apparatus types and configurations, not necessarily having to be fixed to the end of the guides, thus allowing the adjustment of the final height upon assembling said crosshead with respect to the guides.

[0021] The fact that the crosshead is assembled on at least two guides allows distributing the stresses among the guides in the event of impact or collision between the safety device and the car or car frame, as appropriate. _

[0022] The fact that the device is secured or fixed by means of the crosshead to the guides makes it unnecessary to carry out any type of additional structure or work in the shaft, either while it is made or afterwards, once it has been constructed, in which case it will be necessary to strengthen the shaft walls to receive the stresses of an impact between the car and the safety device.

[0023] Likewise, the safety device of the invention is extremely versatile, being able to be used in different elevator types, such as hydraulic or electric elevators, having any suspension ratio, allowing their adaptation to any existing installation as a compensatory safety measure kit, as it is regulated in the aforementioned standard project prEN 81-21:2006, allowing a simple incorporation for modernizations of existing elevator apparatuses and in carrying out rehabilitations.

[0024] It is contemplated that the safety device comprises at least one rigid element, which can consist of a post or profile having a hinged end which is in solidarity with the crosshead.

[0025] Said hinged end is likewise configured to rotate, pivot or be lowered with respect to the crosshead, specifically with respect to a transverse shaft preferably located at an end of said rigid element.

[0026] The device can carry out the rotation of the hinged end between an active position and an inactive position of the device.

[0027] The device is located in the active position while the inspection and/or maintenance tasks are conducted, in which the rigid element is in a substantially vertical position, i.e., deployed or in a position substantially parallel to the guides.

[0028] On the other hand, in the inactive or rest position of the device, the rigid element is in a substantially horizontal position, i.e., retracted, the safety space between the upper end of the elevator shaft and the roof of a car not being maintained in said inactive position.

[0029] In the active position the rigid element is in a vertical position such that it is configured to interfere and collide with the car roof, with the car frame or with the upper part of the hydraulic drive during the upward travel of the car, specifically with a final segment of said travel. In the event that the impact of the rigid element occurs with the car frame, said frame, particularly its area of impact with the rigid element, is equally considered as car roof.

[0030] On the other hand, in the inactive position, in which the rigid element is in a horizontal position, the

device does not interfere with the car in its possible travel.

[0031] Thus, by means of said lowering, the entire surface area available in the car roof as work platform is freed up, without hindering while the inspection and/or maintenance tasks are conducted.

[0032] On the other hand, the possibility is contemplated that at least one rigid element is in solidarity with the crosshead by means of a frame, casing or structure which is configured to be assembled with the possibility of positional adjustment on said crosshead, said frame likewise being configured to support the hinged end of the rigid element.

[0033] Thus, by means of the frame an adjustment of the point of impact is achieved, i.e., a second possibility is achieved of adjusting the position of the device, specifically of the rigid element with respect to the crosshead according to a plan projection or in the horizontal plane, for the purpose of adapting it to the configuration of the car and/or its frame, being able to consist of any type of frame, such as for example a portico or rucksack type frame. The point of impact in the event of collision is thus selected, preserving the car from structural damage, since in the event that the device impacts in the center of the car roof it would cause structural damage as it is less resistant point of said surface.

[0034] In short, the frame allows an adjustable positioning of the rigid element along the crosshead with respect to the guides in the horizontal plane, which allows selecting the area or region of impact in the event of collision with a free end of the rigid element.

[0035] Although the positional adjustment between the rigid element and the crosshead is preferably carried out linearly between the guides according to the shaft of the crosshead, the possibility is contemplated that said adjustment is carried out in a plane substantially perpendicular to the guides, and even in a partially inclined plane.

[0036] It is likewise contemplated that the device comprises means, preferably magnetic means such as a permanent magnet, configured to maintain at least one rigid element in a substantially vertical position when the device is in an active position, which increases its reliability and capacity for remaining in its operating position, withstanding larger forces as a result of said impact.

[0037] In the same way, it is contemplated that the device comprises means, preferably magnetic means such as an electromagnet, configured to maintain at least one rigid element in a substantially horizontal position when the device is in an inactive position.

[0038] The possibility is contemplated that at least one rigid element is configured to be located in the active position, starting from the inactive position, only as a result of a gravitational action when the means configured to maintain the rigid element in a substantially horizontal position, mentioned in the previous paragraph, are not acting. It is thus contemplates that the only force or action making the rigid element pass from the inactive or horizontal position to the active or vertical position is gravitational force, which is especially useful, allowing the activation of the device in emergency situations in which said means do not act, such as for example in a power supply interruption.

[0039] The device thus does not require a manual lowering from the car roof, with the consequent risk that this entails.

[0040] On the other hand, the possibility is contemplated that the device comprises withdrawal means configured to place said rigid element in the inactive position, from the active position. To that end, it is contemplated that said withdrawal means comprise driving means configured to act on a drum having a wound suspension means, preferably a flexible rope or any funicular element, such as a shutter band, the end of which is preferably attached to a free end of the rigid element.

[0041] It is likewise contemplated that the device comprises means configured to detect the position of at least one rigid element, said means comprising at least one electric contact configured to be actuated by means of at least one drive in solidarity with said rigid element. To that end, at least one electric contact is operatively connected with an elevator apparatus maneuver control unit.

[0042] Said drive, preferably two, of an electric contact can consist of a cam which is fixed in an end of the assembly of a transverse shaft of the rigid element, being offset 90° to one another to ensure the control of the inactive position and the active position. The drive of the electric contacts sends a signal communicating the position of the rigid element to the elevator apparatus maneuver control unit.

[0043] According to a preferred embodiment of the device of the invention, at least one rigid element comprises shock absorbing means, for the purpose of reducing the effects of the impact with the roof of the car in the event of collision. The shock absorbing means can also be located at the hinged end or in an intermediate area of the rigid element, in two areas or in the attachment with the frame.

[0044] It is contemplated that the device comprises anti-exit shafts, configured to prevent the rope securing the rigid element to come out of the groove of the drum in the event of an accident, for example, in a failure in the fixings of the rope.

[0045] It is also contemplated that at least one rigid element has an adjustable length, for example by means of wedgings or telescopically, which allows modifying the volume of the safety space, thus being a third possibility of positional adjustment, in collaboration with the adjustment of the height of the crosshead with respect to the guides and the positioning of said rigid element with respect to the crosshead by means of the frame.

[0046] It is also contemplated that the safety device is configured to be actuated and located in the active position when any of the following situations occurs:

a) a power supply cutoff in the elevator apparatus, which would interrupt a supply of the means config-

ured to maintain the rigid element in the inactive position, whereby said rigid element would fall by gravity to the active position,

b) a manual opening of a floor door by a person, which can be an operator or a maintenance technician who intends to access the shaft of the elevator, such that the maneuver control through a safety contact chain detects that a floor door is open, at which time said maneuver control would interrupt the electrical supply, applying that set forth in the previous case.

[0047] An automatic activation of the device is thus achieved, which prevents risks of an accident, since the maintenance professional does not have to enter the safety space inside the shaft to activate and/or place the safety device.

[0048] On the other hand, a second aspect of the invention relates to an elevator apparatus comprising at least one safety device such as that described above.

[0049] The device is applicable to any elevator configuration and type, either electrically driven, i.e., for elevator apparatuses comprising at least one drive sheave, or for hydraulically-driven elevator apparatuses, which comprise at least one hydraulic piston.

Description of the Drawings

[0050] To complement the description which is being made and with the aim of aiding to better understand the features of the invention according to a preferred practical embodiment thereof, a set of drawings is attached as an integral part of said description, in which the following has been depicted with an illustrative and non-limiting character:

Figure 1 shows a perspective view of a preferred embodiment of the safety device proposed by the invention in its inactive position, in which the rigid element is retracted in a substantially horizontal position during the normal operation of the elevator.

Figure 2 shows a perspective view such as that of Figure 1, in which the device is in an active position, in which the rigid element is deployed in a substantially vertical position, for example while conducting inspection and/or maintenance tasks.

Figure 3 shows a schematic perspective view of a hydraulic elevator apparatus according to an embodiment of the invention comprising the proposed safety device, which has been depicted in its active position.

Preferred Embodiment of the Invention

[0051] In view of the indicated figures, it can be observed how in one of the possible embodiments of the invention the safety device for elevator apparatuses proposed by the invention comprises a crosshead (2), consisting of a support structure formed by two open-box UPN profiles, which is fixed to an upper area of two guides (12) of car (13), close to an upper end of an elevator shaft (16), as can be seen in Figure 3.

[0052] Said crosshead (2) is configured to support the safety device, which is turn configured to maintain a safety space between said upper end of the elevator shaft (16) and a roof (14) of a car (13) when the device is in an active position, which is the position depicted in Figures 2 and 3.

[0053] The crosshead (2) is fixed or attached to the guides (12) by means of two supports (1) with an L-shaped configuration, in collaboration with flanges and attachment means such as cylindrical bolts traversing the UPN profiles of the crosshead (2) and the head of the guide (12).

[0054] The safety device comprises a rigid element (4) having a hinged end (4') which is in solidarity with the crosshead (2). Said hinged end (4') is likewise configured to rotate with respect to the crosshead (2).

[0055] The device is configured to carry out said rotation of the hinged end (4') between an active position and an inactive position of the device.

[0056] When the device is located in the active position, the rigid element (4) is in a substantially vertical position, whereas in the inactive position, the rigid element (4) is a substantially horizontal position, i.e., as has been depicted in Figure 1.

[0057] On the other hand, the rigid element (4) is in solidarity with the crosshead (2) by means of a frame (3) which is configured to be assembled with the possibility of positional adjustment on said crosshead (2), said frame (3) likewise being configured to support the hinged end (4') of the rigid element (4).

[0058] The hinge of the hinged end (4') comprises a transverse shaft assembly which is formed by a shaft and two bushings attached to the frame (3), such that the rotation of the entire rigid element (4) is allowed.

[0059] The frame (3) is formed by parts obtained from plates, on which all the functional components of the device are assembled, said frame (3) comprising, according to a preferred embodiment, a lower frame (3') consisting of supports with a C-shaped configuration which are located below the crosshead (2), such that the rigid element (4) is linked to said lower frame (3') by its hinged end (4').

[0060] The device comprises magnetic means consisting of a permanent magnet, not depicted, located in the lower frame (3'), said means being configured to maintain the rigid element (4) in a substantially vertical position when the device is in an active position.

[0061] The device likewise comprises magnetic means, consisting in an electromagnet (10), configured to maintain the rigid element (4) in a substantially horizontal position when the device is in an inactive position.

[0062] The rigid element (4) is configured to be located in the active position, starting from the inactive position, only as a result of a gravitational action when said electromagnet (10) is not acting.

[0063] On the other hand, the device comprises withdrawal means configured to automatically place the rigid element (4) in the inactive position, from the active position.

[0064] To that end, said withdrawal means comprise driving means (9) configured to act on a drum (8) having a wound rope the end of which is attached to a free end (4") of the rigid element (4).

[0065] The drum (8) is located on a lower face at an end of the frame (3) and is configured so that the rope securing the rigid element (4) at a free end (4") opposite the hinged end (4') is wound in said drum (8). The drum (8) comprises two side faces, in one of which there is housed a cylindrical stud bolt through which the rotational movement coming from the driving means (9) is transmitted.

[0066] On the other hand, the driving means (9) consist of a synchronous geared motor which is assembled in the frame (3), externally in one of the side faces of the drum (8). Said driving means (9) are configured to generate a rotational movement to recover the rigid element (4) from the active position to the inactive position, in which it is horizontally placed, when its use has ended.

[0067] The driving means (9) have a shaft which is housed in a shaft bushing which rotates in solidarity with the latter. On said bushing there is assembled a stud bolt which, upon interfering with the stud bolt located in the drum (8), will transmit the rotational movement to it.

[0068] On the other hand, the electromagnet (10) is assembled in the frame (3), next to the drum (8), on the side face opposite the driving means (9). The actuation of the electromagnet determines the position of the drum (8). In another possible configuration, the electromagnet (10) can be assembled next to the driving means (9) and act on them, modifying their position with respect to the drum (8), which remains fixed in one position.

[0069] The device likewise comprises a shaft bushing of the electromagnet (10) housing the shaft of the electromagnet (10) and inserted in the drum (8) or in the driving means (9), according to the configuration chosen.

[0070] The device comprises a spring configured to work under compression and push the drum (8) or the driving means (9), according to the configuration chosen, when the power supply is interrupted, i.e., when the electromagnet (10) does not act. Likewise, the force driving the rigid element (4) from the inactive position to the active position is gravitational.

[0071] Thus, in the inactive position the electric power feeds the electromagnet (10), which is maintained activated, whereby it pushes the drum (8) or the driving means (9), according to the configuration chosen, and makes the spring remain compressed. The stud bolt located in the shaft bushing of the driving means (9) retains the stud bolt located in the side of the drum (8), and makes the latter remain static with the rope wound and the rigid element (4) in the horizontal position.

[0072] In the event of a cutoff of the electric power or in the event that a maintenance operator makes manual use of the safety key, the electromagnet (10) stops acting and pushing the drum (8) or the driving means (9), according to the configuration chosen, whereby the spring is decompressed and the drum (8) and the driving means (9) move away from one another, whereby the stud bolts stop interfering and the drum (8) is freed, at this instant the rigid element (4) falls by gravity, rotating on the shaft assembly of the rigid element (4).

[0073] When the rigid element (4) reaches the vertical position, it is suitably fixed under the actuation of the permanent magnet, located in the lower frame (3'). The support in which said magnet is housed allows an adjustment ensuring the verticality of the rigid element (4).

[0074] On the other hand, the device comprises means configured to detect the position of the rigid element (4), said means comprising two electric contacts (7) assembled in the lower frame (3') and configured to be actuated by means of two drives (5) in solidarity with the rigid element (4). To that end, the electric contacts (7) are operatively connected with an elevator apparatus maneuver control unit.

[0075] The drives (5) of the electric contacts (7) consist of cams which are fixed at one end of the assembly of a transverse shaft of the rigid element (4), being offset 90° to one another to ensure the control of the inactive position and the active position. The drive of the electric contacts (7) sends a signal communicating the position of the rigid element (4) to the elevator apparatus maneuver control unit, all of this in collaboration with a corresponding electrical connection box (11).

[0076] The offset placement of the drives (5) of the electric contacts (7) located at the ends of the shaft assembly of the rigid element (4) allows controlling the position of the device. The length of the rigid element (4) is calculated to ensure a sufficient safety required by the regulations.

[0077] The rearming or repositioning of the device in its inactive position, starting from the active position, is carried out from a maneuver cabinet or control located on any of the floors, preferably in that corresponding to the upper level. At this time, the electric power drives the electromagnet (10) again, the latter acts on the drum (8) or on the driving means (9), according to the configuration chosen, compressing the spring and moving the stud bolts closer to one another so that they interfere with one another. The driving means (9) and the drum (8) thus rotate in a solidary manner again, and after overcoming the force exerted by the permanent magnet, the rope starts to be wound in the drum (8), dragging the rigid element (4) to is horizontal position. When it reaches this position, it is communicated to the maneuver control by means of the drive of one of the electric contacts (7), again activating the electromagnet (10) to maintain the device in its inactive position.

[0078] As can be observed in Figures 1 and 2, the rigid element (4) comprises shock absorbing means (6), consisting of cellular polyurethane, located at its free end (4").

[0079] The rigid element (4) has a telescopically adjustable length, which has not been depicted, which allows modifying the volume of the safety space.

[0080] The safety device is configured to be actuated and located in the active position when any of the following situations occurs:

a) a power supply cutoff in the elevator apparatus, which would interrupt a supply of the electromagnet (10), whereby said rigid element (4) would fall by gravity to the active position,
b) a manual opening of a floor door by a person who intends to access the shaft of the elevator, such that the maneuver control through a safety contact chain detects that a floor door is open, at which time said maneuver control would interrupt the electrical supply of the electromagnet (10) and the rigid element (4) falls automatically.

[0081] On the other hand, a second aspect of the invention relates to an elevator apparatus comprising at least one safety device such as that described above.

[0082] The device is applicable to any elevator configuration and type, either electrically driven, i.e., for elevator apparatuses comprising at least one drive sheave and at least one drive unit, or for hydraulically-driven elevator apparatuses, which comprise at least one hydraulic piston (15), as has been depicted in Figure 3.

[0083] In view of this description and set of drawings, a person skilled in the art will be able to understand that the embodiments of the invention which have been described can be combined in many ways within the object of the invention. The invention has been described according to several preferred embodiments thereof, but for a person skilled in the art it will be evident that multiple variations can be introduced in said preferred embodiments without exceeding the object of the claimed invention.

Claims

1. Safety device for elevator apparatuses, **characterized in that** it comprises a crosshead (2) which is in solidarity with an upper area of at least two guides (12), close to an upper end of an elevator shaft (16), said crosshead (2) being configured to support a safety device configured to maintain a safety space between said upper end of the elevator shaft (16) and a roof (14) of a car (13) when the device is in an active position.

2. Safety device for elevator apparatuses according to claim 1, **characterized in that** it comprises at least one rigid element (4) having a hinged end (4') which is in solidarity with and is configured to rotate with respect to the crosshead (2) between an active position of the device, in which said at least one rigid element (4) is in a substantially vertical position, and an inactive position of the device, in which said at least one rigid element (4) is in a substantially horizontal position in which the safety space between the upper end of the elevator shaft (16) and the roof (14) of a car (13) is not maintained.

3. Safety device for elevator apparatuses according to claim 2, **characterized in that** said at least one rigid element (4) is in solidarity with the crosshead (2) by means of a frame (3) configured to be assembled with the possibility of positional adjustment on said crosshead (2) and support the hinged end (4') of said at least one rigid element (4).

4. Safety device for elevator apparatuses according to any of claims 2 and 3, **characterized in that** it comprises means configured to maintain said at least one rigid element (4) in a substantially vertical position when the device is in an active position.

5. Safety device for elevator apparatuses according to any of claims 2 to 4, **characterized in that** it comprises means configured to maintain said at least one rigid element (4) in a substantially horizontal position when the device is in an inactive position.

6. Safety device for elevator apparatuses according to claim 5,
characterized in that said at least one rigid element (4) is configured to be located in the active position, from the inactive position, only as a result of a gravitational action when the means configured to maintain said at least one rigid element (4) in a substantially horizontal position are not acting.

7. Safety device for elevator apparatuses according to any of claims 2 to 6, **characterized in that** it comprises withdrawal means configured to place said at least one rigid element (4) in the inactive position, from the active position.

8. Safety device for elevator apparatuses according to claim 7, **characterized in that** the withdrawal means comprise driving means (9) configured to act on a drum (8) having a wound suspension means the end of which is attached to a free end (4") of said at least one rigid element (4).

9. Safety device for elevator apparatuses according to any of claims 2 to 8, **characterized in that** it comprises means configured to detect the position of said at least one rigid element (4), said means comprising at least one electric contact (7) configured to be actuated by means of at least one drive (5) in solidarity with said at least one rigid element (4), wherein said at least one electric contact (7) is operatively connected with an elevator apparatus maneuver control

unit.

10. Safety device for elevator apparatuses according to any of claims 2 to 9, **characterized in that** at least one rigid element (4) comprises shock absorbing means (6).

11. Safety device for elevator apparatuses according to any of claims 2 to 10, **characterized in that** at least one rigid element (4) has an adjustable length.

12. Safety device for elevator apparatuses according to any of the previous claims, **characterized in that** it is configured to be actuated and located in the active position when any of the following situations occurs:

a) a power supply cutoff in the elevator apparatus,
b) a manual opening of a floor door by a person.

13. Elevator apparatus comprising at least one safety device according to any of the previous claims.

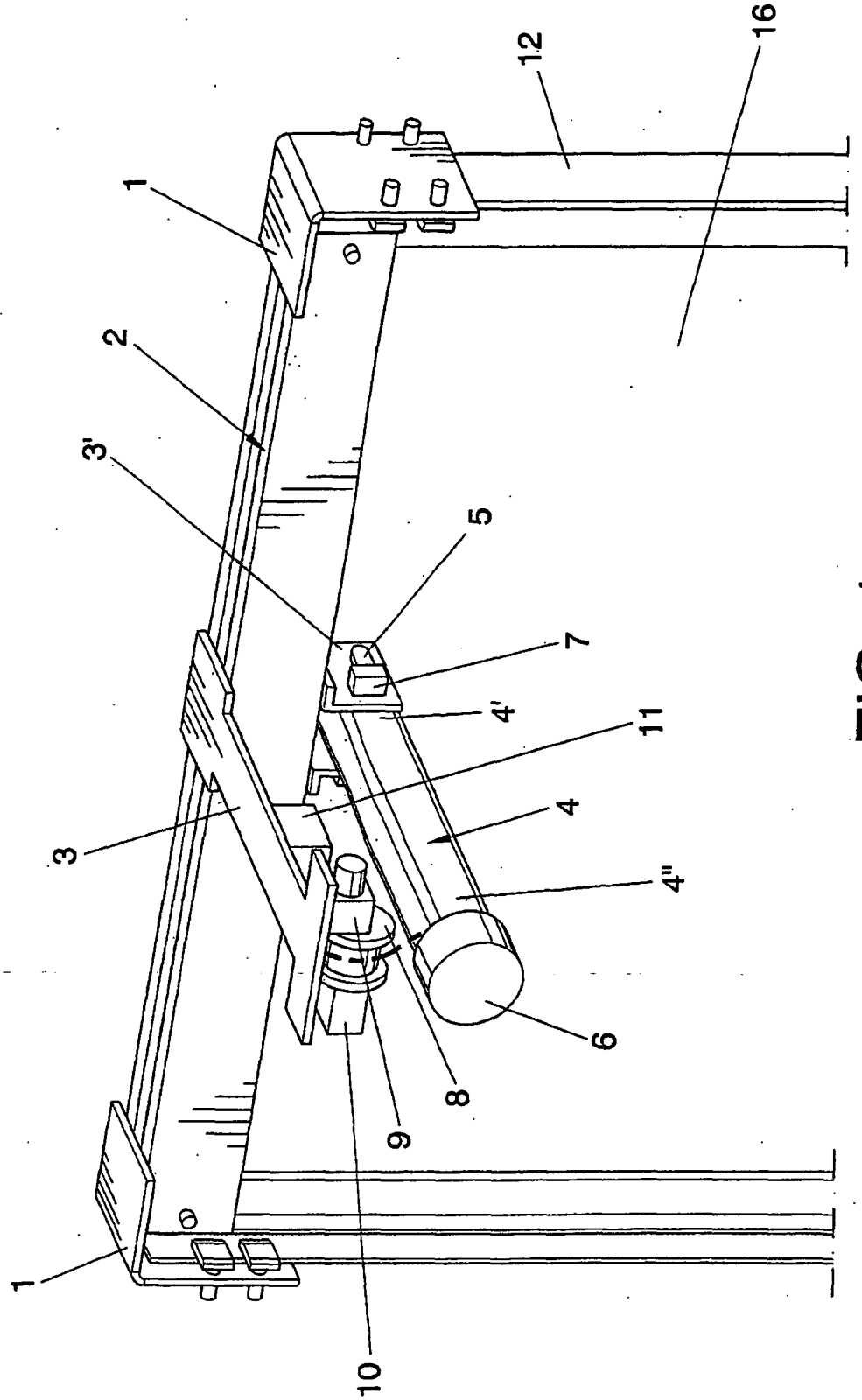

FIG. 1

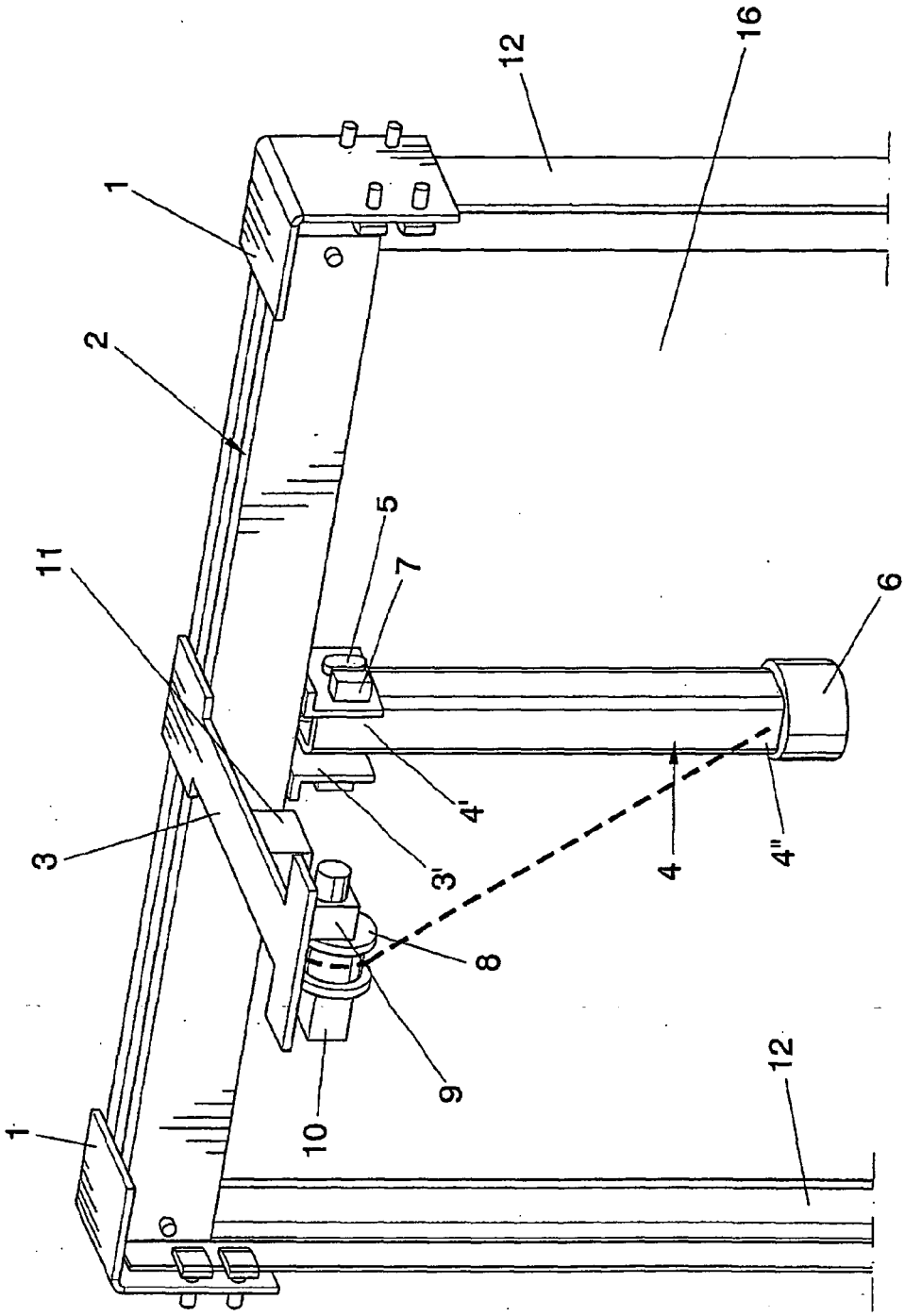

FIG. 2

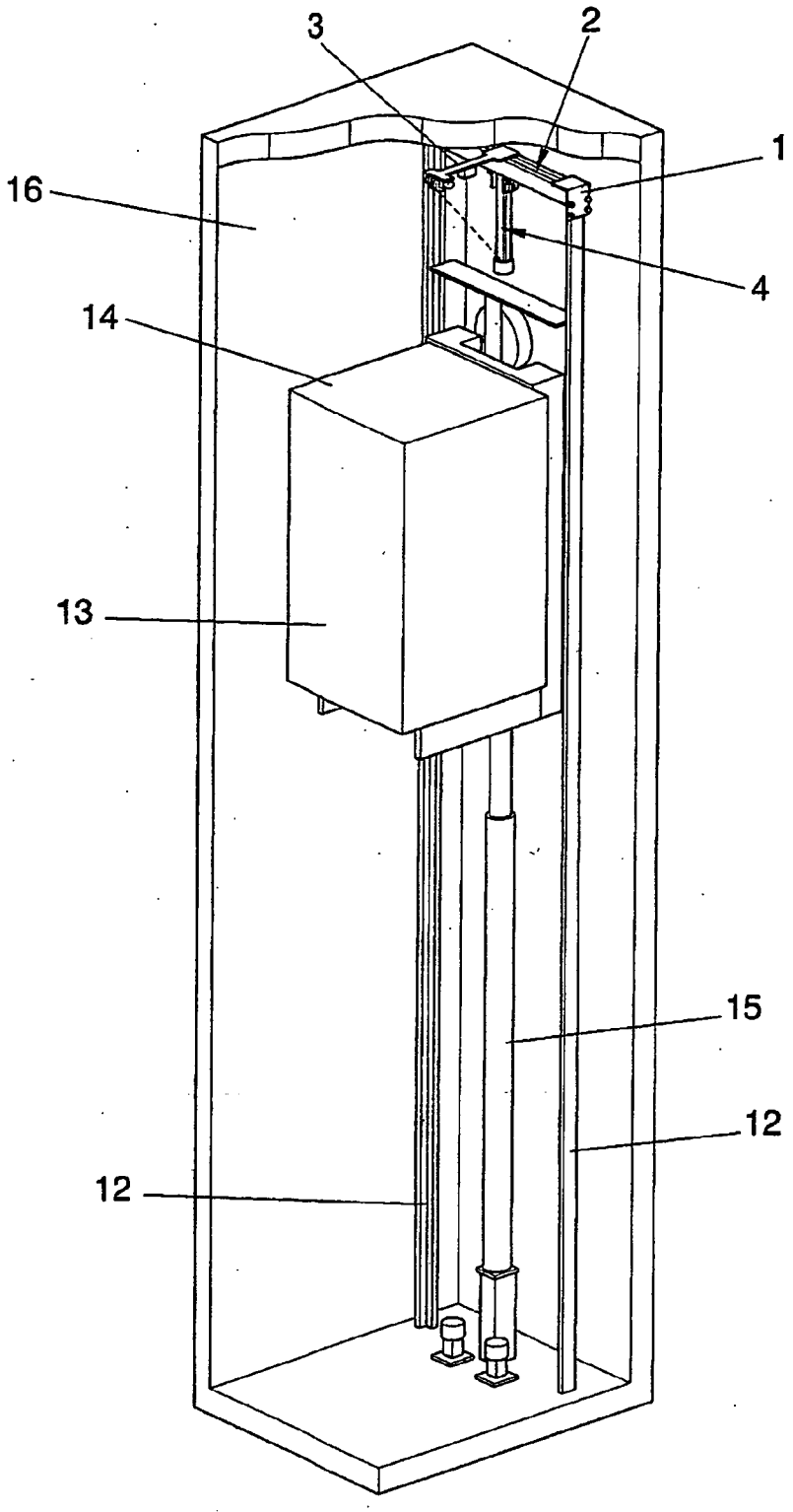

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 08 38 0346

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	NL 9 100 059 A (OTIS LIFTEN B V) 3 August 1992 (1992-08-03) * abstract * * page 3, line 34 - page 5, line 20 * * figures 1,2 *	1-13	INV. B66B5/00
Y		11	

Y	WO 2006/059174 A (OTIS ELEVATOR CO [US]; BEAUCHAUD FREDERIC [FR]; COQUERELLE THOMAS [FR]) 8 June 2006 (2006-06-08) * abstract * * page 3, column 6 - page 4, column 18 * * claim 11 * * figures 1-4 *	11	
A		1	

Y	DE 201 19 498 U1 (PODELWITZ STAHLBAU GMBH [DE]) 28 February 2002 (2002-02-28) * abstract * * page 6, line 29 - page 7, line 6 * * figure 1 *	11	
A		1	TECHNICAL FIELDS SEARCHED (IPC) B66B

A	EP 1 314 678 A (INVENTIO AG [CH]) 28 May 2003 (2003-05-28) * abstract * * paragraphs [0009] - [0011] * * figures 1-4 *	1	

A	DE 102 12 267 A1 (MUELLER WOLFGANG T [DE]) 26 September 2002 (2002-09-26) * abstract * * paragraphs [0018] - [0024] * * figure 1 *	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	19 March 2009	Oosterom, Marcel

CATEGORY OF CITED DOCUMENTS

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19-03-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
NL 9100059 A	03-08-1992	NONE	
WO 2006059174 A	08-06-2006	CN 101068742 A	07-11-2007
		EP 1817252 A1	15-08-2007
		JP 2008521724 T	26-06-2008
		US 2008302612 A1	11-12-2008
DE 20119498 U1	28-02-2002	NONE	
EP 1314678 A	28-05-2003	AT 305892 T	15-10-2005
		CN 1422798 A	11-06-2003
		DE 50204457 D1	10-11-2005
		ES 2249530 T3	01-04-2006
DE 10212267 A1	26-09-2002	DE 20105488 U1	21-06-2001

EPO FORM P0459

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Patent documents cited in the description

- US 6481534 B1 **[0010]**
- WO 2005026033A1 A **[0012]**