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(54) **Elevator installation comprising an auxiliary system for moving the passenger car**

(57) A lift installation (100), comprising a movable car (9) for carrying loads and in particular passengers; a hoistway for the travel of said car (9) among a plurality of floors (P_{1a-2} , P_{1a-1} , P_{1a} , P_{1a+1}) for stopping and accessing to a building, located at respective levels; and a main system for supporting and moving the car in the hoistway (3); characterised in that it further comprises intermediate members (15, 32, 33, 52, 53) for the removable coupling between the car (9) and the main system; and an auxiliary system for supporting and moving the car, selectively actuable by passengers inside of the car (9) when uncoupled from the main system, at the onset of a malfunctioning of the main system with a corresponding stopping of the lift at a given level (P_{1a}) comprised between two floors (P_{1a-1} , P_{1a+1}) of said plurality of stop and access floors; the auxiliary system comprising control means (19) for controlling the travel of said car (9) in said hoistway (3), said means (19) being independent

from said main system;
wherein said intermediate coupling members, the car (9) and the auxiliary system cooperate so that the car (9) assumes a first standard operating configuration (α), coupled with the main system, wherein the relative position between the intermediate members associated to the main system (15, 52, 53) and the car (9) is fixed, the mutual distance remaining unchanged; and a second emergency configuration (β), uncoupled from the main system, wherein the relative position between the intermediate members associated to the main system (15, 52, 53) and the car (9) is selectively changeable by a user, the mutual distance being adjustable by said control means (19); so as to carry out the return of the car (9) to a floor (P_{1a-1} , P_{1a+1}) adjacent to the given stop level (P_{1a}) of the lift, thereby allowing anyhow the evacuation of the passengers and/or the load held up in the car (9).

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Description

[0001] The present invention relates to a hoisting installation for the substantially vertical movement of loads between building floors set at different levels, as in the case of a generic elevator apparatus, and more specifically to a lift.

[0002] More specifically, this invention relates to the field of the manufacturing of operating and safety systems for elevator apparatuses, apt to accommodate passengers, or optionally adaptable therefor.

[0003] Presently, safety systems commonly provided on elevator apparatuses, and typically on lifts, do not effectively allow any passenger to autonomously face - unless external rescue intervene - an emergency such as that typically originating from a malfunctioning of the main system for supporting and moving the elevator apparatuses.

[0004] More specifically, any passengers of an elevator apparatus according to the state of the art do not have at their disposal means useful to free themselves, independently of external aid availability and with the desirable readiness, from a forced stay on the hoisting platforms and/or inside the cars of said elevator apparatus when its functionalities are compromised, even merely temporarily, owing to the onset of failures intrinsic to the hoisting installation or on the supply mains, typically followed by a power supply interruption.

[0005] A situation commonly occurring each time an elevator apparatus breaks down owing to said failures or emergencies, is the stopping of the hoisting platforms and/or of the cars at a given level, comprised between two floors of the plurality of stop and access floors among which the elevator apparatus is operated.

[0006] A stopping in said position does not allow passengers to autonomously evacuate hoisting platforms and/or cars of the elevator apparatus, without recurring to external rescue, which, however, might be disadvantageously hindered and late in intervening.

[0007] Such an evacuation implies a preventive return of the platforms and/or cars back to a floor adjacent to the level of their stopping; then, a subsequent alignment thereof to such a return floor, which is selectable between the two viable adjacent floors, respectively above and below the stopping level.

[0008] Only when this alignment has been attained, within an acceptable range of measures, passengers will be enabled to operate, in the sense of opening the protective barriers, generally in the form of doors, and get out over short times.

[0009] As it is known, modern lift designers aim at a high degree of improvement, in an attempt to conform them also to a fail-safe design philosophy, the adoption of such a philosophy being ever more desirable in the ideation of safety systems.

[0010] According to such a design philosophy, an elevator apparatus should work safely also in the event of failures, at least allowing the freeing of passengers who

might find themselves hanging under conditions of unstable balance.

[0011] In the reference field there are already apparatuses by which an operator can move the platform and/or the car, aligning it to a floor, to allow the letting out the load and in particular of trapped passengers; however, when the elevator apparatus has jammed owing to mechanical failures, maintenance staff inevitably has to intervene.

[0012] Therefore, relatively lengthy times are required to unjam (unlock) the whole system.

[0013] Hence, the problem underlying the present invention is solved only partially by the known art, in particular in the light of the tense and frightful atmosphere that may spread among passengers of a lift on events such as the above-mentioned ones, in the uncertainty of the jamming duration and the time of forced stay within the elevator apparatus under breakdown.

[0014] Assigning an employee, typically a doorkeeper in the building where the elevator apparatus is installed, to the task of controlling the condition of the lift is not a viable solution, besides being particularly burdensome from an economical standpoint.

[0015] There are situations in which any elevator jamming, and the impossibility of a timely exiting from the car, may prove lethal to particularly exposed passenger typologies, such as those of individuals suffering from respiratory deficiencies, or in-patients, e.g. at hospital structures and the like.

[0016] Moreover, particularly fearful is the event of an elevator jamming due to a mechanical failure in a private building, in case all building dwellers are held up in the elevator, as it has actually occurred in the past; all the more so since such lone dwellers are aged and isolated, the occurrence emerging only when the anomaly is fortuitously noticed by those external to the building.

[0017] To date, there is no system for supporting and moving the movable platform and/or the car of an elevator apparatus selectively and easily actuable, at the onset of a malfunctioning, from inside the apparatus by action of the same passengers loaded on the elevator apparatus; this specifically referring to the case in which, owing to said malfunctioning, the movable platform and/or the car stop at a certain level, comprised between two floors of a plurality of stop and access floors among which the apparatus is made to work and is operated.

[0018] Moreover, in the known art of the reference field there is no system for supporting and moving the movable platform and/or the car of an elevator apparatus that allows, even in the absence of electric current, with simple manoeuvres by action of the passengers themselves, autonomously from external rescue and readily with respect to the failure event, to return the platform and/or the car back to a floor adjacent to the elevator stop level, with a perfect levelling of the car at said adjacent floor, so as to allow anyhow the evacuation of passengers and/or load held up in the building where the elevator apparatus is installed.

[0019] Hence, object of the present invention is to solve said problems, by proposing a lift installation comprising an auxiliary system for supporting and moving the movable platform and/or the car, selectively actuable by passengers inside the elevator apparatus, as defined in claim 1.

[0020] A lift installation according to the present invention provides the option, directly to individual users of the elevator apparatus, therefore located inside the relevant car or anyhow on the hoisting platform, to free themselves from a deadlock situation in case of failure, autonomously from external rescue and independently of the main system under breakdown.

[0021] A lift installation according to the present invention enables exiting from the car within a few minutes to all occupants, with no need to wait for external rescue, thereby eliminating the uncertainty and anxiety in connection to actual times for arrival of a rescue squad and to the expectations of their success.

[0022] This result is all the more remarkable and desirable with the increase of the urgency for a solution to the installation jamming.

[0023] In the case in point, an auxiliary system for supporting and moving the movable platform and/or the car as the one contrived ensures a broad option of intervention for unjamming and evacuation also to occupants in precarious health conditions, and/or optionally to their attendants in case their transfer is attended by skilled or support staff.

[0024] Thus, it is prevented the onset of criticalities imputable to a delay of external rescue.

[0025] By providing an elevator apparatus of a double travel according to the design modes of the present invention - where a first travel is linked to a main system for supporting and moving the optionally pre-existing car-lift, and a second travel is associated to an auxiliary system for supporting and moving the car-lift, selectively actuable in an emergency - car occupants are enabled, in case of a jamming of the apparatus between successive stops, to free themselves and move, e.g. by action on a mere crank, to get at a floor adjacent to the jamming level, thereby evacuating the car-lift.

Such an auxiliary system for supporting and moving the car-lift, of easy and safe use, has a substantially reasonable operating cost; in use, it ensures greater peace of mind to those users who are compelled to systematically ride lifts, driving to fruition also those who, to date, are put off by the chance of malfunctioning; besides, in case of hospital or outpatient treatment structures, care institutions, long term care facilities, clinics and the like, it enhances safety in the management of the frequent moving of in-patients among different floors of the buildings, moving typically managed by operators and required for checking on different apparatuses located at respective premises.

[0026] Hence, the lift installation according to the present invention is of easy installation and use, as well as of simple design and inexpensive production.

[0027] Further advantages, as well as features and the operation modes of the present invention will be made apparent from the following detailed description of two embodiments thereof, given by way of example and not for limitative purposes, making reference to the figures of the annexed drawings, wherein:

- Figure 1 is a partially sectional side view of a first embodiment of the lift installation according to the present invention, when in a first standard operating configuration;
- Figure 2 is a partially sectional side view of the lift installation of Figure 1, when in a second emergency configuration;
- Figure 3 is a side view of a car of the lift installation of Figure 1, when in said first standard operating configuration, apt to highlight intermediate members for the removable coupling between said car and a main supporting and moving system;
- Figure 4 is a side view of the car of Figure 3, when the lift installation of Figure 1 is in said second emergency configuration, apt to highlight the uncoupling modes of said car from the main supporting and moving system;
- Figure 5 is a partially sectional top view of said car in the configuration of Figure 4, apt to highlight the components of an auxiliary system for supporting and moving the car, selectively actuable by passengers inside the car at the onset of a malfunctioning of the main system;
- Figure 6 is a partially sectional side view of said car in the configuration of Figure 4, when it is close to the levelling with a floor useful for evacuation of the carried load, apt to illustrate means for signalling the reaching of such a floor, comprising a bell;
- Figure 7 is a partially sectional side view of a second embodiment of the lift installation according to the present invention, when in a first standard operating configuration; and
- Figure 8 is a partially sectional side view of the lift installation of Figure 7, when in a second emergency configuration.

[0028] To describe two embodiments of the present invention, hereinafter reference will be made to the above-indicated Figures.

[0029] The lift installation according to the present invention typically comprises a movable car 9, for carrying loads and in particular passengers; a hoistway 3 for the travel of the car 9 among a plurality of floors P_{1a-2} , P_{1a-1} , P_{1a} , P_{1a+1} for stopping and accessing to a building on which the installation is installed, located at respective levels; and a main system for supporting and moving the car 9 in the hoistway 3.

[0030] The travel of the car 9 along the hoistway 3 is generally controlled by slideways 13, which may be made integral to the hoistway 3.

[0031] With regard to the embodiments of the present

invention, hereinafter introduced and detailed by way of example and not for limitative purposes, the lift installation 100 is substantially operating by friction drive.

[0032] Of course, it is understood that the present invention may be adapted, requiring no substantial interpolations in addition to optional fitting steps within the capacity of a person skilled in the art, to lift installations, provided or not provided with a machine room, in which the car operating system differs from the traditional electric one, e.g. in case of a oil-hydraulic system in which the movement of the car is obtained by mineral oil-displaced piston.

[0033] Referring to a lift installation 100 substantially operating by friction drive, the main system for supporting and moving the car 9 comprises primary driving means 6, generally electromechanic and of winch type; sheave-like primary friction drive means 7, 8; primary means 4, preferably rope-like, for suspending the car 9, as well as preferably a counterweight 10 for facilitating the hoisting of the car 9.

[0034] The lift installation 100 according to the present invention further comprises an auxiliary system for supporting and moving the car 9, selectively actuatable by passengers inside the car.

[0035] Such an auxiliary system implies a preventive uncoupling of the car 9 from the main system, and allows facing a system malfunctioning emergency.

[0036] Typically, such a malfunctioning translates into a stopping of the lift at a given level P_{1a} .

[0037] Most times, the level P_{1a} is not flush with a floor.

[0038] The door of the car 9, or the hoisting platform of the elevator apparatus, is generally not aligned with the corresponding access 14 incorporated in the installation building.

[0039] When the gap exceeds about 20 cm, the interference between door of the car 9 and access 14 to the floor corresponding to the stop level P_{1a} , yields no margin for an improvised adjustment by forcing.

[0040] Therefore, P_{1a} is comprised between two floors P_{1a-1} , P_{1a+1} of said plurality of stop and access floors.

[0041] From such a stopping position there follows an impossibility of opening the door of the car 9; or there ensues a port, between the floor corresponding to the level P_{1a} and the hoisting platform of the elevator apparatus, insufficiently wide to enable transit and evacuation to a passenger.

[0042] The lift installation 100 according to the present invention further comprises intermediate members for the removable coupling between the car 9 and the main system, for safe uncoupling of the car from the main supporting and moving system.

[0043] First intermediate members 15, 52, 53 partially associated to the main system, and supported thereby, cooperate with corresponding second intermediate members 32, 33 associated to the car 9, in order to establish said removable coupling.

[0044] The intermediate coupling members, the car 9 and the auxiliary system cooperate so that the car 9 may

assume a first standard operating configuration α , exemplified in Figures 1 and 3; and a second emergency configuration β , exemplified in Figures 2 and 4.

[0045] The first standard operating configuration α , coupled with the main system, provides for the relative position between the intermediate members 15, 52, 53 associated to the main system and the car 9 to remain fixed, the mutual distance remaining unchanged as determined by the connection by means of the same coupling members.

[0046] The second emergency configuration β , uncoupled from the main system, in which the relative position between said intermediate members 15, 52, 53 associated to the main system and the car 9 is selectively changeable by a user, provides that the mutual distance be adjustable by control means 19 for controlling the travel of the car 9 in the hoistway 3, said means 19 being independent from the main system.

[0047] Thus, the lift installation according to the present invention is empowered to carry out the return the car 9 to a floor P_{1a-1} , P_{1a+1} adjacent to the given stop level of the lift P_{1a} , with levelling of the car to such an adjacent floor.

[0048] Preferably, owing to overall energy-saving reasons, the floor of actual return is the floor P_{1a-1} underlying the elevator stop level P_{1a} .

[0049] Thus, it is anyhow allowed, even in case of main system malfunctioning, the evacuation into the installation building of passengers and/or load held up in the car, or on the corresponding platform.

[0050] With regard to the embodiment introduced by way of example herein, preferably the intermediate coupling members comprise an intermediate bar 15, associated to the main system, in the case in point to the ropes 4 of the main system.

[0051] Such a bar 15 is apt to couple the car 9 to the main system, the former being engaged with the car 9 when in the first standard operating configuration α ; and being instead disengageable from a direct engagement with the car 9 in the second emergency configuration β . Preferably, the intermediate coupling members comprise elongate members 32, 33, associated to the car 9, slidingly passing through anchoring bushes 52, 53, said bushes being integral to the intermediate coupling bar 15. The disengagement of the elongate members 32, 33 from the bushes 52, 53 arranges the car 9 in the second emergency configuration β , uncoupling it from the main system.

With regard to the embodiment considered, the tracks 32, 33 are retractable from the bushes 52, 53 so as to carry out a removable engagement of the intermediate coupling bar 15 with the car 9, and consequently the removable coupling between the car 9 and the main system.

[0052] The lift installation 100 according to the present invention comprises means, e.g. in the form of a locking lever 31, for engaging the auxiliary system for supporting and moving the car 9, apt to switch between a first locking

condition A and a second unlocking condition B of the intermediate coupling members 15, 52, 53, 32, 33.

[0053] Thus, by a user of the installation there may be arranged the assuming by the car 9 of the first standard operating configuration α , coupled with the main system; and of the second emergency configuration β , uncoupled from said main system, respectively.

[0054] The switching of said engaging means 31 between a first locking condition A and a second unlocking condition B of the intermediate coupling members 15, 52, 53, 32, 33, actuates a safety device for opening the main feeding circuit of the main system.

[0055] Thanks to such a safety device, it is avoided the risk of interferences due to any current flow restoration in the main feeding circuit, following the interruption that had originated main system malfunctioning and the corresponding stopping out of position of the elevator car 9.

[0056] The engaging means, such as the locking lever 31, preferably comprises an actuating portion 31_i, manipulable by a user from the inside of the car 9, e.g. by a handle.

[0057] The assembly is such that a user may, through said manipulation, arrange the switching of the lever 31 from said first locking condition A to said second unlocking condition B, and vice versa.

[0058] In order to attain said removable coupling, the locking lever 31 is connected to the elongate members 32, 33, so as to cause their retracting from the bushes 52, 53 when it is desirable to arrange the car 9 in the second emergency configuration β , uncoupling it from the main system.

[0059] Such a connection may be attained by hinging the lever 31 about a pin C placed on the car 9, preferably at the head of the car.

[0060] More specifically, the connection of the lever 31 with the elongate members 32, 33 takes place by means of rods b_1 , b_2 hinged eccentrically with respect to the pin C, with optimized lever ratios, so as to attain the retractability thereof in connection to the movement by rotation of the locking lever 31.

[0061] The lift installation 100 according to the present invention comprises a first safety system associated to the engaging means 31, for the non-random actuation of the auxiliary system for supporting and moving the car 9.

[0062] Preferably, such a safety system comprises a linkage for controlling the switching of the lever 31 from the first locking condition A to the second unlocking condition B and vice versa; and for defining the relevant positions assumed in said switching.

[0063] The linkage may e.g. be obtained from the assembly of a control handle 34, associated to the lever 31; a member 35 for transmitting the command given; an end pin 36; an opposing spring 37; and a stop 39, integral to the car 9.

[0064] As it may be observed from Figures 4 and 5, the pin 36, under the action of the opposing spring 37, engages with the stop 39 at defined stop positions, cor-

responding to the positions assumed by the lever 31 in the switching from the first locking condition A to the second unlocking condition B.

[0065] The auxiliary system for supporting and moving the car 9 comprises a first cable 20, for coupling to the car 9 at a first end 22 thereof, and for winding, at a second and opposite end thereof, about a drum 17, e.g. external, splined to the shaft of an auxiliary reduction unit 18 for the movement of said car 9.

[0066] The overall assembly is such that the first cable 20 is taut and unwinds passing between two sheaves 21 fixed to the intermediate removable coupling members 15 associated to the main system for supporting and moving the car 9.

[0067] In particular, the two sheaves 21 are fixed to the coupling bar 15 even in the unconstrained configuration of the car 9.

[0068] Thus, it is provided a support to the car 9 in the emergency configuration β .

[0069] Therefore, the car continues to be supported thanks to the coupling bar 15, which remains associated to the main system even in the emergency configuration in which the car is disengaged therefrom.

[0070] The reduction unit 18 may be a ratiomotor, comprising, besides the reduction gear, an electric motor supplied independently of the main electric circuit, e.g., by battery.

[0071] Preferably, the means for controlling the travel of the car 9 comprises a hand lever 19, linked to the reduction unit 18 and to said drum 17, by which a user may, from the inside of the car 9, adjust the movement of the car 9 in the hoistway 3 for the return of the car to a floor P_{1a-1} , P_{1a+1} adjacent to the stop level P_{1a} of the lift.

[0072] It is provided a further safety device, associated to the engaging means 31, for stopping the hand lever 19, and active when the engaging means 31 lies in the first locking condition A.

[0073] Thanks to this further safety device, it is prevented any superfluous loosening of the first cable 20 in a standard operating situation α , and the onset of entailed operation anomalies, when the car 9 is subsequently brought into the second emergency configuration β .

[0074] The safety device for stopping said hand lever 19 may comprise a second cable 40, connected, at a first end thereof, to the engaging means 31.

[0075] Therefore, said safety device may comprise sheaves 41, 42 for deviating the cable 40; a stop pin 43 connected to a second end of the second cable 40; a flange 42, coupled to the axis of the hand lever 19, incorporating stop holes in which the stop pin 43 remains engaged, under the action of resilient opposing means, when the engaging means 31 lies in the first locking condition A.

[0076] The safety device for stopping said hand lever 19 is such that, in correspondence of the switching of the engaging means 31 into the second unlocking condition B, the stop pin 43 disengages from the flange 44, disconnecting from the stop holes to allow free rotation of

the hand lever 19.

The auxiliary system for moving the car 9 comprises means for detecting and/or signalling, for the benefit of the users of the elevator, the reaching of a return floor P_{1a-1} , P_{1a+1} of the car 9, substantially adjacent to the stop level P_{1a} of the lift, in an emergency β .

Such signalling means may be auditory; and/or visual, by placing, on regions viewable from the inside of the car 9, through, e.g., a rear window 24, signs apt to allow the assessing of the car travel and alignment with a return floor.

Viewability of said signs may be facilitated by aid of an external emergency spotlight 26, optionally providing also an emergency lamp 25 facilitating operations inside the car 9.

The auditory signalling means may comprise a bell 27 having a hammer 28, the hammer comprising a shank 29 apt to interfere with an obstacle projection 30, associated to the hoistway 3, located at the return floor P_{1a-1} , P_{1a+1} , so as to alert users of an incipient reaching of the return floor P_{1a-1} , P_{1a+1} and allow them to accordingly adjust the operation of the hand lever 19.

[0077] The configuration may be contrived so that the shank 29 abuts the projection 30 only when the car 9 lies in emergency configuration β .

[0078] The signalling means, for adjusting the actuation of a ratiomotor 18, may also be automatic.

[0079] The hand lever 19 may have a hinge-like end portion, for the locating in a non-operating position.

[0080] In case of a motor-driven auxiliary system, a first flywheel could be provided, splined to the shaft of the ratiomotor 18 and sized so as to compensate the inertia of the ratiomotor unit 18, so as to make easier the hand-operated manoeuvring of the supporting and moving auxiliary system, by means of the hand lever 19.

[0081] The lift installation according to the present invention may also be provided with a parking brake, e.g. a disc brake, of electromagnetic type, splined to the shaft of the ratiomotor 18, open during the moving of the car 9 to allow free movement thereof.

[0082] However, the auxiliary system is designed so that the movement of the car 9, even only manually, requires minimum force, available also to aged or weakened users of the lift.

[0083] Moreover, the auxiliary system is sized so as to hold the car 9 locked in the position reached at the stop point of the operation of the hand lever 19, for any load to be supported.

[0084] The mechanism associated to the ratiomotor 18 and the drum 17 is preferably fixed directly to the car, moving therewith when the hand lever 19 is actuated.

[0085] Alternatively, according to a second embodiment of the lift installation 100 according to the present invention, the auxiliary system for supporting and moving the car 9 is a preferably linear oil-hydraulic actuation system.

[0086] Such an oil-hydraulic actuation system comprises rods 56,57 slidably coupled to respective prefer-

ably double-effect hydraulic cylinders 54,55.

[0087] The installing configuration of the oil-hydraulic system to the lift installation 100 is such that the auxiliary system is telescopically associated to the body of the car 9 and to the intermediate members 15 for the removable coupling between the car 9 and the main system.

[0088] Typically, in an oil-hydraulic actuation system, a piston, connected to a rod, acts in a chamber obtained internally to a head.

[0089] Said head is generally associated to a respective hydraulic cylinder; in the hollow of said cylinder, the rod incorporating said piston moves reciprocatingly.

[0090] In the conventional art, the piston defines a fluid-dynamic partition of the chamber in the head, subdividing it into a first front chamber and a second stem-connecting chamber.

[0091] The front chamber is reciprocatingly connected to a pump, suitable for pumping a working fluid; and to a tank, apt to hold said working fluid; during a working stroke, in the rod-thrusting phase outside of the hydraulic cylinder; and during a return stroke of the rod into the differential cylinder, in the pulling phase, respectively.

[0092] Vice versa, the stem-side chamber is reciprocatingly connected to the working fluid tank, and to the pump; during said working stroke; and during the return stroke, respectively.

[0093] In accordance with the above-mentioned general operation principle of an oil-hydraulic actuation system, it is attained a movement of the car 9, when in the second emergency configuration β , useful to the return of the car 9 to a floor P_{1a-1} , P_{1a+1} adjacent to the given stop level P_{1a} of the lift; or, once the passengers and/or the load have been evacuated from the elevator, therefore upon solving the emergency situation, it is attained the recoupling of the car 9 to the intermediate bar 15 and therefore to the main system.

[0094] The movements are anyhow proportional to the stroke of the rods into the hydraulic cylinders.

[0095] The stopping and the levelling of the car 9 are adjusted by the oil-hydraulic balance that onsets astride of the pistons.

[0096] The overall assembly, relevant to the embodiment depicted by way of example in Figures 7 and 8, is such that the rods 56,57 are connected to the intermediate bar 15 for coupling the car 9 to the main system; whereas the cylinders 54,55 are anchored to a support of the car 9, in particular to the base thereof.

[0097] The connection of the rods 56,57 to the intermediate bar 15, at the head of the car 9 when constrained to the main system, occurs, e.g., in the coupling spots 60,61, whereas the connection of the cylinders 55,55 to the base of the car 9 occurs, e.g., on the coupling spots 58,59.

[0098] In figure 8 it is depicted a configuration γ of the oil-hydraulic auxiliary system, with regard to the second embodiment of the lift installation according to the present invention, in which there has been arranged the descent of the car 9 for the return to the floor, following

the thrust, under oil-hydraulic pressure, of the rods 56,57 outside of the hydraulic cylinders 54,55 during the working stroke.

[0099] Overall, the system will be calibrated considering the weight of the car 9, it being adjustable so as to cause the stopping of the car 9 when the levelling with the return floor is deemed to have been attained.

[0100] In figure 7 it is depicted a configuration δ of the oil-hydraulic auxiliary system, relevant to the second embodiment of the lift installation according to the present invention, in which there has been arranged the rising of the car 9 for coupling, by means of the intermediate bar 15, to the main system, following the re-entering, under oil-hydraulic pressure, of the rods 56,57 into the hydraulic cylinders 54,55 during the return stroke.

[0101] The lever 31, as in the case of the first embodiment, is apt to couple and uncouple the car to the intermediate bar 15 analogously to the above-described first embodiment.

[0102] The oil-hydraulic actuation system comprises a working fluid tank 62; a pump 63, as well a system for controlling, adjusting and/or distributing the working fluid flow, connected to the tank 62 and/or to the pump 63.

[0103] Evidently, the adjustment may be carried out on the flow rate; on the pressure and/or on the speed of the working fluid.

[0104] The system for controlling, adjusting and/or distributing the working fluid flow may comprise a control unit 66 comprising automatic and/or manual actuating means, preferably having intervention interfaces accessible from the inside of said car 9.

[0105] Said interfaces may, e.g., take the form of a lever 64 for the operation of the pump 63; and/or of a lever 65 for adjusting a working fluid-distributing valve system.

[0106] Moreover, there are provided ducts 67, 68 for distributing the working fluid into said chambers, so as to arrange a return upstroke or a working downstroke of the car 9, respectively.

[0107] To the above-described lift installation a person skilled in the art, in order to satisfy further and contingent needs, might effect several further modifications and variants, all however encompassed by the protective scope of the present invention, as defined by the appended claims.

Claims

1. A lift installation (100), comprising:

- a movable car (9) for carrying loads and in particular passengers;
- a hoistway (83) for the travel of said car (9) among a plurality of floors (P_{1a-2} , P_{1a-1} , P_{1a} , P_{1a+1}) for stopping and accessing to a building, located at respective levels; and
- a main system for supporting and moving said

car in said hoistway;

characterised in that it further comprises:

- intermediate members (15, 32, 33, 52, 53) for the removable coupling between said car (9) and said main system; first intermediate members (15,52,53), associated to said main system, being apt to cooperate with second intermediate members (32,33) associated to said car (9) in order to establish said removable coupling; and
- an auxiliary system for supporting and moving said car; said auxiliary system comprising control means (19) for controlling the travel of said car (9) in said hoistway (3), said means (19) being independent from said main system;

wherein said intermediate coupling members, said car (9) and said auxiliary system cooperate so that said car (9) assumes:

- a first standard operating configuration (α), coupled with said main system, wherein the relative position between said first intermediate members associated to the main system (15, 52, 53) and said second intermediate members (32,33) associated to said car (9) is fixed, the mutual distance remaining unchanged; and
- a second emergency configuration (β), uncoupled from said main system, wherein the relative position between said first intermediate members associated to the main system (15, 52, 53) and said second intermediate members associated to said car (9) is selectively changeable by a user, the mutual distance being adjustable by said control means (19);

so as to carry out, at the onset of a malfunctioning of said main system with a corresponding stopping of said lift at a given level (P_{1a}) comprised between two floors (P_{1a-1} , P_{1a+1}) of said plurality of stop and access floors, the return of said car (9) to a floor (P_{1a-1} , P_{1a+1}) adjacent to said given stop level (P_{1a}) of the lift and allow anyhow the evacuation of the passengers and/or the load held up in said car (9).

2. The lift installation (100) according to claim 1, substantially operating by friction drive, wherein said main system for supporting and moving said car (9) comprises primary driving means for actuation; sheave-like primary friction drive means (7, 8); as well as rope-like primary means (4) for suspending said car (9).
3. The lift installation according to claim 1 or 2, wherein said intermediate coupling members comprise an intermediate bar (15), associated to said main system, for coupling said car (9) to said main system; said

- intermediate bar being engaged with said car (9) in said first standard operating configuration (α); and disengageable from a direct engagement with said car (9) in said second emergency configuration (β).
4. The lift installation (100) according to claim 3, wherein said intermediate coupling members comprises elongate members (32, 33), associated to said car (9), slidably passing through anchoring bushes (52, 53) integral to said intermediate coupling bar (15), so that their disengagement from said bushes (53, 53) arranges said car (9) in said second emergency configuration (β), uncoupling it from said main system.
 5. The lift installation (100) according to one of the claims 1 to 4, comprising means (31) for engaging said auxiliary system for supporting and moving said car (9), apt to switch between a first locking condition (A) and a second unlocking condition (B) of said intermediate coupling members (15, 52, 53, 32, 33), so as to arrange the assuming by said car (9) of said first standard operating configuration (α), coupled with said main system; and of said second emergency configuration (β), uncoupled from said main system, respectively.
 6. The lift installation (100) according to claim 4, wherein the switching of said engaging means (31) between a first locking condition (A) and a second unlocking condition (B) of said intermediate coupling members (15, 52, 53, 32, 33), actuates a safety device for opening the main feeding circuit of said main system.
 7. The lift installation (100) according to one of the claims 5 or 6, wherein said engaging means is in the form of a locking lever (31) comprising an actuating portion (31_i), manipulable by a user from the inside of said car (9), the assembly being such that said user may arrange the switching of said lever (31) from said first locking condition (A) to said second unlocking condition (B) and vice versa.
 8. The lift installation (100) according to claim 7, wherein said locking lever (31) is connected to said elongate members (32, 33) so as to cause their retracting from said bushes (52, 53) when it is desirable to arrange the car (9) in said second emergency configuration (β), uncoupling it from said main system.
 9. The lift installation (100) according to claim 7 or 8, wherein said lever (31) is hinged to a pin (C) placed on said car (9), the connection with said elongate members (32, 33) taking place by means of rods (b₁, b₂) hinged eccentrically with respect to said pin (C), so as to attain the retractability thereof in connection to the movement of said locking lever (31).
 10. The lift installation (100) according to one of the claims 6 to 9, comprising a first safety system associated to said engaging means (31) for the non-random actuation of said auxiliary system for supporting and moving said car (9); said first safety system comprising a linkage (34, 35, 36, 37, 38, 39) for controlling the switching of said lever (31) from said first locking condition (A) to said unlocking condition (B) and vice versa; and for defining the relevant positions assumed in said switching.
 11. The lift installation (100) according to claim 10, wherein said linkage comprises a control handle (34), associated to said lever (31); a member (35) for transmitting the command given; an end pin (36); an opposing spring (37) and a stop (39), integral to said car (9); said pin (36), under the action of said opposing spring (37), engaging with said stop (39) at defined stop positions, corresponding to the positions assumed by said lever (31) in the switching from said first locking condition (A) to said unlocking condition (B).
 12. The lift installation (100) according to one of the claims 1 to 11, wherein said auxiliary system for supporting and moving said car (9) comprises a first cable (20), for coupling to the car (9) at a first end (22) thereof, and for winding, at a second and opposite end thereof, about a drum (17) splined to the shaft of an auxiliary reduction unit (18) for the movement of said car (9).
 13. The lift installation (100) according to claim 12, wherein the overall assembly is such that said first cable (20) is taut and unwinds passing between two sheaves (21) fixed to said intermediate removable coupling members (15) associated to said main system for supporting and moving said car (9).
 14. The lift installation (100) according to one of the claims 12 or 13, wherein said reduction unit (18) is a ratomotor, comprising an electric motor supplied independently of said main electric circuit.
 15. The lift installation (100) according to one of the claims 12 to 14, wherein said control means comprises a hand lever (19), linked to said reduction unit (18) and to said drum (17), by which a user may, from the inside of said car (9), adjust the movement of said car (9) in said hoistway (3) for the return of said car to a floor (P_{1a-1}, P_{1a+1}) adjacent to said given stop level (P_{1a}) of the lift.
 16. The lift installation (100) according to claim 15, comprising a safety device, associated to said engaging means (31), for stopping said hand lever (19), active when said engaging means (31) lies in said first locking condition (A), so as to prevent any superfluous

loosening of said first cable (20) in a standard operating situation (α) and the onset of entailed operation anomalies, when said car (9) is subsequently brought into said second emergency configuration (β).

17. The lift installation (100) according to claim 16, wherein said safety device for stopping said hand lever (19) comprises a second cable (40) connected, at a first end thereof, to said engaging means (31); sheaves (41, 42) for deviating said cable (40); a stop pin (43) connected to a second end of said second cable (40); a flange (42), coupled to the axis of said hand lever (19), incorporating stop holes in which said stop pin (43) remains engaged, under the action of resilient opposing means, when said engaging means (31) lie in said first locking condition (A); the assembly being such that, in correspondence of the switching of said engaging means (31) into said second unlocking condition (B), said stop pin (43) disengages from said flange (44) to allow free rotation of said hand lever (9).
18. The lift installation (100) according to one of the claims 1 to 11, wherein said auxiliary system for supporting and moving said car (9) is an oil-hydraulic actuation system, comprising rods (56,57) slidably coupled to respective hydraulic cylinders (54,55); said oil-hydraulic system being telescopically associated to the body of said car (9) and to said intermediate members (15) for the removable coupling between said car (9) and said main system.
19. The lift installation (100) according to claim 18, wherein said cylinders (54,55) are double-effect, for a bidirectional control of the stroke of pistons integral to said rods (56,67).
20. The lift installation (100) according to claim 18 or 19 when claim 18 depends on one of the claims 3 to 11, wherein the overall assembly is such that said rods (56,57) are fixed to said intermediate bar (15) for coupling said car (9) to said main system; and said cylinders are anchored to a support of said car (9); or vice versa.
21. The lift installation (100) according to one of the claims 18 to 20, wherein said oil-hydraulic linear actuation system comprises a working fluid tank (62); a pump (63), as well as a system for controlling, adjusting and/or distributing the flow of said working fluid, connected to said tank (62) and/or to said pump (63).
22. The lift installation (100) according to claim 21, wherein said system for controlling, adjusting and/or distributing the flow of said working fluid comprises a control unit (66) comprising automatic and/or man-

ual actuating means having intervention interfaces (64,65) accessible from the inside of said car (9).

23. The lift installation (100) according to one of the claims 1 to 22, wherein said auxiliary system for supporting and moving said car (9) comprises means for detecting and/or signalling, for the benefit of said users of said lift, the reaching of a return floor (P_{1a-1} , P_{1a+1}) of said car (9), substantially adjacent to said given stop level (P_{1a}) of the lift, in an emergency (β).
24. The lift installation (100) according to claim 23, wherein said signalling means is auditory and comprises a bell (27, 28, 29).
25. The lift installation (100) according to claim 24, wherein said bell (27) has a hammer (28), said hammer (28) comprising a shank (29) apt to interfere (abutting) with an obstacle projection (30), associated to said hoistway (3), located at said return floor (P_{1a-1} , P_{1a+1}), so as to alert said users of an incipient reaching of said return floor (P_{1a-1} , P_{1a+1}), allowing them to accordingly adjust the operation of said hand lever (19).