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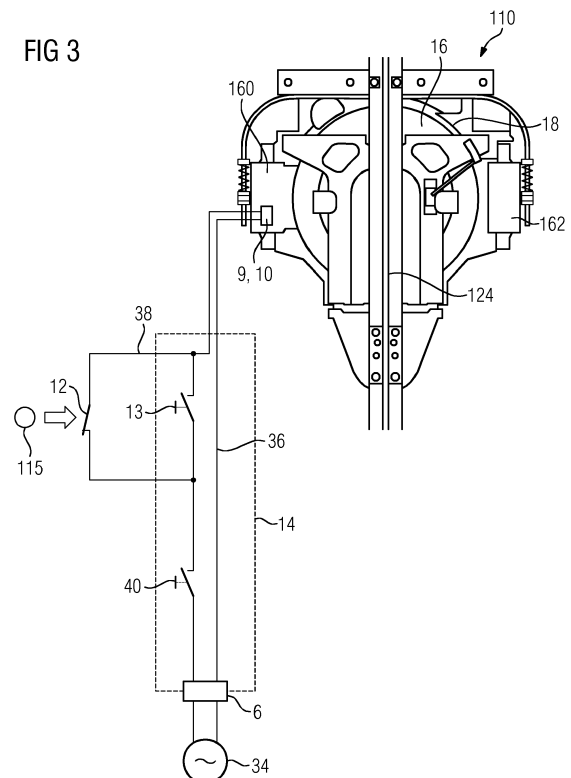
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(54) **ELECTRICAL RESCUE SYSTEM FOR RESCUING PASSENGERS FROM AN ELEVATOR CAR, A TOOL FOR THE SAME, AND A CORRESPONDING METHOD**

(57) An electrical rescue system for rescuing passengers from an elevator car (102) comprises an elevator car (102) movable in an elevator shaft (100) by imbalance between the elevator car (102) and a counterweight (104), a plurality of platform doors (4) providing access to the elevator car (102), and a plurality of normally-closed brakes (160, 162) openable by at least one electromagnet (9) and configured to prevent the movement of the elevator car (102) with respect to the elevator shaft (100) when the at least one electromagnet (9) is not energized and to allow the movement when the at least one electromagnet (9) is energized. The electrical rescue system further comprises an electrical connector (6) located at or in a platform door (4) or its frame structure (5), at or in a number of MAP panels, or at the platform (3), and connected to the at least one electromagnet (9) for supplying electrical current to the electromagnet (9) to energize the electromagnet (9).

FIG 3



Description

Field of the invention

[0001] The invention relates to the electrical rescue systems for rescuing passengers from an elevator car.

Technical background

[0002] To improve elevator safety, the elevator system comprises a number of brakes that are of the normally-closed type which means that unless energized, the brakes must close in order to prevent the car from falling in the elevator shaft. There must be at least two independent brakes available.

[0003] If there is a power outage or if an elevator fails, the energization of the brakes must be removed causing the brakes to close. If the car is between floors when the brakes close, it halts there and in consequence, the passengers in the car must be rescued, which normally is the task of a service technician.

[0004] Instead of rescuing the passengers via the elevator shaft, which obviously is uncomfortable or scary especially in the higher buildings, it is generally preferable to drive the car to the next floor by releasing the brakes and moving the car by imbalance between the car and a counter weight or by powering the elevator drive. Opening the brakes involves a certain risk especially when the power outage or the elevator failure still persists. Both mechanical and electrical rescue systems are known in the background art for releasing of the brakes.

[0005] European patent application of Inventio AG published under publication number EP 0 947 460 A1 discloses a mechanical rescue system to manually disengage the brakes of the car. Manually disengaging the brakes is performed from the top floor. As an assumed improvement to this system, in European patent application of the same applicant published under publication number EP 1 142 814 A1 it is proposed to employ an image sensor and a visualization device for a better control of the manual opening of the elevator brake.

[0006] The English abstract of JP2004238138 (A) -hereinafter the Otis '138 abstract- of Otis Elevator Co. discloses an electrical rescue system. To rescue passengers, an elevator is operated using an emergency battery power supply which makes the car arrive at the nearest floor when the elevator cannot be normally operated due to power outage or failure. The operating apparatus has means for electrically releasing the brakes when the elevator fails or breaks down.

[0007] The electrical rescue system disclosed in the Otis '138 abstract uses a backup power supply at a failure or power outage to move the car to the nearest floor by weight imbalance of car between the car and a counterweight, by intermittently opening the brake in response to a speed estimate based on frequency of induced voltage of a permanent magnet motor, or gradually or continuously varying short circuit resistance between per-

manent magnet motor terminals.

[0008] Obviously, the mechanical rescue systems involve more mechanical failure possibilities than the electrical rescue systems. While the energization of the brakes can easily be removed in an electrical rescue system if necessary, the manually forced mechanical opening of the elevator brakes in a mechanical rescue system could -at least in theory- cause the blocking of the elevator brake in the open position, such as when the rods for manipulating the elevator brakes fail, with devastating consequences.

Objective of the invention

[0009] In the Occident power outages and elevator fails currently occur rather seldomly. In the electrical rescue system disclosed in the Otis '138 abstract, if the emergency battery power supply is used seldomly, it may be that the emergency battery power supply has been discharged during the period of non-use so that the electrical rescue system is not operable when necessary.

[0010] In certain other regions, power outages can currently occur more frequently. If the emergency battery power supply is used more frequently, it may be that the emergency battery power supply has been discharged due to use, such as because of human factors -such as forgetting to charge the emergency battery power supply- so that the electrical rescue system is not operable when necessary.

[0011] It is an objective of the invention to improve the availability of an electrical rescue system.

[0012] This objective can be met with the electrical rescue system according to claim 1, with the tool according to claim 12, and with the method according to claim 14.

[0013] The dependent claims describe advantageous aspects of the system, tool and method.

Advantages of the invention

[0014] The electrical rescue system for rescuing passengers from an elevator car comprises an elevator car movable in an elevator shaft by imbalance between the elevator car and a counterweight, a plurality of platform doors providing access to the elevator car, a plurality of normally-closed brakes openable by at least one electromagnet and configured to prevent the movement of the elevator car with respect to the elevator shaft when the at least one electromagnet is not energized and to allow the movement when the at least one electromagnet is energized, and also an electrical connector located at or in a platform door or its frame structure, at or in a number of MAP panels, or at the platform, and connected to the at least one electromagnet for supplying electrical current to the electromagnet to energize the electromagnet.

[0015] With the electrical rescue system as proposed, the availability problem that may be caused by the stationary backup power supply (i.e. rechargeable battery)

can be avoided since electrical energy required to disengage the brakes can be introduced into the electrical rescue system from the platform door or from the platform. This enables, depending on the implementation, the use of a separate rechargeable battery (that may be connected to the connector via a specific tool, for example) or even electricity from the mains or from an aggregate (that may be connected to the connector via a specific tool, for example). In this manner, since the stationary backup power supply is no longer necessary, the risk of the stationary backup power supply being discharged can be avoided since the service technician can make electrical energy available from an external source.

[0016] If the system further comprises an overspeed governor having a safety contact connected in series with the at least one electromagnet and the electrical connector, configured such that, when the overspeed governor detects an overspeed it opens the safety contact to remove the energization of the electromagnet, the risk associated with opening the brakes during a power outage or after an elevator failure can be mitigated.

[0017] If the system further comprises a bypass for bypassing the overspeed governor, passengers can be rescued also in the case of failure of the overspeed governor.

[0018] Preferably, the bypass may be installable via the electrical connector.

[0019] Preferably, the electrical connector is accessible directly from the platform with a tool. This improves work safety of the service technician.

[0020] The electrical connector may be located behind a hatch that preferably has a lock that is openable with a key.

[0021] Alternatively or in addition, the connector may be located in a frame structure of the platform door. Then preferably the connector may be accessible after opening the platform door. Alternatively, the connector may be located in or at a MAP panel. This may significantly reduce the time by the service technician or a fireman to access the connector.

[0022] Advantageously, connector has a shape, coding or colour different from the coding of the other connectors in the elevator system. This helps to avoid opening the brakes by mistake.

[0023] The electrical rescue system may further comprise a tool for connecting to the electrical connector, and also a) an energy source for energizing the at least one electromagnet or b) a means for connecting to an electric supply, preferably to the mains or to an aggregate. Preferably, the tool comprises a means for energizing the at least one electromagnet in a pulsed manner.

[0024] The tool for use in the electrical rescue system comprises a means for connecting to the electrical connector, and a) an energy source for energizing the at least one electromagnet or b) a means for connecting to an electric supply, preferably to the mains or to an aggregate. The tool may further comprise a means for energizing the at least one electromagnet in a pulsed manner.

[0025] In the method for rescuing passengers from an elevator car, the electrical rescue system is used to open the brakes by electricity fed to the at least one electromagnet via the electrical connector from an electricity supply, preferably from a rechargeable battery, the mains or from an aggregate, such that the elevator car will be moved by imbalance between the elevator car and a counterweight. Preferably, the tool is used for connecting to the electrical rescue system.

List of drawings

[0026] In the following, the electrical rescue system, tool and method will be explained in more detail by way of the exemplary embodiments of the elevators shown in FIG 1 and 2.

[0027] FIG 3 is an exemplary electrical connection diagram illustrating energizing the electromagnet of the normally-closed brakes by means of the electrical rescue system and the tool.

[0028] Same reference numerals refer to similar parts in all FIG.

Detailed description

[0029] FIG 1 illustrates an elevator 1. The elevator 1 comprises an electrical rescue system for rescuing passengers from an elevator car 102. The electrical rescue system comprises an elevator car 102 movable in an elevator shaft 100, a plurality of platform doors 4 providing access to the elevator car 102, and a plurality of normally-closed brakes (such as machinery brakes 160, 162) openable by at least one electromagnet 9 (each of which comprises at least one coil 10) and configured to prevent the movement of the elevator car 102 with respect to the elevator shaft 100 when the at least one electromagnet 9 is not energized and to allow the movement when the at least one electromagnet 9 is energized.

[0030] The electrical rescue system further comprises an electrical connector 6 located at or in a platform door 4 or at the platform 3 and connected to the at least one electromagnet 9 for supplying electrical current to the electromagnet 9 to energize the electromagnet 9.

[0031] The elevator 1 further comprises an overspeed governor 115 having a safety contact 12 preferably connected in series with the at least one electromagnet 9 and the electrical connector 6. When the overspeed governor 115 detects an overspeed of the elevator car 102, such as by monitoring the rotating speed of the block wheel 106, it opens the safety contact 12 to remove the energization of the electromagnet 9. It must be understood that the energization can be removed directly or indirectly via the control system 114 controlling the machinery brakes 160, 162.

[0032] FIG 2 show another embodiment of elevator 1. The elevator 1 comprises a motor 110 (elevator drive machine) with a rotor 16 having a rim 18 which is gripped by two machinery brakes 160, 162. The motor 110 is a

traction sheave drive machine with a rotor 16 that comprises or is attached to a traction sheave, around which an elevator rope or ropes 118, 120 run. One end of the elevator rope or elevator ropes 118, 120 is fixed at a diverting pulley 63 of elevator car 102 whereas the other end of the elevator rope or elevator ropes 118, 120 is fixed to a diverting pulley 64 of the counterweight 104.

[0033] The elevator car 102 comprises a number of brakes 154, 156 that is/are implemented as gripping devices which is/are actuated by the overspeed governor 115 having an upper overspeed governor rope pulley 72 and a lower overspeed governor rope pulley 74 at respective ends of the elevator shaft 100. Between the upper overspeed governor rope pulley 72 and the lower overspeed governor rope pulley 74 an overspeed governor rope 116 runs. The overspeed governor rope 116 has been fixed at a number of fixing points 78 to the elevator car 102. The overspeed governor 115 comprises a mechanism for monitoring the velocity of the upper overspeed governor rope pulley 72, for example, a mechanical rotative force monitoring device and a switch 12 controlled by the overspeed governor 115. The switch 12 may have been arranged in the supply line 38 between the energy supply 34 (such as, the mains, aggregate or a rechargeable battery) and the coil 10 of the electromagnet 9.

[0034] The elevator 1 may further comprise a control panel 80, in which the manual push button 40 is located. Alternatively, the manual push button 40 may be located in a tool 14 as will be described below. The control panel 80 may further comprise a window 82 allowing a view into the elevator shaft 100 as well as an indicator, such as one or more LEDs, indicating the approach of a platform 3 by the elevator car 102 so that trapped passengers may exit via the car door/doors 88 and via the respective platform doors 4 to one of these platforms 3. The invention allows a safe release of trapped passengers without the danger of overspeed of the elevator car 102 during the release action.

[0035] Referring to FIG 3, the elevator 1 may further comprise a bypass 13 for bypassing the overspeed governor 115. When the bypass 13 is active, the safety contact 12 will be bypassed. The bypass 13 is preferably installable via the electrical connector 6.

[0036] The electrical connector 6 may be accessible directly from the platform 3 with a tool 14. Alternatively or in addition, the electrical connector 6 may be located behind a hatch that preferably has a lock that is openable with a key.

[0037] The electrical connector 6 is preferably located in a frame structure 5 of the platform door 4. It can be accessible after opening the platform door 4. Alternatively or in addition, there exists a number of MAP panels (that normally is/are placed in the frame structure of the car door 88 or in the frame structure 6 of the platform door 4, for example), in or at which the the electrical connector 6 may be located. If the electrical connector is located in or at a MAP panel, it may no more be necessary

to open a platform door 4 but it will be enough to open a cover or lid located in the frame structure 6.

[0038] FIG 3 is an exemplary electrical connection diagram illustrating energizing the electromagnet 9 of at least one of the machinery brakes 160, 162 by means of the electrical rescue system and the tool 14.

[0039] FIG 3 shows the electrical rescue system comprising a motor 110 mounted on a linear guide 124 of the elevator 1, which motor 110 comprises a rotor 16 and/or a traction sheave having a rim 18 which is gripped by two machinery brakes 160, 162 of the motor 110. Both machinery brakes 160, 162 are electrically connected to an energy supply 34 that supplies an alternating current (via supply lines 36, 38) to at least one coil 10 of at least one electromagnet 9 in order to open the respective machinery brake 160, 162 by energizing the coil. As energy supply 34, the mains or an aggregate can be used, for example. The electrical connecting is preferably carried out via a connector 6. The connector 6 may have a shape, coding or colour different from the coding of the other connectors in the elevator 1.

[0040] In at least one of the supply lines 36, 38, a switch 12 is located which is controlled by the overspeed governor 115. As long as the overspeed governor 115 detects that the velocity of the elevator car 102 is below a limit value, the switch 42 is closed. If the velocity of the elevator car 102 exceeds the limit value, the switch 12 is opened. Thus, for releasing the machinery brakes 160, 162 of the motor 110, it is necessary that the (preferably manual) push button 40 is continuously pushed and that the overspeed governor 115 does not detect an overspeed situation exceeding a limit value. If the operator (maintenance technician or fireman, for example) releases the push button 40 or if the overspeed governor detects that the velocity of the elevator car 102 exceeds a limit value, the energy supply to the coil/coils 10 is disconnected so that the respective machinery brake/brakes 160, 162 close/closes.

[0041] The tool 14 comprises a means for connecting to the electrical connector 6. It may further comprise an energy source (such as a rechargeable battery) for energizing the at least one electromagnet 9. Alternatively, the connector 6 may be connected to an electric supply 34, such as the mains or an aggregate, for example.

[0042] The tool 14 may further comprise a means for energizing the at least one electromagnet 9 in a pulsed manner.

[0043] The tool 14 may further comprise a means for connecting to the electrical connector 6, and an energy supply 34 (such as a rechargeable battery and preferably a DC-to-AC inverter) for energizing the at least one electromagnet 9 or, alternatively, a means for connecting to an electric supply 34, preferably to the mains or to an aggregate. The tool 14 may further comprise a means for energizing the at least one electromagnet 9 in a pulsed manner.

[0044] In the method for rescuing passengers from the elevator car 102, the electrical rescue system according

is used to open the brakes (preferably the machinery brakes 160, 162) by electricity fed to the at least one electromagnet 9 via the electrical connector 6, obtained from a rechargeable battery 15 or from the electricity supply, preferably from the mains or from an aggregate. In particular, the tool 14 can be used for connecting to the electrical connector 6. The elevator car 102 is then moved by imbalance between the elevator car 102 and the counterweight 104.

[0045] In other words, the feeding cable 170 with the connector 6 for energizing the energization coil 10 of the machinery brake 160, 162 is installed in the door frame 5 of the platform door 4 that is closest to the elevator drive (motor 110). Alternatively, the feeding cable 170 with the connector 4 can be installed to any other floor 3, such as in the case of the elevator 1 installed in a penthouse building.

[0046] The platform door 4 end of the feeding cable 170 has a connector 6, to which the tool 14 for electrically disengaging the machinery brake 160, 162 can be connected. If the manual brake opening is not working, the machinery brake 160, 162 can be disengaged and the car can be driven to the next floor.

[0047] The connector 6 may be accessed directly from the platform 3 with a tool 14 or via a hatch that preferably has a lock that can be opened with a key. Alternatively, the connector 6 may be accessed via the frame structure or by opening the platform door 4.

[0048] The connector 6 preferably has a shape or coding that is different from the other connectors of the elevator 1, for preventing accidentally connecting an electrical cable that would energize the electromagnets 9.

[0049] The safety contact 12 of an overspeed governor 115 can be connected in series between the connector 6 and the brakes 160, 162. If the speed of the car 102 exceeds the speed allowed by the overspeed governor 115, the safety contact 12 opens closing the brakes 160, 162 to bring the car 102 to halt safely. The safety contact 12 of the overspeed governor can be returned with normal means.

[0050] If the safety contact 12 of the overspeed governor 115 has opened and cannot be closed, it is possible to connect a pass-by conductor 13 for bypassing the overspeed governor 115 in emergency use.

[0051] The tool 14 may comprise a rechargeable battery. Alternatively, the necessary electricity feed line can be connected to the tool 14 in order to obtain the energy needed to open the brakes 160, 162.

[0052] The brakes 160, 162 are opened in a pulsed manner such that the brakes 160, 162 cannot accidentally remain open for longer than a known period of time.

[0053] In a further embodiment, a mechanic crank/pump/string-pull-generator can be used as an energy supply 34 to generate energy into supercapacitor or to any other suitable energy storage means for initial brake opening energy needed to open at least one machinery brake 160, 162. Then use energy generated from dynamic braking to hold the machinery brake 160, 162

open. This solves the need for controlled brake opening in an offline elevator 1. It does not consume energy when the opening function is not used. It also uses existing drive functions of the motor 10, such as energy generating dynamic braking for controlling speed safely. There is thus no need for large battery which needs to be kept charged.

[0054] In a still further embodiment, at least one electromagnet of at least one of the machinery brakes 160, 162 is equipped with a supplementary coil that has less windings and therefore a considerably smaller resistance than the coil 10 of the electromagnet. If the coil 10 has a resistance of 200 Ω with $N=1000$ windings, a voltage of 200 VDC causes a current of 1 A which results in electromagnetic force of 1000 A rounds. The power loss of the coil 10 is $1 \text{ A} \times 200 \text{ V} = 200 \text{ W}$.

[0055] If in the supplementary coil we have less windings, say $N = 20$ windings, having a resistance 0,24 Ω . When a voltage of 12 VDC is fed to the supplementary coil (from a rechargeable battery, for example, such that are used in passenger cars or solar systems, for example), the resulting current is 50 A which produces electromagnetic power $20 \times 50 = 1000 \text{ A rounds}$. The power loss of the supplementary coil is $12 \text{ V} \times 50 \text{ A} = 600 \text{ W}$.

[0056] So it results that the supplementary coil heats up much faster than the coil 10 but this does not really matter, since the supplementary coil is used only for a very limited time, normally for a maximum time of 30 s.

[0057] The invention is not to be understood to be limited in the attached patent claims but must be understood to encompass all their legal equivalents.

List of reference numerals used:

[0058]

1	elevator
3	platform
4	platform door
5	frame structure
6	electrical connector
9	electromagnet
10	coil
12	safety contact
13	bypass
14	tool
16	rotor
18	rim
34	energy supply
36	supply line
38	supply line
40	manual push button
63	diverting pulley
65	diverting pulley
72	upper overspeed governor rope pulley
74	lower overspeed governor rope pulley
78	fixing point
80	control panel

82 window
 84 approach indicator
 88 car door
 100 elevator shaft
 102 elevator car
 104 counterweight
 106 block wheel
 107 shaft
 108 shaft
 109 power transmission
 110 motor (elevator drive machine)
 111 control cable
 112 control cable
 114 control system
 115 overspeed governor
 116 overspeed governor rope
 118, 120 elevator rope (suspension rope)
 122, 124 linear guide
 154, 156 brake (gripping device)
 160, 162 machinery brake
 170 cable

Claims

1. Electrical rescue system for rescuing passengers from an elevator car (102), **comprising**:

- an elevator car (102) movable in an elevator shaft (100) by imbalance between the elevator car (102) and a counterweight (104);
- a plurality of platform doors (4) providing access to the elevator car (102);
- a plurality of normally-closed brakes (160, 162) openable by at least one electromagnet (9) and configured to prevent the movement of the elevator car (102) with respect to the elevator shaft (100) when the at least one electromagnet (9) is not energized and to allow the movement when the at least one electromagnet (9) is energized; and
- an electrical connector (6) located at or in a platform door (4) or its frame structure (5), at or in a number of MAP panels, or at the platform (3), and connected to the at least one electromagnet (9) for supplying electrical current to the electromagnet (9) to energize the electromagnet (9).

2. The electrical rescue system according to claim 1, **wherein**: the system further comprises an overspeed governor (115) having a safety contact (12) connected in series with the at least one electromagnet (9) and the electrical connector (6), configured such that, when the overspeed governor (115) detects an overspeed it opens the safety contact (12) to remove the energization of the electromagnet (9).

3. The electrical rescue system according to claim 2, **wherein**: the system further comprises a bypass (13) for bypassing the overspeed governor (115).

4. The electrical rescue system according to claim 3, **wherein**: the bypass (13) is installable via the electrical connector (6).

5. The electrical rescue system according to any one of claims 1 to 4, **wherein**: the electrical connector (6) is accessible directly from the platform (3) with a tool (14).

6. The electrical rescue system according to any one of claims 1 to 5, **wherein**: the electrical connector (6) is located behind a cover, lid or hatch that preferably has a lock that is openable with a key.

7. The electrical rescue system according to any one of claims 1 to 6, **wherein**: the electrical connector (6) is located in a frame structure (5) of the platform door (4) or in or at a MAP panel.

8. The electrical rescue system according to any one of the preceding claims, **wherein**: the connector (6) is accessible after opening the platform door (4).

9. The electrical rescue system according to any one of claims 1 to 8, **wherein**: the connector (6) has a shape, coding or colour different from the coding of the other connectors in the elevator (1).

10. The electrical rescue system according to any one of the preceding claims, further **comprising**: i) a tool (14) for connecting to the electrical connector (6), and ii) an electric (34) supply, preferably the mains or an aggregate.

11. The electrical rescue system according to claim 10, **wherein**: the tool (14) comprises a means for energizing the at least one electromagnet (9) in a pulsed manner.

12. A tool (14) for use in an electrical rescue system according to any one of claims 1 to 11, **comprising**: i) a means for connecting to the electrical connector (6), and iia) an energy supply (34), preferably a rechargeable battery, the mains or an aggregate, for energizing the at least one electromagnet (9).

13. The tool (14) according to claim 12, **wherein**: the tool (14) comprises a means for energizing the at least one electromagnet (9) in a pulsed manner.

14. A method for rescuing passengers from an elevator car (102), **wherein**: an electrical rescue system according to any one of claims 1 to 11 is used to open the brakes (160, 162) by electricity fed to the at least

one electromagnet (9) via the electrical connector (6) from an electricity supply (34), preferably from a rechargeable battery, the mains or from an aggregate, such that the elevator car (102) will be moved by imbalance between the elevator car (102) and a counterweight (104). 5

15. The method according to claim 14, **wherein:** in the method, a tool (14) according to claim 12 or 13 is used for connecting to the electrical connector (6). 10

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FIG 1

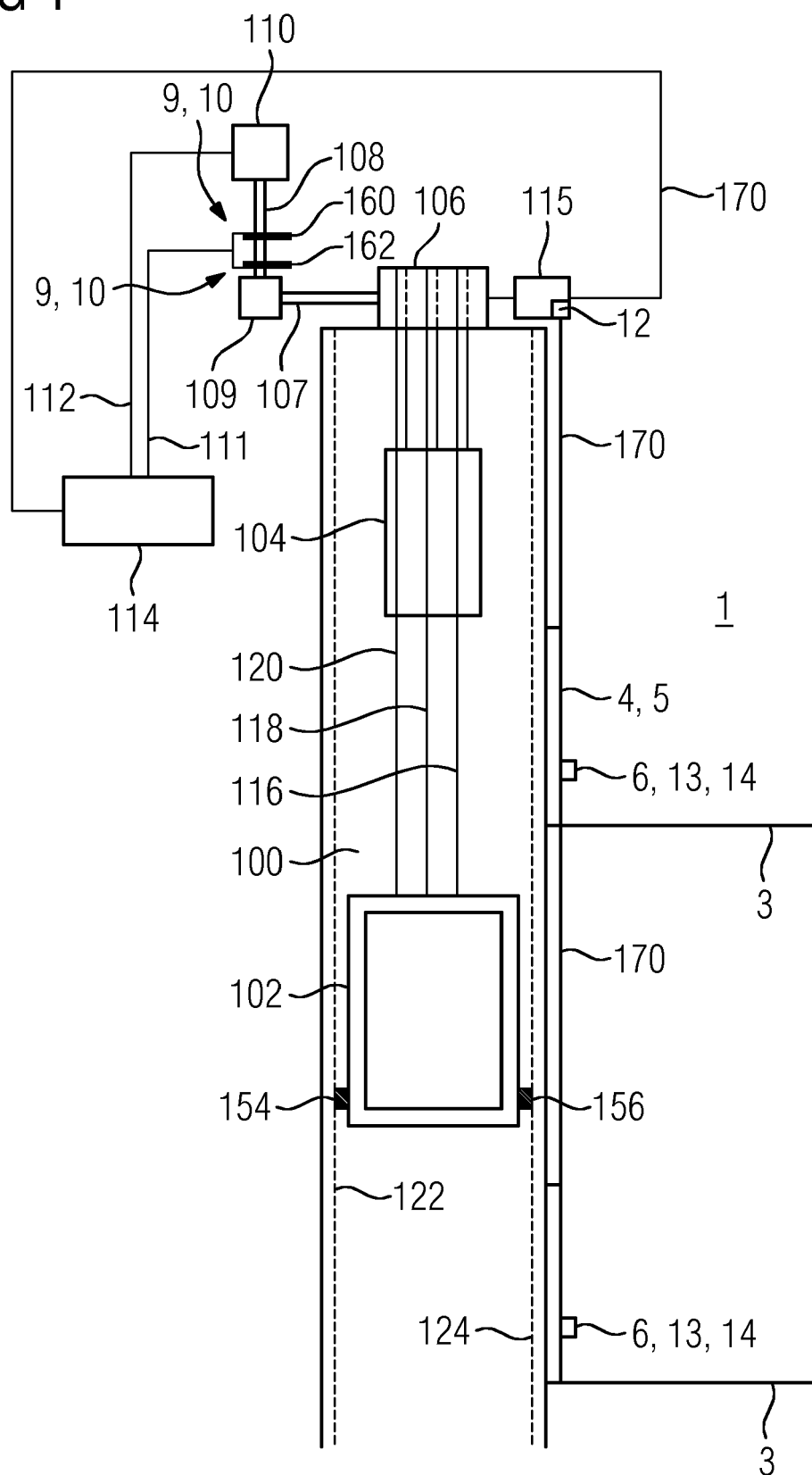


FIG 2

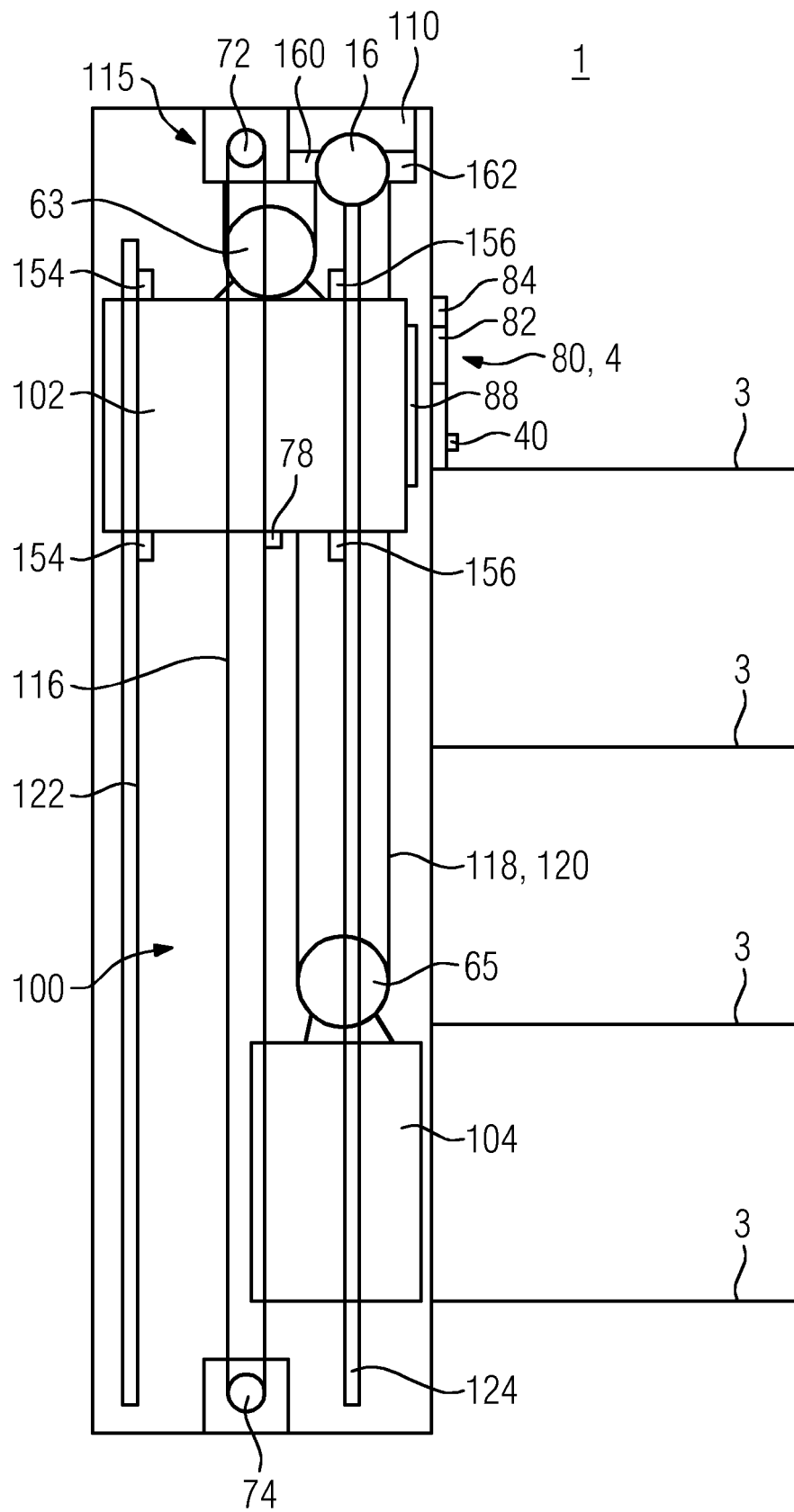
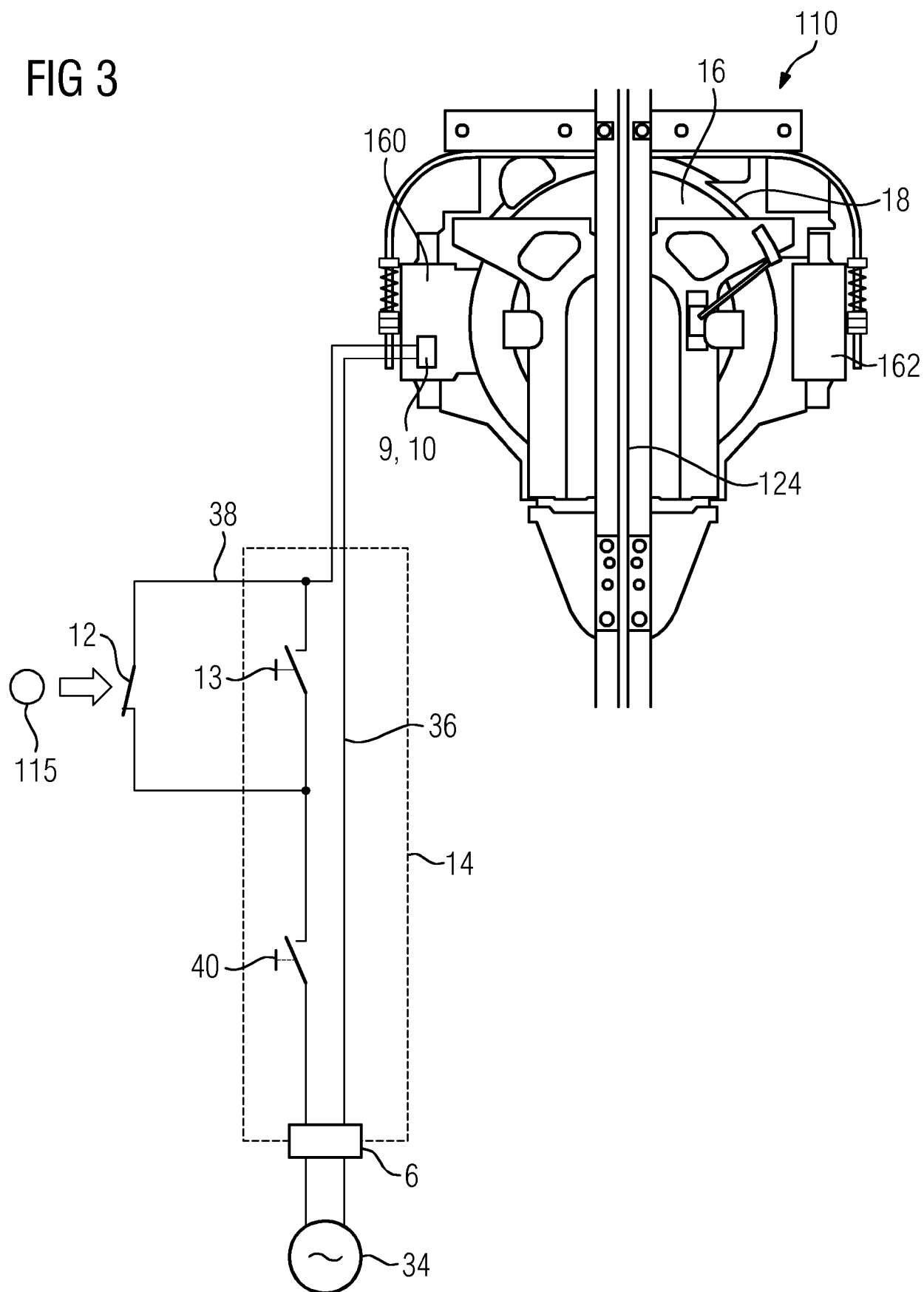


FIG 3



**PARTIAL EUROPEAN SEARCH REPORT**

Application Number

under Rule 62a and/or 63 of the European Patent Convention.
This report shall be considered, for the purposes of
subsequent proceedings, as the European search report

EP 16 19 8217

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	JP 2008 230757 A (TOSHIBA ELEVATOR CO LTD) 2 October 2008 (2008-10-02)	1,5-10, 14	INV. B66B5/02
Y	* paragraphs [0013] - [0015]; figure 1 * -----	2-4,11	
X	JP 2001 019309 A (HITACHI BUILDING SYS CO LTD) 23 January 2001 (2001-01-23)	1,5-10, 14	
Y	* paragraphs [0018], [0019]; figure 1 * -----	2-4,11	
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Y	* paragraph [0016]; figure 4 * -----	2-4,11	
Y	WO 2016/113471 A1 (KONE CORP [FI]) 21 July 2016 (2016-07-21) * page 12, lines 22-34; figure 2 * -----	2-4,11	
A	US 3 610 371 A (ABBOTT PAUL DOUGLAS) 5 October 1971 (1971-10-05) * the whole document *	1-11,14	
A	WO 2008/072023 A1 (OTIS ELEVATOR CO [US]; SIRIGU GERARD [FR]; DUKACZ OLIVIER [FR]; LEJON) 19 June 2008 (2008-06-19) * the whole document * -----	1-11,14	TECHNICAL FIELDS SEARCHED (IPC) B66B
INCOMPLETE SEARCH			
The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out. Claims searched completely : Claims searched incompletely : Claims not searched : Reason for the limitation of the search: see sheet C			
Place of search		Date of completion of the search	Examiner
The Hague		29 June 2017	Lenoir, Xavier
CATEGORY OF CITED DOCUMENTS		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	
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			

EPO FORM 1503 03/82 (P04E07)

**INCOMPLETE SEARCH
SHEET C**

Application Number

EP 16 19 8217

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Claim(s) completely searchable:
1-11, 14

10

Claim(s) not searched:
12, 13, 15

Reason for the limitation of the search:

15

The search report has been drawn up on the basis of the first independent claim of each category (Rule 62a(1) EPC):

Claims 1 to 11 and 14 were searched.

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The applicant's attention is drawn to the fact that the application will be further prosecuted on the basis of subject-matter for which a search has been carried out and that the claims should be limited to that subject-matter at a later stage of the proceedings (Rule 62a(2) EPC).

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

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-06-2017

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REFERENCES CITED IN THE DESCRIPTION

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