



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
27.05.2009 Bulletin 2009/22

(51) Int Cl.:
B66B 1/34 (2006.01) B66B 5/00 (2006.01)

(21) Application number: **07121389.6**

(22) Date of filing: **23.11.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK RS

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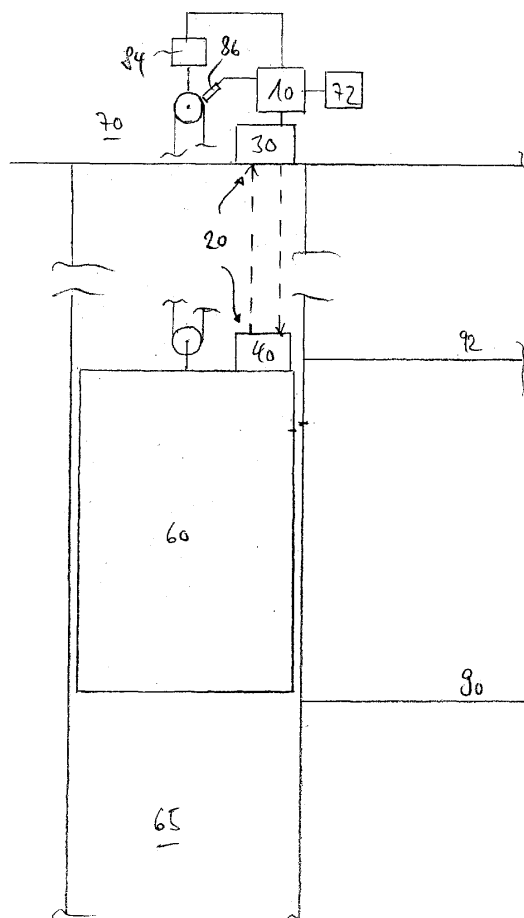
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(54) **Monitoring device for a lift, lift and method for monitoring a lift**

(57) The invention relates to a monitoring device for a lift comprising a control unit (10) and a safety device (20) with several safety units (30, 40) for monitoring the function of the lift. The safety device (20) is connected to the control unit (10). Further, the control unit (10) and the safety device (20) communicate with each other via a wireless optical data communication. Furthermore, the invention relates to a lift and to a method for monitoring a lift comprising a lift car.

Fig. 1



Description

[0001] The invention relates to a monitoring device for a lift, a lift and a method for monitoring a lift.

[0002] A conventional lift system comprises a central control unit located in the machine room or in the shaft top. Further, a safety system is used to detect an unsafe condition of the function of the lift. The safety system and the control unit communicate with each other via a communication bus. The safety device comprises a plurality of switches, contacts and sensors linked together in a serial circuit in order to build a so called safety chain. An operation of any safety means within the chain will disconnect the motor drive from the main power supply in order to stop the lift car. In order to connect the safety means of the lift car with the machine room a flexible travelling cable is used. However, the data transfer capacity of long cables is often limited. Further, the material costs for such cables are high.

[0003] It is an object of the invention to improve the communication between the safety system and the control unit, so that an easy and rapid data transfer is possible.

[0004] According to the present invention a monitoring device for a lift comprising a control unit and a safety device with several safety units for monitoring the function of the lift, wherein the safety device is connected to the control unit, is characterised in that the control unit and the safety device communicate with each other via a wireless optical data communication.

[0005] Preferred embodiments of the monitoring device according to the invention are described in claims 2 to 8.

[0006] In one such preferred embodiment the wireless optical data communication is laser based. Preferably, a laser beam unit providing at least one laser beam is used.

[0007] According to a preferred embodiment the safety device comprises a first safety unit and a second safety unit, wherein the first safety unit comprises several safety means, which are serially connected together to build a first safety chain and wherein the second safety unit comprises several safety means, which are serially connected together to build a second safety chain. Hence, the at least two safety chains are electrically separated but optically coupled.

[0008] In a further embodiment the first safety unit comprises at least one controller and/or the second safety unit comprises at least one controller. Preferably, the first safety unit is linked to the control unit and/or the second safety unit is linked to a lift car.

[0009] According to a further preferred embodiment the control unit is logically connected with a first safety unit and with the second safety unit via the wireless optical communication.

[0010] Further, the first safety unit and/or the second safety unit comprises at least one transceiver having a light emitting unit and/or a light receiving unit. Preferably, the light emitting unit is capable of providing at least one

laser beam and/or the light receiving unit is capable of receiving at least one laser beam.

[0011] According to a preferred embodiment of the invention the fixed lift nodes, for example located in the machine room or the shaft pit, and the moving nodes located in the lift car communicate with each other via a laser based wireless communication path or network. Preferably, two or more control area networks (CAN) are provided, which are electrically separated but optically coupled.

[0012] According to the present invention a lift comprises a monitoring device according to one of the claims 1 to 8. Preferred embodiments of the lift are described in claims 10 to 11.

[0013] In a preferred embodiment the safety device comprises several safety units for monitoring the function of the lift, wherein a first safety unit is linked to the lift car and a second safety unit is linked to the control unit. In a further embodiment the first safety unit is mounted to the lift car and the second safety unit is positioned in or close to a machine room of the lift.

[0014] The invention further relates to a method for monitoring a lift comprising a lift car, a control unit and a safety device with several safety units for monitoring the function of the lift, wherein the safety device is connected to the control unit, characterised in that the control unit and the safety device communicate with each other via a wireless optical data communication.

[0015] Preferred embodiments of the method are described in claims 13 to 14.

[0016] In a preferred embodiment, the wireless optical data communication is laser based. Further, the safety device can comprise a first safety unit and a second safety unit, wherein the first safety unit communicates with the control unit and the second safety unit communicates with the first safety unit.

[0017] One advantage of the monitoring device, the lift and/or the method according to the invention is the reduction of weight and cost in comparison to the conventional wired communication network path between the car and the machine room via a travelling cable. In case of combination with wireless car power supply feeding it is possible to eliminate the travelling cable. The wireless optical can be used for tall buildings and the same lift safety device can be installed in all lift systems.

[0018] A further advantage is to increase the system reliability via eliminating typical problems of voltage drops in the safety chain namely in mid to high travelling heights.

[0019] A further advantage is that much higher CAN bus baud rates between the nodes are possible. Hence, the system performance and reliability can be improved. Moreover, increasing the baud rate will also increase the response time of safety relevant nodes. Baud rates of 1 Mbps can be achieved.

[0020] By using a laser based communication also very tall buildings are possible and even elevators with open shafts, normally influenced by the wind, are possi-

ble.

[0021] In the following the invention is further described with reference to the figures:

Fig. 1 is a schematic section through a building with a lift having a monitoring device, and

Fig. 2 is a schematic block diagram of the safety device of Fig. 1.

[0022] Fig. 1 shows a lift with a lift car 60 movably within a shaft 65 of a building. The building comprises several landing floors, for example floors 90, 92. In a machine room 70 on the top of the shaft 65, a drive unit 84 and a brake unit 86 are mounted.

[0023] A monitoring device for the lift comprises a control unit 10 and a safety device 20. In the present case, the safety device 20 has a first safety unit 30 and a second safety unit 40, which are shown in detail in Fig. 2. In a further embodiment (not shown) the safety device 20 can comprise a plurality of safety units.

[0024] The first safety unit 30 and the second safety unit 40 provide two separated control area networks (CAN), which are electrically separated, but optically coupled. In order to build a first safety chain, the first safety unit 30 comprises several safety means 36, 37, 38, 39, which are serially connected. To build a second safety chain, the second safety unit 40 comprises several safety means 46, 47, 48, 49. Further, the first safety unit 30 comprises two CAN controllers 32, 33 and a microcontroller 31 and the second safety unit 40 comprises two CAN controllers 42, 43 and a microcontroller 41. The two controllers 32, 33 drive a transceiver 34, which in turn drives an optical transceiver 35. Further, the two controllers 42, 43 drive a transceiver 44, which in turn drives an optical transceiver 45.

[0025] As can be seen from Fig. 1, the first safety unit 30 is linked to the control unit 10 and the second safety unit 40 is linked to the car 60. The first safety unit 30 and the second safety unit 40 communicate with each other via a wireless optical data communication. Preferably, this wireless optical data communication is laser based. For example, two laser beams are provided for this communication path. The two laser beams can carry data objects.

[0026] As shown in Fig. 2, the optical transceiver 35 has a light emitting unit 50 and a light receiving unit 52 and the optical transceiver 45 has a light emitting unit 54 and a light receiving unit 56. Thus, the light emitting unit 50 sends communication data to the light receiving unit 56 and the light emitting unit 54 sends communication data to the light receiving unit 52. The transceiver 34 connects the optical transceiver 35 with the controllers 31, 32, 33. Also transceiver 44 connects the optical transceiver 45 with the controllers 41, 42, 43.

[0027] As shown in Fig. 1, a frequency controller 72 is linked to the control unit 10. Fig. 2 shows that a main car controller 80 and a car position controller 82 are linked

to the lift car 60.

[0028] The data sent via the communication network between safety units 30 and 40 contains safety relevant data regarding the function of the lift. The safety device 20 is used to detect an unsafe condition of the function of the lift. The safety device 20 and the control unit 10 communicate with each other via the wireless optical communication path. The safety device 20 comprises a plurality of switches, contacts and sensors linked together in a serial circuit in order to build at least one safety chain.

[0029] In case that at least one of the safety means 36 to 39, 46 to 49 of the safety chains delivers an error signal, the optical data communication between the first safety unit 30 and the second safety unit 40 is interrupted. Then the drive unit 84 is disconnected from the main power supply. As a result, the drive unit 84 is stopped and/or the brake unit 86 is activated to stop the lift car 60.

[0030] For example, if the safety unit 40 detects that the car door contact as one of the safety means opens during a trip, it will communicate its state to the safety unit 40, which in turn will open the safety chain disabling the drive energy flow and therefore stopping the drive unit 84 and the car 60. To reduce system cost the safety unit 30 may be integrated in the control unit 10 and the safety unit 40 may be integrated in the main car controller 80.

Claims

1. Monitoring device for a lift comprising a control unit (10) and a safety device (20) with several safety units (30, 40) for monitoring the function of the lift, wherein the safety device (20) is connected to the control unit (10), **characterised in that** the control unit (10) and the safety device (20) communicate with each other via a wireless optical data communication.
2. Monitoring device according to claim 1, **characterised in that** the wireless optical data communication is laser based.
3. Monitoring device according to claim 1 or 2, **characterised in that** the safety device (20) comprises a first safety unit (30) and a second safety unit (40), wherein the first safety unit (30) comprises several safety means (36, 37, 38, 39), which are serially connected together to build a first safety chain and wherein the second safety unit (40) comprises several safety means (46, 47, 48, 49) which are serially connected together to build a second safety chain.
4. Monitoring device according to one of the claims 1 to 3, **characterised in that** the first safety unit (30) comprises at least one controller (31, 32, 33) and/or the second safety unit (40) comprises at least one controller (41, 42, 43).

5. Monitoring device according to one of the claims 1 to 4, **characterised in that** the first safety unit (30) is linked to the control unit (10) and/or the second safety unit (40) is linked to a lift car (60). 5
6. Monitoring device according to one of the claims 1 to 5, **characterised in that** the control unit (10) is logically connected with the first safety unit (30) and/or with the second safety unit (40) via the wireless optical communication. 10
7. Monitoring device according to one of the claims 1 to 6, **characterised in that** the first safety unit (30) and/or the second safety unit (40) comprise at least one transceiver (34, 35, 44, 45) having a light emitting unit (50, 54) and/or a light receiving unit (52, 56). 15
8. Monitoring device according to one of the claims 1 to 7, **characterised in that** the light emitting unit (50, 54) is capable of providing at least one laser beam and/or the light receiving unit (52, 56) is capable of receiving at least one laser beam. 20
9. Lift **characterised by** a monitoring device according to one of the claims 1 to 8. 25
10. Lift according to claim 9, **characterised in that** the safety device (20) comprises several safety units (30, 40) for monitoring the function of the lift, wherein a first safety unit (30) is linked to the control unit (10) and a second safety unit (40) is linked to the lift car (60). 30
11. Lift according to claim 9 or 10, **characterised in that** the first safety unit (30) is positioned in or close to a machine room of the lift and the second safety unit (40) is mounted to the lift car (60). 35
12. Method for monitoring a lift comprising a lift car (60), a control unit (10) and a safety device (20) with several safety units (30, 40) for monitoring the function of the lift, wherein the safety device (20) is connected to the control unit (10), **characterised in that** the control unit (10) and the safety device (20) communicate with each other via a wireless optical data communication. 40
45
13. Method according to claim 12, **characterised in that** the wireless optical data communication is laser based. 50
14. Method according to claim 12 or 13, **characterised in that** the safety device (20) comprises a first safety unit (30) and a second safety unit (40), wherein the first safety unit (30) communicates with the control unit (10) and the second safety unit (40) communicates with the first safety unit (30), preferably via a wireless optical data communication. 55

Fig. 1

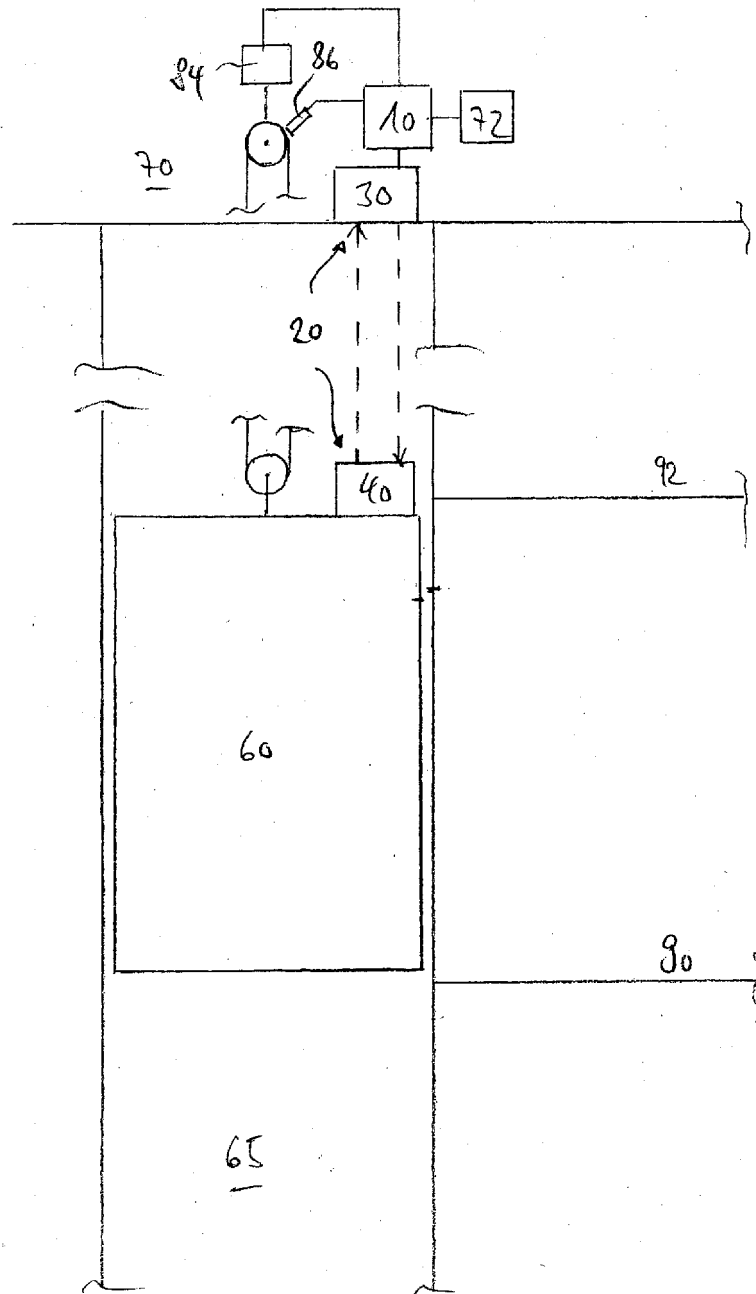
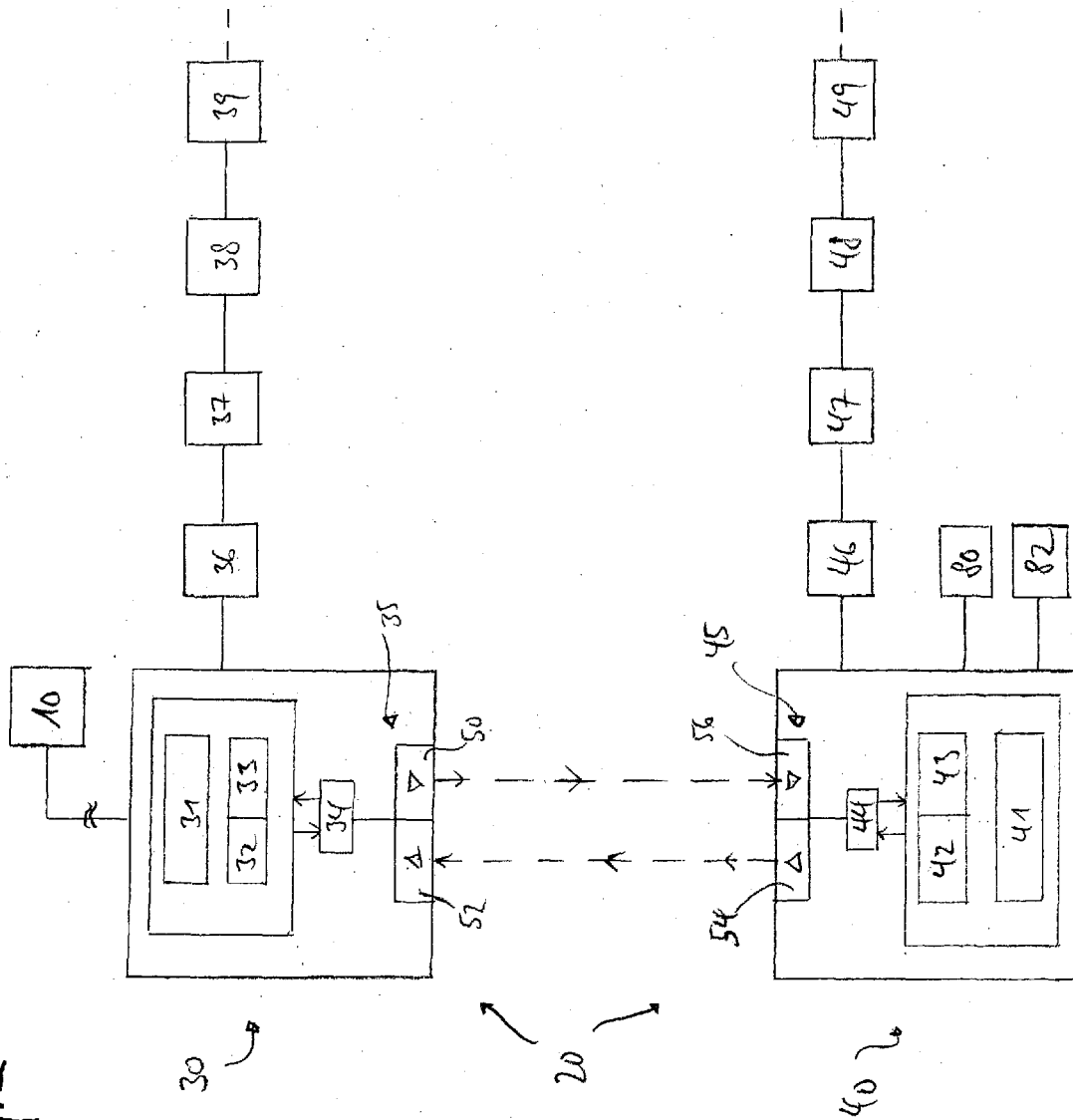


Fig. 2





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	US 2003/057030 A1 (YUMURA TAKASHI [JP] ET AL) 27 March 2003 (2003-03-27) * paragraph [0029] - paragraph [0035]; figures 1,4 *	1-14	INV. B66B1/34 B66B5/00
X	WO 2006/057898 A (OTIS ELEVATOR CO [US]; URATA MASAZUMI [JP]) 1 June 2006 (2006-06-01) * the whole document *	1	
A		2-14	
X	US 2006/157304 A1 (PUSTELNIAK RICHARD [US]) 20 July 2006 (2006-07-20) * paragraph [0016]; figure 1 *	1	
A		1-14	
X	EP 1 762 531 A (MITSUBISHI ELECTRIC CORP [JP]) 14 March 2007 (2007-03-14) * the whole document *	1	
X	WO 02/46081 A (THYSSEN ELEVATOR CAPITAL CORP [US]) 13 June 2002 (2002-06-13) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC) B66B
A		1-14	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 May 2008	Examiner Trimarchi, Roberto
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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

EP 07 12 1389

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
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23-05-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2003057030 A1	27-03-2003	NONE	
WO 2006057898 A	01-06-2006	JP 2006143443 A	08-06-2006
US 2006157304 A1	20-07-2006	NONE	
EP 1762531 A	14-03-2007	NONE	
WO 0246081 A	13-06-2002	AU 2018502 A	18-06-2002
		CA 2430187 A1	13-06-2002
		EP 1339627 A2	03-09-2003
		JP 2004515428 T	27-05-2004
		US 2002071158 A1	13-06-2002