[19]	INTELLECTUAL PROPERTY PHILIPPINES				
[12]	INVENTION PUBLICATION				
[11]	Publication Number:	12014501214	Document Code:	B1
[22]	Publication Date:	8/9/2014		
[21]	Application Number:	12014501214	Document Code:	A
[22]	Date Filed:	29/5/2014		
[54]	Title:	FAULT DIAGNOSIS OF A LIFT SYSTEM AND THE COMPONENTS THEEREOF BY MEANS OF A SENSOR		
[71]	Applicant(s):	INVENTIO AG		
[72]	Inventor(s):	CHRISTIAN STUDER HANS KOCHER MIRCO ANNEN THOMAS NEUENSCHWANDER		
[30]	Priority Data:	14/12/2011 EP20110193507		
[51]	International Class 8:	B66B 5/00 20060101AFI20170614BHPH;		
[57]	Abstract:	The invention relates to a lift installation (10) comprising a sensor (8) by which vibrations generated during operation of the lift installation (10) are detectable and an evaluating circuit (9), which is connected with the sensor (8) and by which the vibrations detected by the sensor can be evaluated. In that case, the detected vibrations can be compared by means of the evaluating circuit (9) with a predeterminable operating value and a predeterminable threshold value. The invention equally embraces a method of operating this lift installation (10).		

INTELLECTUAL PROPERTY OFFICE RECEIVED 2016 JAN 22 PM 4:25

FAULT DIAGNOSIS OF A LIFT INSTALLATION AND COMPONENTS THEREOF BY MEANS OF SENSOR

The present invention relates to a lift installation with a sensor for detecting vibrations and a method of operating such a lift installation, according to the subject of the claims.

A lift installation comprises movable mechanical components such as a drive, cage and shaft doors, cage door drive, a cage door closing mechanism and guide rollers or guide shoes, the faultless functional capability of which is to be ensured. For that purpose the individual components are serviced at regular intervals in time and kept serviceable. The cost for such maintenance operations is relatively inefficient, since the maintenance intervals are fixedly preset and are not oriented to the effective utilisation of an actual lift installation and the components thereof.

A reliable indicator for the degree of wear of a moving mechanical component is represented by the degree of vibrations. In normal permissible operation a certain degree of vibrations is not exceeded. With progressive wear of a component the vibrations noticeably increase. If a predeterminable degree of vibrations is exceeded, then the point in time has been reached to restore the component to serviceability or to exchange it.

Vibrations propagate as sonic or solid-borne soundwaves and are detectable by means of a sensor. As sonic waves there are to be understood here waves which propagate in a gaseous medium such as air and by solid-borne soundwaves there are to be understood here waves which propagate in a solid medium such as steel or iron. Sensors designed as microphones, acceleration pick-ups or voltage measuring sensors are suitable for detection of sonic waves and solid-borne soundwaves. An evaluating circuit is connected with one or more sensors. The evaluating circuit and at least one associated sensor form a monitoring unit. The evaluating circuit comprises a processor by which the evaluating circuit evaluates the detected sonic waves or solid-borne soundwaves. The detected sonic waves or solid-borne soundwaves can be evaluated in the evaluating circuit with respect to the amplitude and frequency thereof and compared with a predetermined value. Conclusions about the functional integrity of the lift installation and its components can be made therefrom. In the case of exceeding a specific threshold value, a change-of-state alarm can be triggered. Correspondingly, maintenance operations can be undertaken efficiently at the lift installation, namely only when a component actually has to be serviced. Patent Specification WO 2009/126140 A1 shows, by way of example, such an evaluating and comparison method.

However, the evaluating reliability is not discussed in WO 2009/126140 A1, since vibrations of the lift installation are based not only on movable components in normal operation. Thus, movements of passengers in the cage or a cage carrying out an emergency stop can also produce vibrations, which possibly exceed a threshold value and thus trigger a change-of-state alarm. Accordingly, monitoring of this kind is susceptible to erroneous triggerings of the change-of-state alarm.

A further unsolved problem is represented by the equipping of an existing lift installation with a monitoring unit, since the existing lift control of the lift installation is not intended for the purpose of evaluating data of the monitoring unit or even for communicating status data, such as operational state of the lift installation, speed or position of the cage, to the monitoring unit. WO 2009/126140 A1 also does not comment on this problem.

Accordingly, the invention is based on the object of developing an improved and more reliable monitoring unit for monitoring the components of a lift installation, particularly by means of detecting and evaluating vibrations.

In a further aspect, an existing lift installation shall be able to be retrofitted in simple manner with a monitoring unit for monitoring the components.

The object is fulfilled by a lift installation having a sensor and an evaluating circuit. In that case, vibrations generated during operation of the lift installation are detectable by the sensor. The evaluating circuit is connected with the sensor. The vibrations detected by the sensor can be evaluated by the evaluating circuit. The lift installation is distinguished by the fact that the detected vibrations can be compared by means of the evaluating circuit with a predeterminable operating value and a predeterminable threshold value.

The operating value represents a value of vibrations which occur in acceptable normal operation of the lift installation. The threshold value, thereagainst, represents a value of vibrations which is unacceptable.

In disturbance-free operation with intact functional integrity of the components the generated vibrations lie in a characteristic frequency range and/or amplitude range. In the case of progressive wear and ageing of the components, this frequency range or amplitude range correspondingly changes. These changes in vibration behaviour can be detected by the sensor via sonic waves or solid-borne soundwaves.

The vibrations are picked up by the sensor as sonic waves or solid-borne soundwaves, passed on to the evaluating circuit and spectrally evaluated there. This means that the vibrations are evaluated with respect to amplitude and frequency. The thus-evaluated vibrations are compared with the operating value and the threshold value. The operating value represents a vibration value such as usually occurs in normal operation of the lift installation. By contrast, the threshold value represents an impermissible vibration value which indicates faulty functioning or excessive wear of a component. The evaluating circuit has for this evaluation at least one processor which undertakes the spectral analysis and the value comparison and a memory unit in which the operating value and the threshold value are stored.

An advantage of this two-stage value comparison resides in establishing the operating value, since it can be ascertained by that without feedback from the lift control whether the lift installation is in operation or at standstill. This is advantageous particularly in a case of retrofitting to lift installations. Thus, for example, the evaluating circuit during standstill of the lift installation can independently decide whether components of the monitoring unit which are not needed can be placed in a standby mode and awakened from the standby mode again only when the evaluating circuit ascertains an operating value.

In a further aspect a quality characteristic can be calculated by means of the evaluating circuit from the comparison of the vibrations with the operating value and threshold value. The quality characteristic is calculated from the ratio between the period of time in which the threshold value is reached or exceeded and the period of time in which the operating value is reached or exceeded. The evaluating circuit compares this quality characteristic with a predeterminable critical quality characteristic. The critical quality characteristic is preferably filed in the memory unit. If the critical quality characteristic is reached or exceeded, then a state alarm can be triggered. The change-of-state alarm indicates that at least one component of the monitored lift installation is to be replaced or repaired.

Thanks to calculation of the quality characteristic and the comparison with a critical quality characteristic, erroneous triggerings of the change-of-state alarm are largely avoidable, since causes occurring once, such as an emergency stop or movements of passengers in the cage which lead to vibrations lying above the threshold value, can be filtered out over time by the evaluation of the threshold value. Such unique events thus do not automatically lead to an undesired change-of-state alarm. It is also ensured that during operation of the lift installation only vibrations lying above the threshold value over a longer period of time trigger a change-of-state alarm.

In a further aspect a change-of-state alarm can be triggered in the case of exceeding the operating value for a predeterminable period of time. The evaluating circuit can thus test the functional capability of the sensor and the connection with the sensor, since each lift installation has a specific use characteristic. Thus, a lift installation in an office building is continuously used during the working day and is stationary at night and at weekends apart from individual journeys. Based on that, it can be assumed that the lift installation over a weekend is stationary for approximately 62 hours, namely Friday night from about 1800 hours to Monday morning at about 0800 hours. On weekdays standstill time can be correspondingly reduced to approximately 14 hours. In a case of a larger dwelling with numerous apartments, thereagainst, the lift installation is typically constantly used on a daily basis, thus also at the weekend over the day until in the latter part of the evening. Longer standstill times are primarily to be expected over the night between approximately 2200 and 0600 hours. Accordingly, in the case of a larger dwelling the standstill times are at most approximately 8 hours. The evaluating circuit can now be configured so that if vibration signals are not received by an associated sensor for a specific time period of approximately 8, 14 or more hours, a change-of-state alarm is triggered.

In particular, in this form of change-of-state alarm the reason for triggering, namely the failure of the sensor or the interruption of a connection with the sensor, can also be communicated, which simplifies localisation of the disturbance for a maintenance engineer.

In a particularly preferred embodiment the evaluating unit comprises a time data unit. The evaluating circuit can thus preset the time duration up to triggering of a change-of-state alarm on the basis of absence of the operating value in dependence on the time of day and/or date. Thus, a state-change alarm can be triggered over the day in a strongly frequented lift installation when the operating value is fallen below during at least one hour. In a smaller dwelling, thereagainst, triggering of a change-of-state alarm can take place only after several weeks, since the lift installation can, for example, be at standstill during the summer holidays for a longer period of time.

Yet a further aspect relates to establishing the operating value by means of a learning travel of the lift installation. This learning travel is performed after installation of the evaluating circuit and the associated sensor. In that case, the sensor picks up vibrations generated during this learning travel and the evaluating circuit stores these vibrations as operating value in the memory unit.

An advantage in the case of detection of the operating value by means of a learning travel resides in the fact that always the same monitoring unit, consisting of sensor and evaluating circuit, can be installed regardless of the type of lift installation. This reduces the co-ordination outlay in configuring and ordering a monitoring unit. In addition, mounting of a monitoring unit with an incorrectly filed operating value is excluded.

The operating value can alternatively be filed in advance in the memory unit of the evaluating circuit in dependence on the type of lift installation. In that case, the learning travel is redundant.

The evaluating circuit preferably calculates the threshold value after detection of the operating value by means of the learning travel. In that case, the operating value serves as a starting position. The amplitudes, which are recorded for the operating value, of the frequencies in the spectral analysis are in that case multiplied by a predeterminable factor. Finally, the calculated threshold value is stored in the memory unit.

The threshold value can alternatively be filed in advance in the memory unit of the evaluating circuit in dependence on the type of lift installation.

According to a further aspect of the method the lift installation is provided for a maintenance operation when a change-in-state alarm occurs. In that case a maintenance engineer is notified to service the lift installation. This increases the efficiency of the maintenance operations, since the maintenance operations are carried only when a component is actually to be serviced or exchanged.

The invention is clarified and further described in the following by embodiments and drawings, in which:

Fig. 1 shows an exemplifying form of embodiment of the lift installation with a sensor for detecting vibrations generated by faulty functioning of a lift component at the counterweight;

Fig. 2 shows a schematic illustration of the monitoring unit; and

Fig. 3 shows a spectral analysis, by way of example, of vibrations detected by the sensor.

Fig. 1 shows a lift installation 10. This lift installation comprises a cage 1, a counterweight 2, a supporting and driving means 3, at which the cage 1 and the counterweight 3 are suspended in a 2:1 relationship and a drive pulley 5.1. The drive pulley 5.1 is coupled with a drive unit, which is not illustrated in Fig. 1 for reasons of clarity, and is in operative contact with the supporting and driving means 3.

The cage 1 and the counterweight 2 are movable substantially along vertically oriented guide rails by means of a rotational movement of the drive pulley 5.1, which transmits a drive torque of the drive unit to the supporting and driving means 3. For reasons of clarity, the guide rails are not illustrated in Fig. 1. The cage 1 and the counterweight 2 are guided at the guide rails by means of guide elements such as, for example, guide shoes or guide rollers.

The counterweight 2 is in that case suspended in a first loop of the supporting and driving means 3. The first loop is formed by a part of the supporting and driving means 3 lying between a first end 3.2 of the supporting and driving means 3 and a deflecting roller 5.2. The counterweight 2 is suspended at the first loop by means of a bearing 4.1. The counterweight 2 is for that purpose coupled with the bearing 4.1. In the illustrated example the bearing 4.1 represents the fulcrum of a counterweight support roller 4. In that case, the supporting and/or driving means 3 extends from a first fixing point, at which the first end 3.2 of the supporting and/or driving means is fastened, downwardly to the counterweight support roller 4. The supporting and/or driving means 3 loops around the counterweight support roller 4 through approximately 180° and then extends upwardly to the first deflecting roller 5.2.

The cage 1 is suspended in a second loop of the supporting and/or driving means 3. The second loop is formed by a part of the supporting and/or driving means lying between a second end 3.1 of the supporting and/or driving means 3 and a second drive pulley 5.1. The cage 1 is suspended at the second loop by means of two cage support rollers 7.1, 7.2. In that case the supporting and/or driving means 3 extends from a second fixing point, at which the second end 3.1 of the supporting and/or driving means is fastened, downwardly to a first cage support roller 7.1. The supporting and/or driving means 3 loops around the first cage support roller 7.1 through approximately 90°, then extends substantially horizontally to a second cage support roller 7.2 and loops around the second cage support roller 7.2 by approximately 90°. In addition, the supporting and/or driving means 3 extends upwardly to the drive pulley 5.1. From the drive pulley 5.1 the supporting and/or driving means 3 finally runs to the first deflecting roller 5.2.

The two fixing points at which the first and second ends 3.2, 3.1 of the supporting and/or driving means 3 are fastened, the deflecting roller 5.2, the drive pulley 5.1 and the guide rails of the cage 1 and the counterweight 2 are coupled indirectly or directly to a supporting structure, typically shaft walls.

The first end 3.2 of the supporting and/or driving means 3 is coupled with a sensor 8. The sensor 8 detects solid-borne soundwaves transmitted thereto by the supporting and/or driving means 3.

In an alternative form of embodiment the sensor 8 is coupled to a guide rail of the counterweight 2. In this regard, the sensor 8 detects solid-borne soundwaves which the guide rail transmits to the sensor 8.

The solid-borne soundwaves arise, during operation of the lift installation 10, due to vibrations of movable lift components. For example, vibrations occur due to the play between the guide elements of the cage 1 or the guide elements of the counterweight 2 and the corresponding guide rails, due to the drive unit, due to the play in the bearings of the deflecting roller 5.2, drive pulley 5.1, cage support rollers 7.1, 7.2 and counterweight support roller 4, and due to the vibrations of the supporting and driving means 3 itself.

In addition, vibrations can also be produced by movements of the cage and shaft doors, door drive and the like. Vibrations also occur at the bearing 4.1, at which the counterweight 2 is suspended, as well as at guide elements at which the counterweight 2 is guided at guide rails.

All above-mentioned components and further movable components which are not mentioned generate, in disturbance-free operation, vibrations lying in a characteristic frequency range and amplitude range. In the course of time, these lift components are subject to wear phenomena which are reflected in a changed frequency range and amplitude range.

The positioning of the sensor 8 in the region of the lift installation 10 is not limited to the arrangement, which is shown in the example, at the first end 3.2 of the supporting and/or driving means 3 and the detection of solid-borne soundwaves. The positioning of the sensor 8 as well as the form of detection of vibrations, namely with regard to sonic waves or solid-borne soundwaves, is oriented towards the components to be monitored and the design of the lift installation 10, particularly the monitoring unit, by the expert.

A sensor 8 designed for the purpose of detecting solid-borne soundwaves is, for example, positionable at the second end 3.1 of the supporting and/or driving means 3. Solid-borne sound waves transmitted at the cage side by way of the supporting and/or driving means 3 are thereby detectable. The support rollers 7.1, 7.2 of the cage 1 or further components which are arranged at the cage 1 can thus be monitored.

Moreover, a sensor for monitoring the motor or further drive parts, such as transmission or drive pulley 5.1, is positionable at the motor housing in order to detect the vibrations generated by the components to be monitored.

Solid-borne soundwaves are also detectable in the region of the cage 1, for example by sensors fastened to a door panel of a cage door, a housing of the door drive, a panel of a cage wall or a cage floor. In this way vibrations of movable components, such as the cage door, the cage support rollers 7.1, 7.2, the guide elements of the cage 1 or door drive are able to be measured.

Finally, movable components of a shaft door generate vibrations, which can be measured as, for example, solid-borne soundwaves at the door panels of a shaft door. A sensor can, for detection of such solid-borne soundwaves, preferably be arranged at a door panel.

A further group of sensors concerns sensors detecting sonic waves. Such sensors measure vibrations of components of the lift installation, which are detectable as air-pressure waves. The arrangement of these sensors is possible within the entire region of the shaft space wherever the vibrations of the components are detectable as sonic waves.

A sensor 8 preferably detects sonic waves or solid-borne soundwaves in a frequency range between 0 and 60,000 Hz, particularly between 0 and 2,500 Hz.

Fig. 2 shows a monitoring unit 20 comprising at least one sensor 8 and evaluating circuit 9. The sensor 8 transforms the detected sonic waves or solid-borne soundwaves into a signal and transmits this signal to an evaluating circuit 9 by way of a signal transmission path, typically a signal line or a cable-free connection. This evaluating circuit 9 is provided for evaluation of the detected sonic waves or solid-borne soundwaves.

The evaluating circuit 9 comprises at least one analog-to-digital converter 14, a processor 11, a memory unit 12 and a time data unit 13. Analog signals arriving from the sensor 8 are in that case firstly converted by the analog-to-digital converter 14 into a digital signal. This digital signal is communicated to the processor 11 and spectrally analysed by this, in particular the frequencies and amplitudes of the transmitted sonic waves or solid-borne soundwaves. The processor 11 determines frequency bands and establishes a measured signal intensity for each of these frequency bands. By frequency band there is to be understood here a frequency range, for example, a frequency range of 1,297 to 1,557 Hz (see Fig. 3). The signal intensity denotes a value dependent on the amplitude of the measured frequencies in this frequency band.

The processor 11 now establishes the measured signal intensity for each determined frequency band and compares this signal intensity in the frequency bands with a first signal intensity, which is filed for the corresponding frequency band in the memory unit 12, or a second signal intensity, which is filed for the corresponding frequency band in the memory unit 12 and which lies above the first signal intensity. The first signal intensity corresponds with the operating value and the second signal intensity with the threshold value.

The processor 11 counts the number of time steps in which the signal intensity in operation of the lift installation reaches or exceeds the operating value and the number of time steps in which the signal intensity in operation of the lift installation reaches or exceeds the threshold value. The statement of time steps necessary for that purpose is provided by the time data unit 13 to the processor 11.

Subsequently, the ratio of time steps with threshold value to time steps with operating value is determined in the processor 11 in a further evaluation. This ratio represents a quality characteristic of the vibrations. If this quality characteristic exceeds a defined critical quality characteristic then a change-of-state alarm is triggered. Occasional disturbances arising only for a short period of time or a few time steps are thus filtered out.

Fig. 3 shows an exemplifying evaluation of the vibrations. The measured frequencies are here divided up into ten frequency bands between 0 and 2,595 Hz. The signal intensity over time or time steps is recorded for each of these frequency bands. In Fig. 2 it is apparent that an operating value is predetermined for the frequency band 1,297 - 1,557 Hz. From this operating value a threshold value is calculated which here lies at, for example, 100% above the operating value. The threshold value can preferably be established at at least 10% above the operating value.

The signal intensity exceeds the permissible threshold value for the last-mentioned frequency band between the time steps 130 and 200, 200 and 250, 270 and 310, 315 and 380, 400 and 440 and 480 and 540. In the additional evaluation of the quality characteristic the critical quality characteristic is exceeded three times ("trip not ok"). A change-of-state alarm is triggered in these three cases. The signal intensity lies once above the threshold value. Since in this regard the calculated quality characteristic lies below the predetermined critical quality characteristic, no change-of-state alarm takes place. Exceeding of the threshold value is attributable to a single brief event, namely hitting against the side wall of the cage ("hit car wall"). This short event is filtered out by the additional evaluation of the quality characteristic.

The critical quality characteristic is here established at, for example, 10%. This means that of 100 time steps with a measured signal intensity lying above the operating value, 10 time steps with a measured signal intensity lying above the threshold value arise. Correspondingly, in the above-described evaluation the quality characteristic lies three times above the critical quality characteristic of 10% and the quality characteristic lies one below the critical quality characteristic of 10% notwithstanding exceeding of the threshold value.

The critical quality characteristic can preferably be fixed at at least 10%. In further preferred embodiments the critical quality characteristic can also be fixed at at least 20, 30, 40 or 50%. The critical quality characteristic is preferably filed in the memory unit 12 of the evaluating circuit 9.

The operating value is preferably determined by means of learning travel. During this learning travel the sensor 8 measures the vibrations which occur. A characteristic signal intensity for each frequency band is determined therefrom in the evaluating circuit 9 or the processor 11, for example a maximum signal intensity or a mean signal intensity. This signal intensity is then filed in the memory unit 12 of the evaluating circuit 9 as an operating value. The threshold value can preferably be calculated from the operating value and represents a characteristic signal intensity increased by a certain percentage. This threshold value can be calculated in the processor 11.

A further evaluation of the vibrations relates to self-testing of the sensor 8 or the signal transmission path. The evaluating circuit 9 or the processor 11 for that purpose counts the time steps in which the signal intensity does not reach the operating value. These time steps represent a time period in which the lift installation 10 is stationary. The processor 11 checks whether this time period exceeds a specific time value. For that purpose the processor 11 compares the time period with a time value filed in the control unit. If the processor 11 ascertains exceeding of this time value, then faulty functioning of the sensor is assumed. This time value is calculated on the basis of a characteristic use profile of the lift installation 10 and represents a time period in which the lift installation 10 would, with very high probability, have had to have been used. If this time value, is exceeded, a change-of-state alarm is similarly triggered.

The triggering of the change-of-state alarm has the consequence that the lift installation 10 is provided for a maintenance operation, in which the operational disturbance of the lift installation 10 is eliminated. For example, an alarm is communicated to a service centre, which instructs a service engineer to service the corresponding lift installation 10. Alternatively, when a change-of-state alarm is triggered the service engineer is directly notified by way of a mobile radio receiving system connected with the lift installation to service the corresponding lift installation 10.

For reasons of safety the lift installation may also be stopped when a change-of-state alarm occurs. In this case, a service engineer is similarly instructed to service the lift installation and place it back in operation.

The detection of vibrations by the sensor 8 and evaluation of those in the evaluating circuit 9 according to the above procedure is not restricted to the illustrated configuration of the lift installation 10. Thus, monitoring of the vibrations of movable components also relates to lift installation with a suspension ratio of 1:1, 3:1, etc., lift installations without a counterweight, lift installations with an engine room or in general lift installations in which movable components cause vibrations.

In departure from the illustrated example in Fig. 1 it is also possible to simultaneously position, at different places of the lift installation, several sensors which have a common evaluating circuit, are allocated in groups to an evaluating circuit or each have an own evaluating circuit.

Claims:

1. Lift installation (10) comprising

-a sensor (8) by which vibrations generated during operation of the lift installation (10) are detectable and

- an evaluating circuit (9), which is connected with the sensor (8) and by which the vibrations detected by the sensor can be evaluated,

wherein the detected vibrations can be compared by means of the evaluating circuit (9) with a predeterminable operating value and a predeterminable threshold value,

characterised in that a quality characteristic can be calculated by means of the evaluating circuit (9) from the comparison of the vibrations with the operating value and the vibrations with the threshold value, and that the quality characteristic is calculated from a ratio between the time period in which the threshold value is reached or exceeded and the time period in which the operating value is reached or exceeded.

2. Lift installation (10) according to claim 1, **characterised in that** a change-of-state alarm can be triggered if a critical quality characteristic is exceeded.

3. Lift installation (10) according to one of the preceding claims, **characterised in that** a change-of-state alarm can be triggered if the operating value is fallen below during a predeterminable time period.

4. Lift installation (10) according to claim 3, **charactrised in that** the time period is at least one hour.

5. Lift installation (10) according to claim 1, **characterised in that** the operating value can be established by means of a learning travel of the lift installation (10).

6. Method of operating a lift installation (10) with

- a sensor (8) and

- an evaluating circuit (9) connected with the sensor (8), wherein a sensor (8) detects vibrations generated during operation of the lift installation (10) and the evaluating circuit evaluates the vibrations detected by the sensor, wherein the evaluating circuit (9) compares the detected vibrations with a predeterminable operating value and a predeterminable threshold value,

characterised in that the evaluating circuit (9) calculates a quality characteristic from the comparison of the vibrations with the operating value and the vibrations with the threshold value and the quality characteristic is formed from a ratio between the time period in which the threshold value is reached or exceeded and the time period in which the operating value is reached or exceeded.

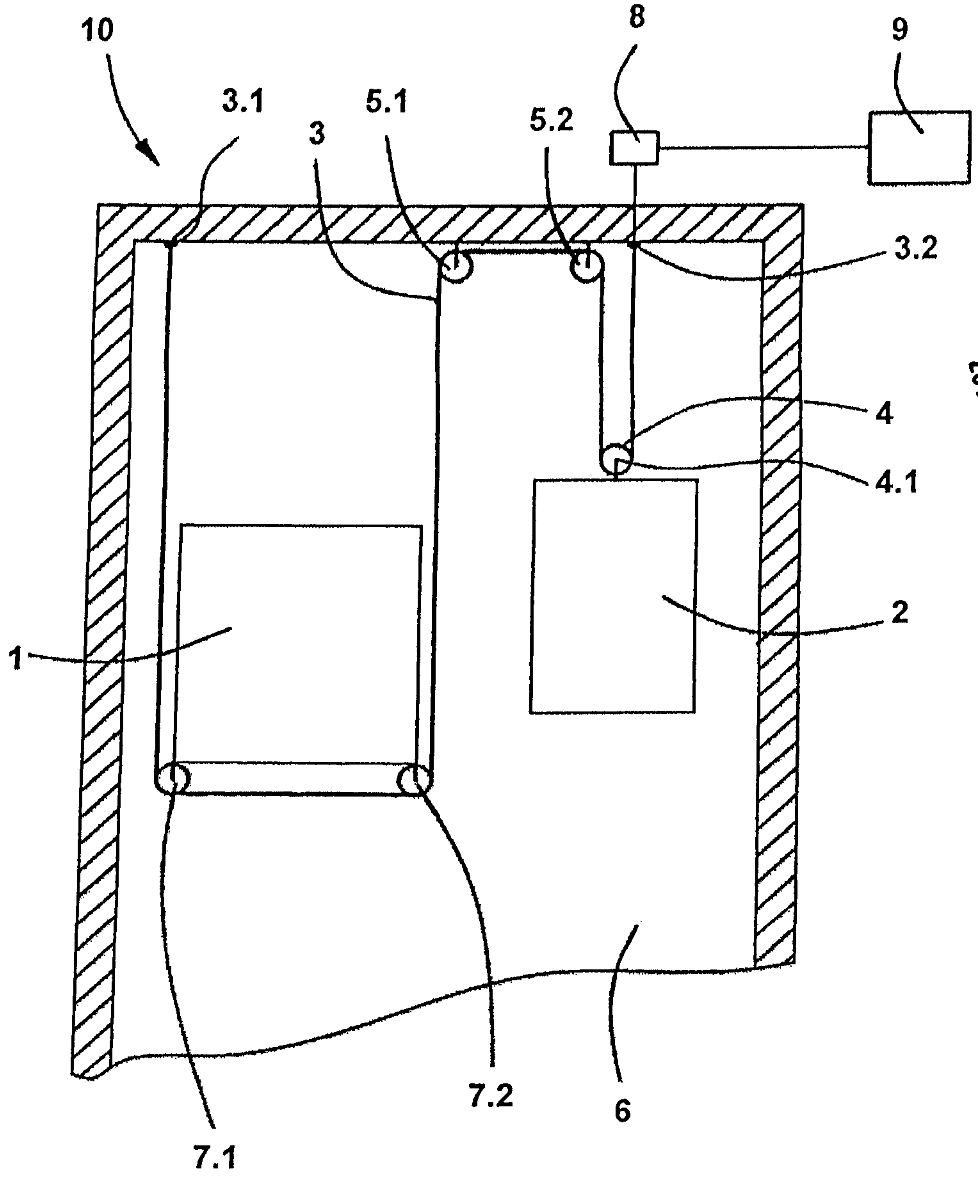
7. Method according to claim 6, **characterised in that** a change-of-state alarm is triggered if a critical quality characteristic is exceeded.

8. Method according to any one of claim 6 and 7, **characterised in that** a change-of-state alarm is triggered if the operating value is fallen below during a predeterminable time period.

9. Method according to claim 8, **characterised in that** a time period of at least one hour is predetermined.

10. Method according to claim 6, **characterised in that** the operating value is established by means of a learning travel of the lift installation (10).

Fig. 1



INTELLECTUAL PROPERTY OFFICE
RECEIVED
2016 JAN 22 PM 4:25

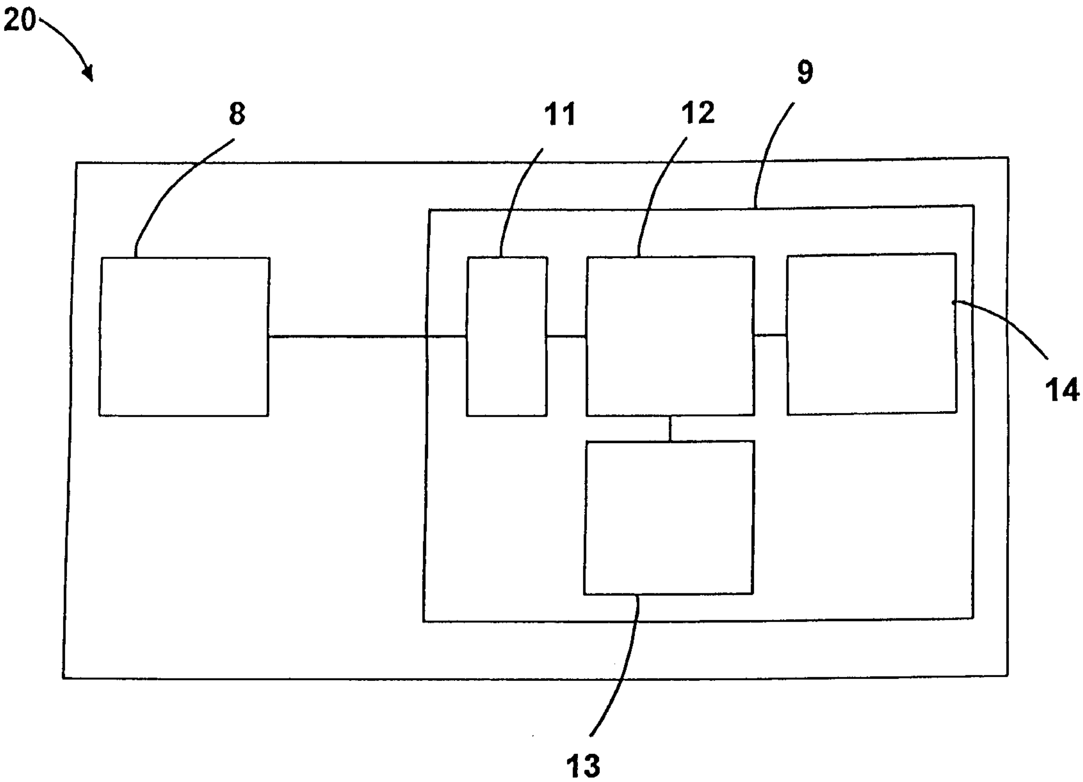
INVENTIO AG
Applicant

E. B. ASTUDILLO & ASSOCIATES

By:

ASTERIA I. MERCADO

Fig. 2



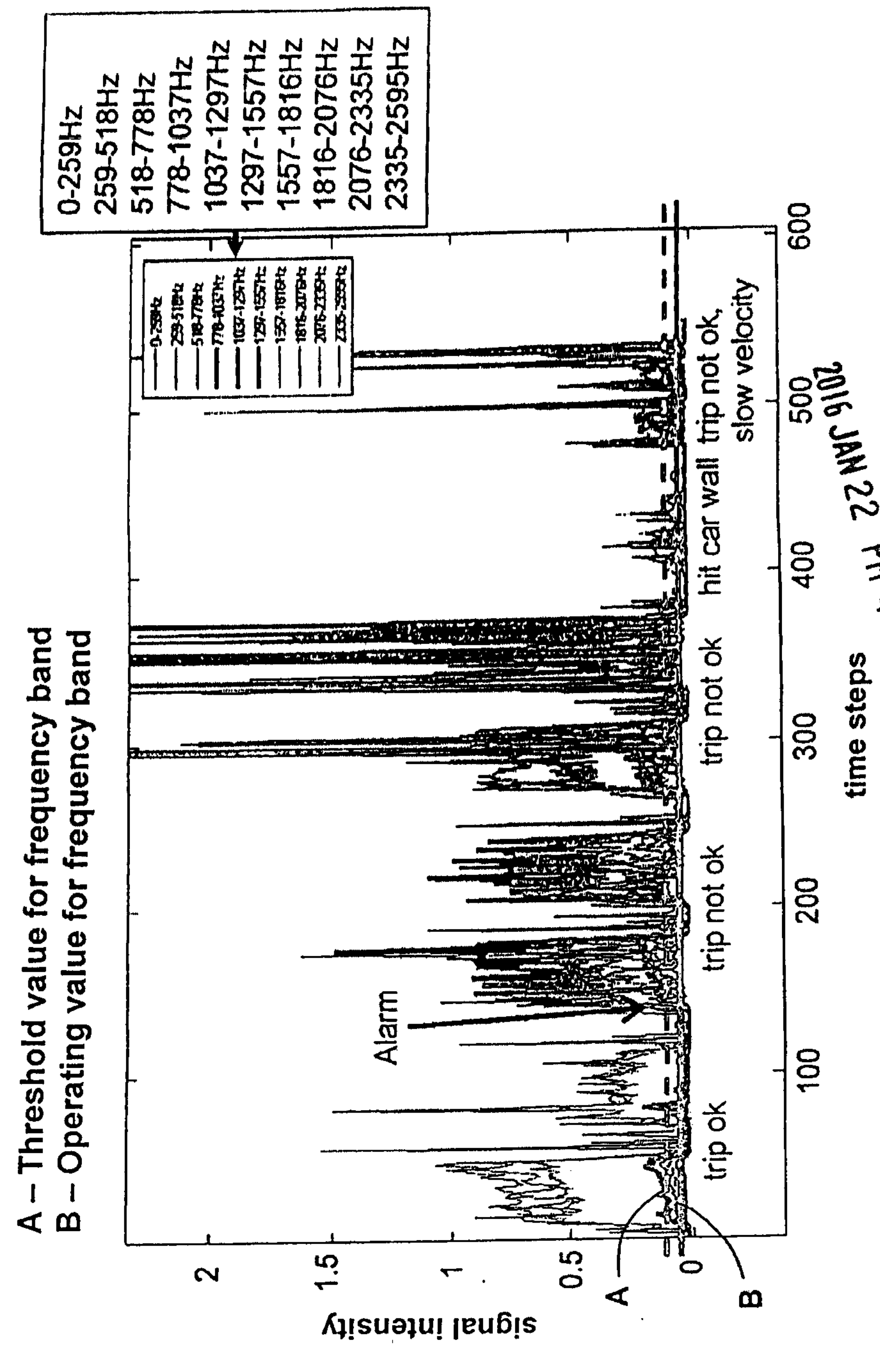
INVENTIO AG
Applicant

E. B. ASTUDILLO & ASSOCIATES

By:

ASTERIA I. MERCADO

Fig. 3



INTELLECTUAL PROPERTY OFFICE
RECEIVED
2016 JAN 22 PM 4:25

INVENTIO AG
Applicant

E. B. ASTUDILLO & ASSOCIATES

By:

ASTERIA I. MERCADO