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(71) Applicant: **AKADEMIA G0RNICZO-HUTNICZA IM. STANISLAWA STASZICA** [PL/PL]; Al. Mickiewicza 30, 30-059 Krakow (PL).

(72) Inventors: **KWAŚNIEWSKI, Jerzy;** ul. Heila 9/9, 30-654 Krakow (PL). **GRZYBOWSKI, Jozef;** ul. Poznanska 2C, 35-084 Rzeszow (PL). **KRAKOWSKI, Tomasz;** ul. Wroclawska 68/9, 30-017 Krakow (PL). **MOLSKI, Szymon;** ul. Os. Kombatantow 4/14, 31-630 Krakow (PL). **RUTA, Hubert;** ul. Wiosenna 14/1, 26-600 Radom (PL).

(74) Agent: **WOŹNIAK, Jolanta;** Kancelaria Rzecznikowska Patent, ul. Bobrzynskiego 31a/l, PL-30-348 Krakow (PL).

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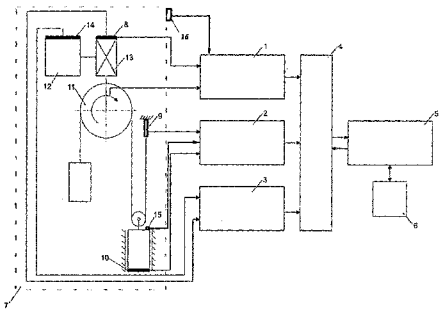
(54) Title: A DEVICE FOR ASSESSING THE POWER CONSUMPTION EFFICIENCY OF LIFTS AND A METHOD FOR EXAMINING THE POWER CONSUMPTION EFFICIENCY OF LIFTS



1. Processing block
2. Processing block
3. Processing block
4. Data acquisition system
5. Data visualization and archiving system
6. Report printouts
7. Lift
8. Shaft angular frequency measurement
9. Cables
10. Cabin
11. Linear velocity measurement
12. Control cabinet
13. Power unit shaft
14. Power unit
15. Ride track
16. Acoustic measurements

(57) Abstract: The device for assessing the power consumption efficiency of lifts is characterized in that it contains a microcomputer-based portable programmable data acquisition system with registration of the measured parameters in non-volatile memory that has measurement sensors coupled with processing blocks (1,2, 3) of the intelligent transducer connected with the data acquisition system (4) and with the supervising program on a personal computer (5). The method for examining the power consumption efficiency of lifts is characterized in that the measurement process is realized within a definite time interval (lift operation cycle) allowing to estimate the average value of the lift operating intensity and load and the averaged operation cycle of the lift (7). The method allows to determine the recovery energy and the energy related to riding up, riding down, and stopping the lift (7). The method allows also to determine individual operation cycles of the lift, number of stops at individual floors, running time, and stop time.

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— *as to the identity of the inventor (Rule 4.17(i))*

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

A **device for assessing the power consumption efficiency of lifts and a method for examining the power consumption efficiency of lifts**

The subject of the present invention is a device for assessing the power consumption efficiency of lifts and a method for examining the power consumption efficiency of lifts with the use of an intelligent system for supervision of service parameters of lifts.

Intensive development of micro-electromechanical system seen in recent years in the area of nanotechnology resulted in providing solutions known as MEMS — Micro-Electro-Mechanical Systems, but such names as Micromachines and MST (Micro System Technologies) are also commonly used. As a matter of fact, all of the names designate the same systems, although they come from different regions of the world and thus were created based on different products manufactured and available on international market. MEMS are systems containing a combination of mechanical and electronic components but manufactured to a miniature scale. They are characterized with micrometer dimensions, although the technological progress brings more and more miniaturized solutions known as NEMS (Nano-Electro-Mechanical Systems).

The device for assessing the power consumption efficiency of lifts is characterized in that it contains a microcomputer-based portable programmable data acquisition system with registration of the measured parameters in non¬ volatile memory that has measurement sensors coupled with processing blocks of the intelligent transducer connected with the data acquisition system.

The method of examining the power consumption efficiency of lifts consists in that in the course of measurements, the system parameters are registered with on¬ line data acquisition and registration of the measured parameters in non-volatile memory, and the registered data are input via serial interface to a personal computer provided with analyzing-supervising program.

Signals from measuring sensors are transmitted to processing blocks 1, 2, 3 of the intelligent transducer and further to the data acquisition system 4.

The presented system offers the possibility to measure physical quantities in a maximum of 24 measurement channels with the registration time resolution of 10 ms. The registered data are output via a serial interface to a personal computer provided with analyzing-supervising software (data archiving).

For the purpose of diagnostics and in-depth analysis of the parameters, a dedicated microcomputer-based portable programmable data acquisition system is developed with registration of measured parameters in non-volatile memory. In the course of measurements, the system parameters are registered on the lift (item 7) with on-line acquisition of the following data:

- measurement of the lift's linear velocity and direction of motion of the drive wheel 11;
- measurement of the lift's load (item 9 on cables or 10 in the cabin);
- measurement of accelerations observed in the course of the lift's operation (item 10);
- measurement of the working cycle number and duration (directly from the energy consumption measurement);
- measurement of the power consumed by the power unit in individual operating cycles (item 14), e.g. in the control cabinet (item 12);
- measurement of angular velocities (item 8), e.g. in the drive unit shaft (item 13);
- measurement of deviation and irregularity of the ride track (item 15);
- measurement of power consumed by selected subassemblies of the lifting device (e.g. cabin lighting etc.);
- acoustic measurements (item 16).

The subject of the invention is shown in an example embodiment in the figure showing the block diagram of the measuring system. Signals from measurement sensors are transmitted to processing blocks 1, 2, 3 of the intelligent transducer and further to the data acquisition system 4.

The presented system offers the possibility to measure physical quantities in a maximum of 24 measurement channels with the registration time resolution of 10 ms. The registered data are input via serial interface to a personal computer provided with analyzing-supervising program (data archiving).

The registered data are visualized and archived by means of the supervising program installed on personal computer 5. The system has a program allowing for in-depth analysis of the lift's operating data. Printouts of reports 6 on results representing the lift's energy efficiency class can be generated in any format

agreed with the purchaser. For particularly difficult service conditions, wireless transmission of signals will be utilized.

The system is based on solid-state intelligent measurement transducers MEMS designed for measurement of motion parameters and measurement signal conditioning circuits cooperating with them.

Data recording allows for continuous registration of lift operating parameters within the period of a week. Parameters of the system are being set from the system configuring program level. The program of in-depth analysis is based on fuzzy logic algorithms in order to work out a unambiguous information about the elevator's service conditions and technical efficiency parameters. The system is planned to be applied in a number of elevator systems with different technical parameters.

Implementation of the above-described invention requires application of high-technology solutions.

Patent claims

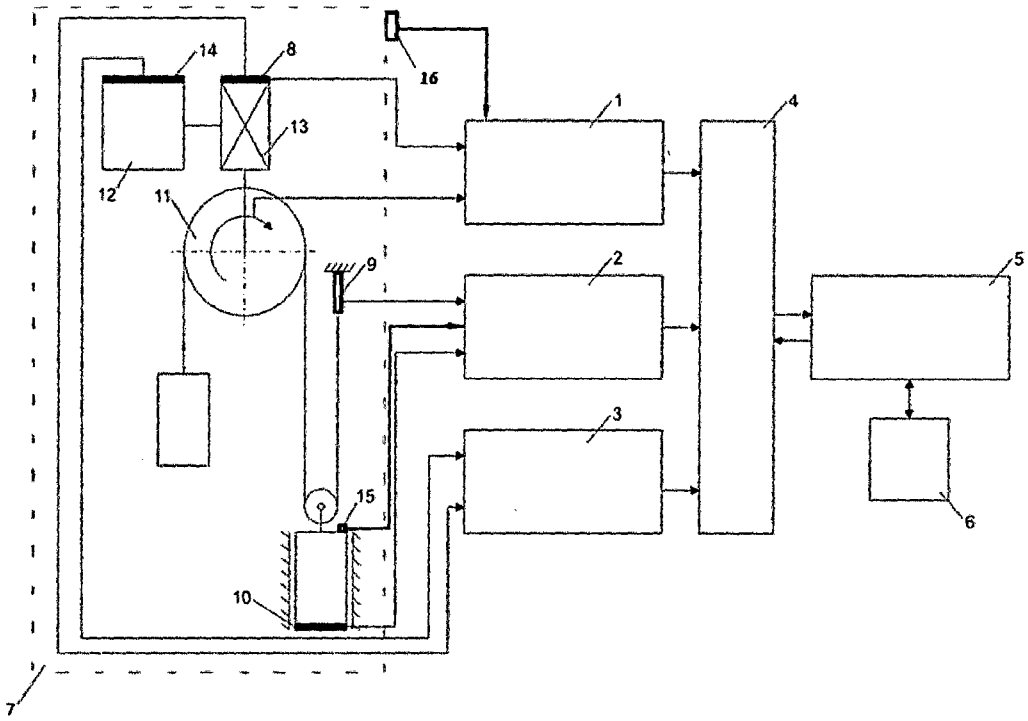
1. A device for assessing the power consumption efficiency of lifts comprising a data acquisition system and analyzer, processing blocks to which signals from intelligent measurement systems are transmitted, and a personal computer with a supervising program characterized in that it includes a microcomputer-based portable programmable data acquisition system with registration of the measured parameters in non-volatile memory, such system having measurement sensors coupled with intelligent processing blocks (1, 2, 3) of the transducer connected with the data acquisition system (4) and the supervising program of the personal computer (5).

2. A method of examining the power consumption efficiency of lifts characterized in that in the course of measurements, system parameters on the lift (7) are registered with on-line data acquisition and registration in non¬volatile memory, and the registered data is output via a serial interface to the personal computer (5) with analyzing-supervising software (6).

3 The method according to claim 2 characterized in that the measurement process is realized within a definite time interval (lift operation cycle) allowing to estimate the average value of the lift operating intensity and load and the averaged operation cycle of the lift (7).

4. The method according to claim 3 characterized in that it allows to determine the recovery energy and the energy related to riding up, riding down, and stopping of the lift (7).

5. The method according to claim 3 characterized in that it allows to determine individual operation cycles of the lift, number of stops at individual floors, running time, and stop time.



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16. Acoustic measurements

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A. CLASSIFICATION OF SUBJECT MATTER
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ADD. G01D4/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B66B G01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 136 285 A (OKUYAMA TOSHIHARU [JP]) 4 August 1992 (1992-08-04)	1
Y	column 3 - column 5; figures 1,3	2-5

X	WO 02/13412 Al (STATSIGNAL SYSTEMS INC [US]) 14 February 2002 (2002-02-14)	1-5
Y	page 6 - page 15; figures 1,3	1-5

X	US 2012/138388 Al (FINSCHI LUKAS [CH] ET AL) 7 June 2012 (2012-06-07)	2-5
Y	paragraph [0036] - paragraph [0074]	1

X	CN 102 030 233 A (GUANGZHOU INST OF STANDARDIZATION) 27 April 2011 (2011-04-27)	2-5
Y	abstract	1

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Kallinger, Christian

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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X	CN 101 525 100 A (CHINA ASS OF SPECIAL EQUI PMENT CHINA ASS OF SPECIAL EQUI PMENT INSPECTI) 9 September 2009 (2009-09-09)	1-5
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