(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
12 November 2015 (12.11.2015)

WIPO | PCT

(10) International Publication Number
WO 2015/169351 A1

(51) International Patent Classification:
B66B 1/46 (2006.01) *G06F 3/00* (2006.01)

(21) International Application Number:
PCT/EP2014/059313

(22) International Filing Date:
7 May 2014 (07.05.2014)

(25) Filing Language: English

(26) Publication Language: English

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

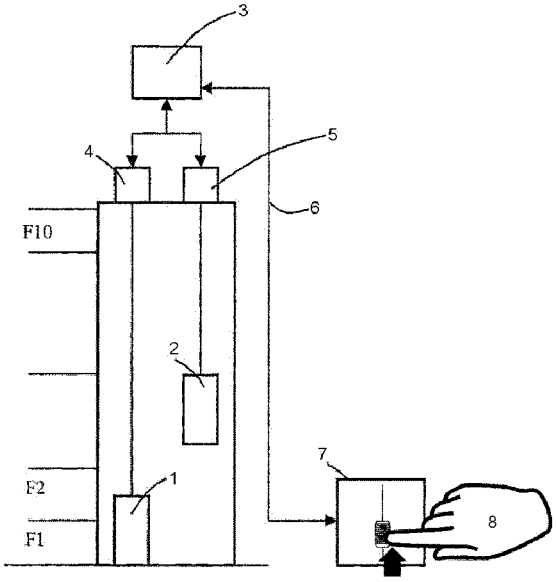
Published:

— *with international search report (Art. 21(3))*

WO 2015/169351 A1

(54) **Title**: HAPTIC FEEDBACK SYSTEM AND RESPECTIVE METHOD FOR ELEVATORS

FIG. 1



(57) **Abstract**: The invention relates to a haptic feedback system for elevator systems, wherein the haptic feedback system is designed to receive data from a touchscreen and comprises a feedback unit that is designed to produce a haptic response, wherein the response is activated when a sl ider on the touchscreen is activated and/or moved, at least to special positions. Furthermore, the invention relates to a haptic feedback method performed with such systems.

HAPTIC FEEDBACK SYSTEM AND RESPECTIVE METHOD FOR ELEVATORS

FIELD OF THE INVENTION

The invention relates to a haptic feedback system for elevator applications. More particularly the invention relates to a haptic feedback of a slider of a touchscreen panel communicating with a processor of the elevator system. The invention also refers to a haptic feedback method for elevator systems.

BACKGROUND OF THE INVENTION

Known in the art are elevator systems comprising a Destination Operator Panel (DOP) or similar input devices that are based on a touchscreen as input facility.
By using this touchscreen, passengers are able to communicate with the elevator system, and may e.g. select destinations, override pre-programmed features or get additional information.

In modern elevator systems, touchscreens replace panels with physical buttons.

Beside many advantages, touchscreen based systems normally don't have a convenient kind of physical response when used. This may be one disadvantage of such a device, since visually disabled persons may have difficulties to operate these devices, if not being able to recognize the operational signs on the screens.

Thus, either there appear to be disadvantages for visually disabled persons that they cannot use the elevator system properly, or there have to be used alternative input devices that allow visually disabled persons to communicate with the elevator system. However, the use of these devices can lead to additional costs, additional service and a place where they can be installed.

AIM OF THE INVENTION

The aim of the present invention is to disclose a solution, which eliminates or at least alleviates the drawbacks occurring in prior-art solutions presented above, or to show an alternative solution to those known in prior art, and to enable even a visual disabled person to easily use a touchscreen as input device.

It is also an aim of the invention to disclose an elevator system which is optimized in regard to the prior art.

SUMMARY OF THE INVENTION

The system and the method according to the invention and preferred embodiments are characterized by the claims. Some further inventive embodiments are also presented in the descriptive section and in the drawings of the present application. The inventive content of the application can also be defined differently than in the claims presented below. The inventive content may also consist of several separate inventions, especially if the invention is considered in the light of expressions or implicit sub-tasks or from the point of view of advantages or categories of advantages achieved. In this case, some of the attributes contained in the claims below may be superfluous from the point of view of separate inventive concepts. The features of the various embodiments of the invention can be applied within the scope of the basic inventive concept in conjunction with other embodiments.

The invention refers to a haptic feedback method for elevator systems, wherein a destination operator panel (DOP) is part of the elevator system or communicates with the elevator system and the DOP comprises at least one touchscreen. The DOP offers a non-physical but visual slider on the touchscreen that is operated with a fluvial-touching movement over the touchscreen ("swipe") and the swipe is accompanied by a haptic feedback that is perceptible by the user. Said feedback is sensible while moving the slider at least to special positions.

The invention also refers to a haptic feedback system for elevator systems, wherein the haptic feedback system is designed to receive data from a touchscreen and comprises a feedback unit that is designed to produce a haptic response, wherein the response is activated when a slider on the touchscreen is activated and/or moved, at least to special positions.

In a preferred embodiment, the touchscreen is part of the haptic feedback system and is especially arranged in an elevator lobby or in elevator car(s). The touchscreen must be able to show a non-physical but visual slider and to register a swipe over its surface. Preferably, the slider is designed to input destination calls.

The feedback unit produces a haptic feedback that is designed to be sensed by a person. The feedback unit preferably produces a haptic response that can be felt on the touchscreen or that can be felt in a region different from the touchscreen provided for this purpose, e.g. sensed by the feet.

In other words: To provide users that do not want a haptic response with a non-tactile feedback, it is possible that the haptic feedback is not sensible by means of the touchscreen, but in an area over, under or at the sides of the touchscreen, or on the floor. A user who likes or needs a haptic feedback can simply touch this area by hand or by foot and use the touchscreen with a free hand.

In a preferred embodiment, the feedback unit comprises at least one vibrator that is designed to produce vibrations that can be sensed. The vibrational effects are preferably achieved with implemented eccentric rotating mass actuators controlled by a processor or a microcontroller. The actuators are especially placed behind the touchscreen.

Inputs from users are used to drive the actuators. While using the slider interface of a DOP, haptic feedback is used e.g. to indicate the change of floors along the

slide. Preferably, haptic feedbacks are also received when buttons on other interfaces are touched.

Although it could be of advantage that the haptic feedback (e.g. the vibration effect) is the same for all floors for some applications, an embodiment is preferred where there can be at least two different kind of haptic feedback effects, e.g. vibration effects, to separate target floors from each other. Especially, every 5^{th} or 10^{th} floor is indicated by another haptic feedback, e.g. a longer and/or stronger vibration. It could be also of advantage, that any floor having the cipher 5 as last digit is symbolized by another haptic feedback as floors having the cipher 0 as last digit, wherein these floors are symbolized with another haptic feedback than any other floor.

In another preferred embodiment, that can advantageously be combined with the above embodiment, there is a different haptic effect in difference to other floors, if the target floor is locked and therefore no call can be given to that floor, or if this floor has at least a different status compared to other floors.

In another embodiment there can be an additional voice feedback to indicate target floors. It should be noted that the haptic feedback is necessary with this embodiment, too, since voice feedback is relative slow and is useless if the passenger is also deaf.

The haptic feedback is preferably achieved with a vibration of the DOP-device and/or the touchscreen. The vibration effect may consist of a constant vibration of certain length or two or more constant vibrations with same or different length (durations).

There are also preferred vibration effects comprising special vibration patterns consisting of two or more vibrations of certain duration separated by pauses (silent intervals) to indicate special information for the user.

It is also preferred that these vibration patterns are shaped such that the number of floors or the number of the elevator is represented, e.g. 3 vibrations for 3rd elevator from left or the 3rd floor, or that they are shaped like Morse-code.

In a preferred embodiment the haptic feedback system comprises an anti-vibration layer that is designed to be arranged between the touch screen and the DOP assembly or between the haptic actuators and the DOP assembly. Its aim is to dampen the vibration for those regions where the vibration is unwanted. In other words, the haptic result is realized solely on regions intended for this haptic aim.

The haptic feedback system and -method provides quick or instantaneous tactile confirmation of user input. It especially helps visually disabled users or users not looking on the screen to be able to use a touchscreen destination operation panel in spite of an inability to see the screen properly. Thus, it enhances the usability of slider interfaces on touchscreens by using the combination with physical feedback.

LIST OF FIGURES

In the following, the invention will be described in detail by the aid of examples of its embodiments, wherein:

- Fig. 1 presents an elevator system suitable for the method of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 presents an elevator system suitable for the method of the present invention. The elevator system forms an elevator group, which comprises two elevator cars 1 and 2, the elevator cars 1 and 2 are able to move in the elevator hoistway between the floors F1, F2 ... F10. The elevator system is operated by processing device 3 of a destination control system that moves elevator car 1 via motor unit 4 and

elevator car 2 via motor unit 5. In addition, processing device 3 receives signals over a data line 6 from an input device comprising a touchscreen 7 of the input system that is mounted at least on the ground floor, but preferably also in any lobby of floors 1 to 10. On the touchscreen 7 a non-physical but visual slider is shown that can be operated by moving a hand 8 with a vertical swiping motion over the slider while touching the touchscreen 7.

When a user touches the touchscreen at the position of the slider, for example at the bottom of touch screen and moves his finger upwards, the target floor of the call will be counted up step by step. Due to the invention, each time when the target floor is changed, there will be a haptic feedback (e.g. a vibration) on the surface of the touchscreen or at another position that can be easily accessed by the user. By counting vibrations, the user will simply know when his finger is at a right floor position and he can register a destination to his target floor. If the haptic feedback is not provided directly via the touchpad, the zone of haptic feedback is preferably marked or at least is the visually disabled person informed about the position of this spot.

Reference signs

1 & 2	elevator cars
3	processing device
4 & 5	motor units
6	data line
7	touchscreen
8	hand

Claims

1. Haptic feedback system for elevator systems, wherein the haptic feedback system is designed to receive data from a touchscreen and comprises a feedback unit that is designed to produce a haptic response, wherein the response is activated when a non-physical but visual slider on the touchscreen is activated and/or moved, at least to special positions.

2. Haptic feedback system as claimed in claim 1, **characterized in that** the touchscreen is part of the haptic feedback system and is especially arranged in an elevator lobby and/or in an elevator car.

3. Haptic feedback system as claimed in one of the preceding claims, **characterized in that** the feedback unit produces a haptic feedback that is designed to be sensed by a user, wherein the feedback unit preferably produces a haptic response that can be felt on the touchscreen or that can be felt in a region different from the touchscreen provided for this purpose.

4. Haptic feedback system as claimed in one of the preceding claims, **characterized in that** the feedback unit is designed such that a short vibration occurs every time the counter coupled and represented by the slider is about to change its value or has just changed its value.

5. Haptic feedback system as claimed in one of the preceding claims, **characterized in that** the system also provides voice feedback to indicate target floors.

6. Haptic feedback system as claimed in one of the preceding claims, **characterized in that** the DOP-device and/or the touchscreen are designed such

that they are able to vibrate or at least guide vibrations of a feedback unit to the surface of these modules.

7. Haptic feedback system as claimed in one of the preceding claims, **characterized in that** the haptic feedback system comprises an anti-vibration layer that is designed to be arranged between the touch screen and the DOP assembly or between the haptic actuators and the DOP assembly.

8. Elevator system **characterized in that** it comprises a haptic feedback system as claimed in one of the preceding claims.

9. Haptic feedback method for haptic feedback systems as claimed in one of the preceding claims, wherein a non-physical but visual slider on the touchscreen is operated with a fluvial-touching movement over the touchscreen ("swipe") and the swipe is accompanied by a haptic feedback that is perceptible while moving the slider at least to special positions.

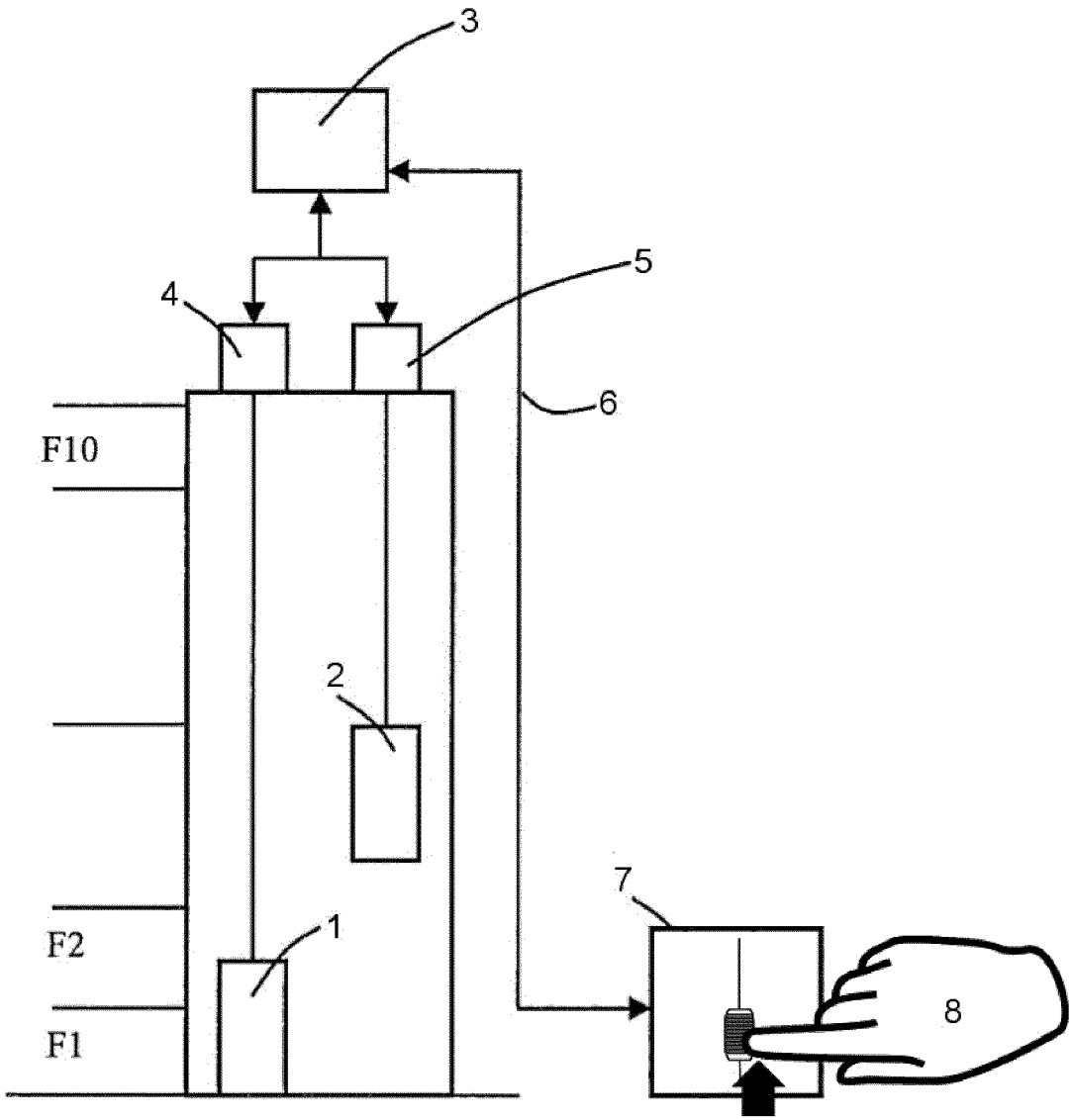
10. Method as claimed in claim 9, **characterized in that** there can be at least two different kind of haptic feedback effects to separate target floors from each other, especially, every 5^{th} and/or 10^{th} floor is indicated by a different haptic feedback.

11. Method as claimed in one of preceding claims, **characterized in that** the vibration effect consists of a constant vibration of certain length or two or more constant vibrations with different length (duration) and/or the vibration effects comprising special vibration patterns consisting of two or more vibrations of certain duration separated by pauses (silent intervals).

12. Method as claimed in one of claims 9 to 11, **characterized in that** the haptic feedback is not sensible through the touchscreen, but in an area over, or under or at a side of the touchscreen, or on the floor.

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FIG. 1



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/059313

A. CLASSIFICATION OF SUBJECT MATTER
INV. B66B1/46 G06F3/00
ADD.

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 G06F

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	EP 2 701 037 A2 (IMMERSION CORP [US]) 26 February 2014 (2014-02-26) abstract paragraphs [0011], [0014] - [0016], [0018], [0032] - [0041] figures 1-4	1-3,5-9, 11,12 4,10
X Y	US 2012/178431 A1 (GOLD STEVEN K [US]) 12 July 2012 (2012-07-12) abstract paragraphs [0023], [0030], [0031], [0043], [0044] figures 1A, 2, 3A	1-3,5-9, 11,12 4,10
X Y	JP 2013 056732 A (TOSHIBA ELEVATOR CO LTD) 28 March 2013 (2013-03-28) the whole document	1-3,5-9, 11,12 4,10

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

[X] See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
7 January 2015	14/01/2015

Name and mailing address of the ISA/	Authorized officer
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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	XIAOWEI DAI ET AL: "SlickFeel", ADJUNCT PROCEEDINGS OF THE 25TH ANNUAL ACM SYMPOSIUM ON USER INTERFACE SOFTWARE AND TECHNOLOGY, UIST ADJUNCT PROCEEDINGS '12, 7 October 2012 (2012-10-07), - 10 October 2012 (2012-10-10), page 21, XP055160296, New York, New York, USA DOI: 10.1145/2380296.2380308 ISBN: 978-1-45-031582-1 the whole document & , 1 July 2013 (2013-07-01), Retrieved from the Internet: URL:https://www.youtube.com/watch?v=wgJew5rh3iQ [retrieved on 2015-01-07] -----	4,10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2014/059313

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