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(54) **Detection device integrated in a driving system**

(57) A detection device (30) integrated in a driving system is described, preferably for blinds, comprising a detector for detecting a quantity such as the ambient or solar light and/or the temperature and/or the level of environmental conditioning and/or the level of dehumidification and/or an hour indication and/or humidity and/or the on/off state of alarm systems and/or component parts thereof and/or the open/closed status of windows, doors,

garage doors or gates. The device comprises means (50) for displaying simultaneously (i) the actual value, or a representative value thereof (52), of at least one of those quantities, and (ii) two thresholds (S1, S2) for the displayed quantity, an upper and a lower one, outside which the device is configured to react by commanding the movement of the blind and/or an action of the system.

Advantages: efficiency and simplicity of use, especially during adjustment operations.

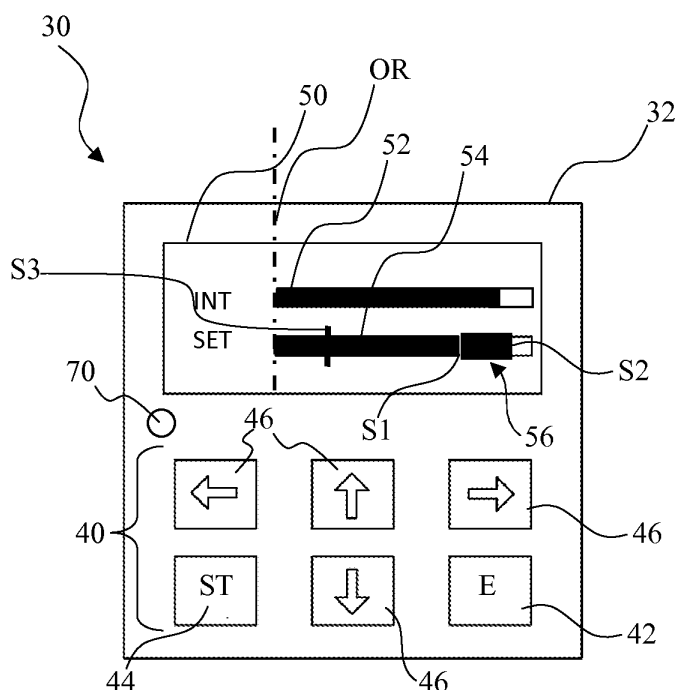


FIG. 3

Description

[0001] The invention refers to a detection device integrated in a driving system, preferably for blinds, here given as an example. In this case the device interacts with the driving system for blinds but it can also generally interact with, or operate in, any further system (heating, conditioning, dehumidification, opening and closing windows, doors and garage doors, gates, etc.) to adjust ambient and/or functional parameters.

[0002] The device can detect and control different ambient parameters like solar luminosity, ambient luminosity (inside the room), temperature, humidity, etc. As an example we shall refer to solar luminosity.

[0003] In the field of home automation, devices for detecting solar luminosity 10, 20 are known, to be applied to the glass of windows, from inside, through suction pads (see figs. 1 and 2).

[0004] These devices control and adjust the position of blinds (roller blinds or awnings) via radio, depending on the outer solar luminosity, with the purpose of obtaining the desired amount of luminosity inside the room. It is sufficient to position them at a certain height on the glass of the window, and they automatically command the blinds to lower to such a height when the sunlight passes a (single) adjustable luminosity threshold. The level of luminosity is set by the installer or by the user. Some models simultaneously carry out a control with a temperature threshold as well.

[0005] When the luminosity returns below the threshold value, the blinds are raised again, so as to maintain an optimal ambient luminosity and/or exploit to the maximum solar irradiation to heat homes in winter and/or limit it so as to save power of air conditioners. Of course the interaction of many systems (heating, conditioning, dehumidification, opening and closing of windows, doors and garage doors, gates, etc.) makes it possible to optimise the ambient conditions and manage energy consumption efficiently.

[0006] The adjustable luminosity threshold can be set through a potentiometer 22 or a rotary selector, or a pair of high-low buttons 12, 14. The user or installer applies the device to the glass and makes attempts - through the buttons 12, 14 or the potentiometer 22 - to find the current illumination value. A LED 19 usually indicates with multiple colours or different flashing when the current ambient luminosity is equal to, greater than, or below the threshold value the installer is setting. Then, through a programming procedure by means of buttons 12, 14 or the potentiometer 22, the threshold value is fixed equal to the detected value (luminosity value that the installer or user sees/experiences at the time of its setting). At this point the threshold value thus set becomes the reference point with respect to which the device controls the opening or closing of the blinds through a fixed timing: when the current luminosity is greater or lower than the threshold for a certain amount of time, the device controls the blinds to move.

[0007] The setting/adjustment of the threshold value must necessarily be checked on the spot, during a special programming modality, which becomes the real "feedback" of whether or not the settings made are correct.

5 This adjustment procedure with LEDs is very long and involves approximate adjustments, far from the real value desired by the user. It does not make it possible to adjust the threshold in an effective manner, necessarily having to wait for there to be outdoor luminosity corresponding to the threshold to be set. Only a threshold value corresponding to the luminosity detected through comparing by a present person can be set, without quantifying the level of luminosity. Settings carried out at different moments throughout the day lead to detected luminosity values and the consequent threshold settings which are different from one another.

10 **[0008]** Moreover, another drawback is that an installer and/or the user do not have any precise reference point for resetting the threshold after an accidental cancellation or for setting it the same in many rooms or buildings. The entire programming operation must be therefore repeated for each sensor (think of the time that would be wasted for a building).

15 **[0009]** Therefore, all of this takes up time and/or labour.

[0010] The general object of the invention is to improve this state of affairs with a device that is more practical to use.

20 **[0011]** Another object of the invention is to facilitate the setting of the thresholds with a system which is intuitive and accessible even to the unskilled.

[0012] Such objects are obtained with a detection device integrated in a driving system, preferably for blinds, comprising

25 a detector for detecting a quantity such as the ambient or solar light and/or the temperature and/or the level of environmental conditioning and/or the level of dehumidification and/or hour indication and/or humidity and/or the on/off state of alarm systems and/or component parts thereof (for example, in an integrated system in which the alarm sensors detect whether or not people are present inside the house and close all the blinds activating the alarm or whether after a certain hour, every blind has been commanded to close) and/or the open/closed status of windows, doors, garage doors or gates; comprising means for displaying simultaneously the actual value, or a representative value thereof, of at least one of those quantities, and two thresholds for the displayed quantity, an upper and a lower one, outside which the device is configured to react by commanding the movement of the blind and/or an actuation of the system.

30 **[0013]** With the invention there is the advantage of displaying and quantifying the quantity value in an objective and significant manner. Moreover, the adjustment is carried out by referring to a range defined by two thresholds, between a minimum and a maximum threshold value, and not only using a discriminator value. For such a pur-

pose, the displaying means are configured to display a menu through which the thresholds can be adjusted by a user comparing them directly with said quantity detected. The comparison made directly by the user in a visual manner greatly simplifies the adjustment and makes it very intuitive. The quantity is indeed detected so that this value can be used as a reference point for the subsequent adjustments.

[0014] The displaying means can be configured to display said value, representative or not, and/or said thresholds through a numerical representation or through an analog scale indicator, for example, a bar, horizontal or vertical, with a length proportional to said value, or a position on a graduated scale corresponding to said value.

[0015] In order to simplify the adjustment, a movable slider on a second bar displayed next to the first one, is preferably displayed, so as to facilitate as much as possible the visual comparison with the thresholds.

[0016] The device preferably integrates a dot-matrix display adapted for displaying the value of the quantities and/or the relative thresholds and all the information in graphical form described above.

[0017] By displaying on the screen or on the display and through the bar interface, a simultaneous and safe method for adjusting the range of the thresholds is obtained, thanks to the direct comparison of the two adjustment bars (the width of the threshold field with respect to the detected luminosity can be seen, see figure 3).

[0018] A good result is obtained also by using numerical values, for example detected luminosity 60, max. threshold 65, min. threshold 40.

[0019] In any case, it should be clear that it is easy, in this way, to mnemonically remember the adjustment values, memorise them, save them, and also reset them.

[0020] It is advantageous for the displaying means to be configured to display menus and sub-menus, to be navigated through buttons, touch-screen, mouse or roll-ball. This allows a simple and intuitive representation of the information, as well as an easy and fast input of the data and of the controls of the user.

[0021] The displayed information, especially the described amount/s and the relative thresholds, can be converted inside the device into digital values, saved in storage devices, and transferred outside. In such a way the configuration and the programming of a device can be repeated, and quickly replicated in other sensors of the same type.

[0022] The device preferably comprises two light detectors arranged so as to measure the light coming from two substantially different directions. This makes it possible, for example, to monitor the light from outdoors as well as from indoors.

[0023] Preferably, the displaying means are configured so as to display at least one third threshold for the displayed quantity, or for a different quantity, below which the device is configured to react by unconditionally commanding the displacement of the blind and/or an action of the system.

[0024] Moreover, the displaying means can be configured to display a graphical table which represents the programmed and/or recorded course of the quantity displayed. This further facilitates the management of the device.

[0025] Of course, the management integrated in the device of different ambient parameters or of a different kind (heating, conditioning, dehumidification, opening and closing windows, doors and garage doors, gates, etc.) implies the use of different "ranges with thresholds" which can act singularly or interact with one another, also using a priority criteria which is assigned or can be assigned by the installer/user.

[0026] Further characteristics and advantages of the invention shall become clearer from the following example description of a device for the detection of solar luminosity, together with the attached drawings, in which:

figure 1 shows a known device;

figure 2 shows another known device;

figure 3 shows a device according to the invention;

figure 4 shows further possible representations which can be displayed by the device of fig. 3;

figure 5 shows another possible graphical representation of the device of fig.3

[0027] Fig.3 shows a device 30 according to the invention, comprising a plastic casing 32 on a face of which a dot-matrix display 50, a luminosity sensor 70 and some buttons 40 are arranged. The device 30 preferably runs on batteries.

[0028] On the opposite face of the casing 32 there is a second luminosity sensor (not shown). Therefore, when the device 30 is attached to glass (with a suction pad, not shown) it can detect the light outside the building and that of the room, or it can be rested on a table with buttons 40 in sight and operate the same.

[0029] The buttons 40, six in the example, are used to navigate the menus displayed on the display 50. An internal microprocessor circuit (not shown) manages the displaying of the information on the display 50 and the control/reading of the buttons 40. In particular, four buttons 46 have an arrow on top of them and are used to navigate the menus, a button 44 is used to exit from the menu or from a function, and a button 42 is used for confirming a selection. The intelligence of the device is also programmed to select and interrogate only a sensor or to process the signals of both sensors.

[0030] The display 50 simultaneously displays two bars or horizontal columns 52, 54 side by side. The length of the bars 52 with respect to an origin OR indicates the actual ambient luminosity value, detected through the sensor 70 or the one on the opposite side (in the case in which the device 30 is applied to glass it is the latter to provide information concerning luminosity). The bar 54 has the same reference origin OR and acts as a support for a cursor 56 the ends of which represent two luminosity thresholds S1, S2. The thresholds S1, S2 can be adjusted

through the buttons 40, in particular, they can move independently along the bar 54. During this adjustment the user is well aware of the reference of the current luminosity level in the bar 52, with the advantage of an easy, precise and fast adjustment.

[0031] The operation of the device 30 differs from the prior art. The threshold value corresponding to the detected luminosity value is not fixed and, once exceeded, a fixed time must not pass before actuating the blinds. But rather, an adjustable luminosity tolerance range is created (between the thresholds S1, S2) in which luminosity variations are tolerated (hysteresis).

[0032] In use the device 30, positioned at the desired height on the glass of a window (or positioned anywhere in a room), makes the blinds automatically lower down to such a height when the sunlight exceeds the threshold S2. When the luminosity drops below the threshold S1, the device 30 controls the opening of the blinds. The thresholds S1, S2 are thus managed to obtain a hysteresis control, whose amplitude is given by the field ranged between S2 and S1.

[0033] The device 30 commands the blinds or sends command signals to the system in which it operates via radio, for example through an antenna and a transmitter stage operating at the frequencies 433.9 MHz or 868.3 MHz.

[0034] When the user wants to adjust the thresholds S1, S2, he accesses a special sub-menu through the buttons 46 and selects it with the button 42. The device 30 enters into an adjustment mode in which the user can update the threshold values S1, S2, moving them either right or left, for example, respecting the current value of luminosity indicated by the bar 52. When doing this, the user always has a visual feedback on the display 50 of both what he is doing, as well as of the proportions of the "distance" of the two thresholds S1, S2, from one another and from the current luminosity. The great advantage that comes from this is that the adjustment becomes significant, intuitive, easily repeated (adapted to be copied from one room to another and at different times throughout the day) and abstracted from a complicated measurement like luminosity.

[0035] The display 50 is configured also so as to visualise a user menu and a configuration menu. The menus are made up of a series of entries, and for complex models each entry is made up of a series of sub-entries or sub-menus. Each entry or sub-menu has some values which can be set and can be of the Boolean or numeric type. Again, in order to "navigate" the menus, the buttons 40 are used. As preferred functions there are:

- the setting of a timer (the day is selected, the hour, and a desired event);
- the setting of a clock with the current hour;
- the setting of a twilight-mode: makes it possible to have an operation in which the blinds are automatically and unconditionally closed when the illumination value drops below a third threshold S3. Such a

threshold S3 can also be adjusted along the bar 54 with the buttons 40, similarly to S1 and S2;

- memory reset: the device 30 comprises a storage memory to save the values S1, S2, S3 and other functional parameters. The cancellation of the memory is useful in the case in which the system is re-configured;
- creation of a table 90 in a graphical mode along a graph 92 (see fig. 5). In abscissa, for example, the time frame of the last 24 hours is displayed, and in ordinate the value of desired light, which can be adjusted point by point with the buttons 40. The device 30 acts so as to adjust the ambient luminosity according to the programmed course, or the table 90 can be used to display the daily luminosity course, in which case the points of the graph 92 will be stored samples of its value;
- open/closed status indicator of a gate or garage door;
- temperature indicator with reference to a timer;
- on/off state indicator of an alarm system with reference to a timer;
- mutual interaction indicator of these functions;
- exhausted battery indicator.

[0036] Fig. 4 shows alternative graphical representations of the bars 52, 54, but also simple bar-markings with or without bar, arrows, pointers or the like may be used, or only numbers.

[0037] The graphical representation according to the invention can be used in the device 30 for other measurements, like temperature; or also in different applications, for example to set gate end-stops.

Claims

1. Detection device (30) integrated in a driving system, preferably for blinds, comprising a detector for detecting a quantity such as the ambient or solar light and/or temperature and/or the level of environmental conditioning and/or the level of dehumidification and/or an hour indication and/or humidity and/or the on/off state of alarm systems and/or component parts thereof and/or the open/closed status of windows, doors, garage doors or gates, **characterized in that** it comprises means (50) for displaying simultaneously

- the actual value, or a representative value thereof (52), of at least one of those quantities, and
- two thresholds (S1, S2) for the displayed quantity, an upper and a lower one, outside which the device is configured to react by commanding the movement of the blind and/or an action of the system.

2. Device according to claim 1, wherein the means (50) for displaying are configured to display a menu by which the thresholds (S1, S2) are adjustable by a user and/or installer, by comparing them with the detected quantity. 5
3. Device according to any one of the preceding claims, wherein the means (30) for displaying are configured to display said value, representative or not, and/or said thresholds (S1, S2) through a numerical representation. 10
4. Device according to any one of the preceding claims, wherein the means (30) for displaying are configured to display said value, representative or not, and/or said thresholds (S1, S2) through an analog scale indicator (52, 54). 15
5. Device according to any one of the preceding claims, comprising a dot-matrix display (50) capable of displaying said value and/or said thresholds. 20
6. Device according to claim 5, wherein the display is driven to display a bar (52), horizontal or vertical, with a length proportional to said value, or a position on a graduated scale corresponding to said value. 25
7. Device according to claim 6, wherein the display is capable to display a movable slider (56) on a second bar (54) displayed next to the first (52). 30
8. Device according to any one of the preceding claims, comprising two light detectors (70) arranged to measure the light coming from two substantially different directions. 35
9. Device according to any one of the preceding claims, wherein the means (50) for displaying are configured to display at least a third threshold (S3) for the displayed quantity, or for a different quantity, below which the device is configured to react by commanding unconditionally the displacement of the blind and/or an action of the system. 40
10. Device according to any one of the preceding claims, wherein the means (50) for displaying are configured to display a graphical table which represents the programmed (90) and/or registered course of the quantity displayed. 45

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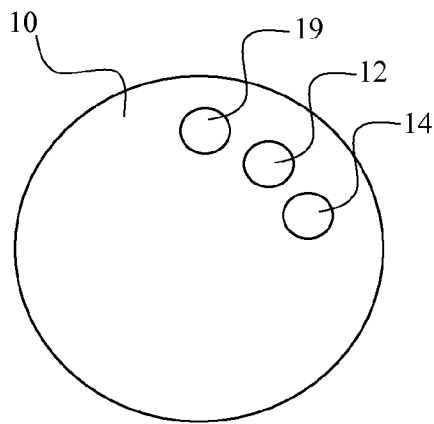


FIG. 1

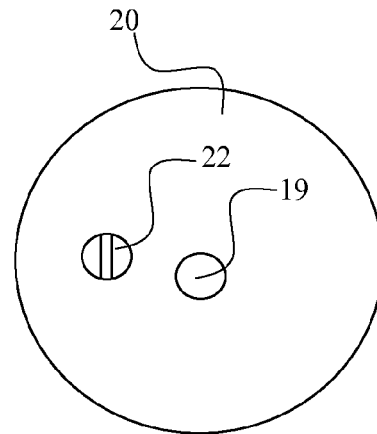


FIG. 2

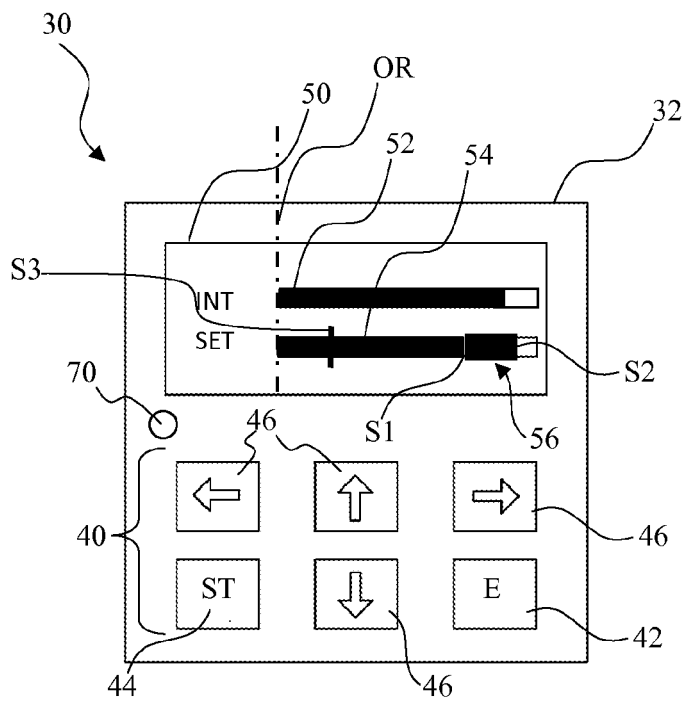


FIG. 3

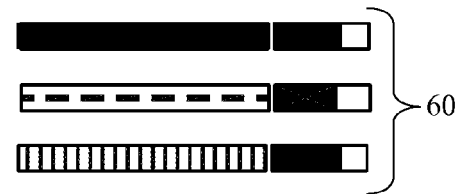


FIG. 4

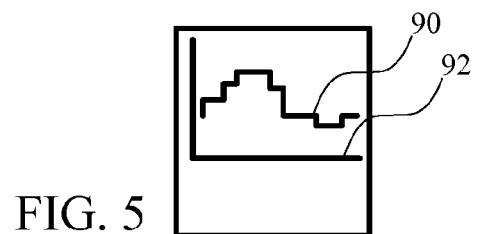


FIG. 5