

ELECTRIC BLIND CONTROL APPARATUS AND ELECTRIC BLIND CONTROL PROGRAM

BACKGROUND OF THE INVENTION

5 Field of the Invention

The present invention relates to an electric blind control apparatus and an electric blind control program controlling operation of an electric blind.

Description of the Related Art

10 There is known a control technology that elevates an electric blind or opens and closes slats in accordance with a predetermined schedule. In the technology of controlling the electric blind, the operation of the electric blind is changed depending on the weather (for example, refer to JP-A-H06-299768).

For example, in an office floor having an electric blind installed adjacent to a
15 window, a plurality of desks may be arranged in many cases. In this indoor environment, since the angle of elevation with respect to the sun varies between a person sitting at a position close to the electric blind and a person sitting at a position distant from the electric blind, the amount of sunlight incident through the gaps between the slats varies. That is, the optimal slat angle of the electric blind differs depending on
20 position. Furthermore, generally, between the person sitting at a position close to the electric blind and the person sitting at a position distant from the electric blind, the person sitting at a position close to the electric blind feels more dazzle than the person at the distant position. Accordingly, even when the electric blind adopting the electric blind control technology is used, the person sitting at a position close to the electric blind
25 often operates the electric blind in order to reduce feel of dazzle.

Furthermore, when a person sits only at a position distant from the electric blind, the person may want to operate the electric blind without considering the position close to the electric blind in order to contribute to energy saving by receiving more sunlight to brighten the room or to increase room temperature.

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SUMMARY OF THE INVENTION

Therefore, the invention is made in view of such circumstances, and provides an electric blind control apparatus and an electric blind control program capable of

appropriately reducing feel of dazzle and reducing energy used in a room using an electric blind in accordance with the arrangement of people.

In order to solve the above-described problems, a first aspect of the invention provides an electric blind control apparatus including: a blind control amount

5 information storage unit configured to store a control amount for shading or dimming an electric blind at an occupied position associated with the electric blind; an occupancy status registration unit configured to register a person occupancy status at the occupied position; a blind control command creation unit configured to read the control amount from the blind control amount information storage unit based on the occupancy status
10 registered in the occupancy status registration unit, and creates a blind control command operating the electric blind based on the read control amount; and a blind control unit configured to control the electric blind by supplying the blind control command created by the blind control command creation unit to the electric blind.

In the electric blind control apparatus, when a seated status of a person is
15 included in the occupancy status registered in the occupancy status registration unit, the blind control command creation unit may read the electric blind control amount at a position closest to the electric blind in the occupied position corresponding to the seated status from the blind control amount information storage unit.

In the electric blind control apparatus, there is further provided a non-occupancy
20 control amount information storage unit configured to store a non-occupancy control amount as a control amount of the electric blind when a person does not sit at the occupied position, and when a seated status of a person is not included in the occupancy status registered in the occupancy status registration unit, the blind control command creation unit may read the non-occupancy control amount from the non-occupancy
25 control amount information storage unit, and create a blind control command operating the electric blind based on the read non-occupancy control amount.

In order to solve the above-described problems, a second aspect of the invention provides an electric blind control program that allows a computer including a blind control amount information storage unit configured to store a control amount for shading
30 or dimming an electric blind with regard to an occupied position associated with the electric blind to serve as: an occupancy status registration unit configured to register a person seated status at the occupied position; a blind control command creation unit configured to read the control amount from the blind control amount information storage

unit based on the occupancy status registered in the occupancy status registration unit, and creates a blind control command operating the electric blind based on the read control amount; and a blind control unit configured to control the electric blind by supplying the blind control command created by the blind control command creation unit to the electric blind.

According to some aspects of the invention, it is possible to reduce feel of dazzle and to reduce the amount of energy used in a room using an electric blind in accordance with the arrangement of people existing in the room.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic plan view illustrating an office floor where an electric blind control system adopting an electric blind control apparatus according to a first embodiment of the invention is installed.

FIG. 2 is a block diagram illustrating a functional configuration of the electric blind control system according to the same embodiment.

FIGS. 3A, 3B, and 3C are diagrams illustrating a data configuration of blind control amount information.

FIG. 4 is a diagram illustrating a data configuration of non-occupancy control amount information.

FIG. 5 is a diagram illustrating a data configuration of a control table created by a blind control command creation unit when occupancy flag data is turned on in the same embodiment.

FIG. 6 is a flowchart illustrating a sequence of a process in which the electric blind control apparatus controls an electric blind in the same embodiment and a second embodiment of the invention.

FIG. 7 is a block diagram illustrating a functional configuration of an electric blind control system in the second embodiment.

FIG. 8 is a diagram illustrating a data configuration of desirable control amount information.

FIG. 9 is a diagram illustrating a data configuration of a control table created by a blind control command creation unit when occupancy flag data is turned on in the same embodiment.

DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, exemplary embodiments of the invention will be described in detail by referring to the accompanying drawings.

First Embodiment

5 FIG. 1 is a schematic plan view illustrating an office floor where an electric blind control system adopting an electric blind control apparatus according to a first embodiment of the invention is installed. As shown in FIG. 1, the office floor is provided with windows W1 to W4 which receive external light. Then, in the office floor, electric blinds 1A to 1D are installed to respectively correspond to the windows
10 W1 to W4. Each of the electric blinds 1A to 1D is an electric blind which receives a blind control command supplied from an electric blind control apparatus not shown and described later and operates a blind based on the blind control command to shield external light or adjust the amount of incident light.

On the opposite side of the window W1 (the inside of the office floor) with the
15 electric blind 1A interposed therebetween, desks A1 to A4 are arranged in a sequential order from a position close to the electric blind 1A. Furthermore, on the opposite side of the window W2 with the electric blind 1B interposed therebetween, desks B1 to B4 are arranged in a sequential order from a position close to the electric blind 1B. Furthermore, on the opposite side of the window W3 with the electric blind 1C
20 interposed therebetween, desks C1 to C4 are arranged in a sequential order from a position close to the electric blind 1C. Furthermore, on the opposite side of the window W4 with the electric blind 1D interposed therebetween, desks D1 to D4 are arranged in a sequential order from a position close to the electric blind 1D. Hereinafter, the desks A1 to A4, the desks B1 to B4, the desks C1 to C4, and the desks D1 to D4 may be
25 collectively referred to or any one of them may be simply referred to as a "desk".

Furthermore, in the embodiment, the invention may be applied to cases where chairs, sofas, beds, and the like are arranged besides desks. The positions where desks and the like are present are occupied positions where people may stay at any time.

Next, a functional configuration of the electric blind control system according to
30 the first embodiment will be described. FIG. 2 is a block diagram illustrating the functional configuration of the electric blind control system. As shown in FIG. 2, an electric blind control system 100 includes an occupancy detection device 10, an electric blind control apparatus 20, and the electric blinds 1A to 1D.

The occupancy detection device 10 detects an occupancy status of a person at the desks A1 to A4, the desks B1 to B4, the desks C1 to C4, and the desks D1 to D4 arranged in the office floor, creates occupancy detection information as the detection result thereof, and supplies the result to the electric blind control apparatus 20. The occupancy status is either a seated status where a person sits at a desk and a non-occupancy status where the desk is not occupied by a person. The occupancy detection device 10 detects an occupancy status whenever a person sits at the desk or leaves from the desk, creates occupancy detection information, and supplies the occupancy detection information to the electric blind control apparatus 20.

Specifically, the occupancy detection device 10 detects the seated status when a person sits at the desk by using, for example, an RFID (Radio Frequency Identification) technology, and transmits the person's identification information (personal ID) and the identification information (desk ID) of the desk where the person sits as occupancy detection information to the electric blind control apparatus 20. Furthermore, the occupancy detection device 10 detects the non-occupancy status when the person leaves from the desk, and transmits the desk ID of the desk where the person is absent as the occupancy detection information to the electric blind control apparatus 20.

More specifically, each person using the desk wears or carries an IC tag having an IC chip storing his or her personal ID (for example, an employee identification number or the like), a battery, and an antenna. The IC tag is an active tag, and has a function in which the IC chip reads the personal ID stored in the IC chip through the driving of the battery and transmits the personal ID from the antenna. Furthermore, each desk is provided with a reader device which receives the personal ID transmitted from the IC tag. The transmission power of a radio wave between the reader device and the IC tag is restricted so that the radio wave is transmitted and received only between the antenna of the reader device installed at the desk and the antenna of the IC tag put on or carried by the person sitting at the desk. When the reader device receives the personal ID transmitted from the IC tag, the reader device transmits the personal ID and the desk ID stored in advance in the reader device as the occupancy detection information to the electric blind control apparatus 20. Furthermore, when the reader device cannot receive the personal ID transmitted from the IC tag, the reader device transmits the desk ID of the reader device as the occupancy detection information to the electric blind control apparatus 20.

Furthermore, the IC tag may be formed as a passive tag. In this case, when the person carrying the IC tag sits at the desk, the person places or attaches the IC tag onto an IC tag reader unit of the reader device so that the IC tag may communicate with the reader device. On the other hand, when the person leaves from the desk, the person
 5 leaves with the IC tag. That is, when the person leaves from the desk, the person detaches the IC tag from the IC tag reader unit of the reader device so that communication therebetween is disabled.

The electric blind control apparatus 20 controls the operation of the electric blind 1A in accordance with the occupancy statuses of the desks A1 to A4, controls the
 10 operation of the electric blind 1B in accordance with the occupancy statuses of the desks B1 to B4, controls the operation of the electric blind 1C in accordance with the statuses of the desks C1 to C4, and controls the operation of the electric blind 1D in accordance with the statuses of the desks D1 to D4.

Specifically, the electric blind control apparatus 20 stores blind control amount
 15 information including a blind control priority for each of four desks as targets respectively corresponding to the electric blinds 1A to 1D and a control amount of the electric blinds 1A to 1D. Furthermore, the electric blind control apparatus 20 stores non-occupancy control amount information including desk IDs of four desks as targets respectively corresponding to the electric blinds 1A to 1D and a non-occupancy control
 20 amount as a control amount of the electric blinds 1A to 1D to be controlled when nobody sits at the four desks.

Then, when the electric blind control apparatus 20 receives the occupancy detection information supplied from the occupancy detection device 10, the electric blind control apparatus 20 updates information representing the entire occupancy status of the
 25 office floor based on the occupancy detection information. Then, the electric blind control apparatus 20 determines whether the electric blinds 1A to 1D may be controlled based on the information representing the updated occupancy status, the non-occupancy control amount information, and the blind control amount information. Then, when the electric blind control apparatus 20 determines that the electric blinds 1A to 1D may be
 30 controlled, the electric blind control apparatus creates a blind control command and supplies the blind control command to the electric blinds 1A to 1D to be controlled.

More specifically, a functional configuration of the electric blind control apparatus 20 will be described. The electric blind control apparatus 20 includes a blind

control amount information storage unit 21, a non-occupancy control amount information storage unit 22, an occupancy status registration unit 23, a blind control command creation unit 24, and a blind control unit 25.

5 The blind control amount information storage unit 21 stores the blind control amount information. The non-occupancy control amount information storage unit 22 stores the non-occupancy control amount information. The blind control amount information storage unit 21 and the non-occupancy control amount information storage unit 22 are formed as, for example, a magnetic hard disc device and a memory. The detailed examples of the blind control amount information and the non-occupancy
10 control amount information will be described later.

The occupancy status registration unit 23 is formed as, for example, a memory, and receives and stores the occupancy detection information supplied from the occupancy detection device 10.

Specifically, when the office floor shown in FIG. 1 is used as an example, the
15 occupancy status registration unit 23 sets pair data including sixteen desk IDs and personal IDs respectively corresponding to the desk IDs, and creates a memory map mapping the sixteen pair data in a memory space. That is, the sixteen pair data expressed in the memory map is information representing the occupancy status. In this memory map, a data group 1 is constituted by pairs of one of desk IDs of the desks A1 to A4 and one of personal IDs associated with the one of desk IDs, a data group 2 is
20 constituted by pairs of one of desk IDs of the desks B1 to B4 and one of personal IDs associated with the one of desk IDs, a data group 3 is constituted by pairs of one of desk IDs of the desks C1 to C4 and one of personal IDs associated with the one of desk IDs, and a data group 4 is constituted by pairs of one of desk IDs of the desks D1 to D4 and
25 one of personal IDs associated with the one of desk IDs. When the occupancy status registration unit 23 receives the occupancy detection information supplied from the occupancy detection device 10, the occupancy status registration unit newly registers or updates the pair data including the desk ID and the personal ID in the memory map by using the desk ID as a key if the occupancy detection information is the desk ID and the
30 personal ID. Furthermore, if the occupancy detection information is the desk ID, the occupancy status registration unit 23 sets the personal ID as null data, and newly registers or updates the pair data including the null data and the desk ID as the occupancy detection information by using the desk ID as a key.

The blind control command creation unit 24 reads the pair data including the desk ID of the desk where the person sits and the personal ID of the person sitting at the desk in the data group including the desk ID having the occupancy detection information from the memory map. Specifically, when the occupancy detection information
 5 supplied from the occupancy detection device 10 is stored in the occupancy status registration unit 23, the blind control command creation unit 24 reads the pair data including the desk ID in the data group (any one of the groups 1 to 4) including the desk ID included in the occupancy detection information and the personal ID instead of the null data from the memory map.

10 Then, when the blind control command creation unit 24 reads the pair data from the memory map, the blind control command creation unit turns on occupancy flag data (for example, "1").

When all data of the data group including the desk ID included in the occupancy detection information is the pair data including the desk ID and the null data, that is,
 15 nobody sits at the desk of the group as a target, the blind control command creation unit 24 may not read the pair data including the desk ID and the personal ID instead of the null data from the memory map. In this case, the blind control command creation unit 24 turns off the occupancy flag data (for example, "0").

When the occupancy flag data is turned on, the blind control command creation
 20 unit 24 uses the desk ID read from the memory map as a search key, and reads the priority, the control amount, and the blind ID associated with the search key from the blind control amount information storage unit 21. The blind ID is identification information previously associated with the electric blinds 1A to 1D. Then, the blind control command creation unit 24 uses the desk ID as a key, creates a control table of the
 25 priority and the control amount associated with the key, and correlates the control table with the blind ID. Then, the blind control command creation unit 24 extracts a record having the highest priority from the control table from the control table, and further extracts the control amount from the record. Then, the blind control command creation unit 24 determines whether the extracted control amount is equal to the control amount
 30 currently supplied to the electric blinds 1A to 1D corresponding to the blind ID. Then, when the blind control command creation unit 24 determines that the extracted control amount is different from the control amount currently supplied to the electric blinds 1A to 1D, the blind control command creation unit creates the blind control command

including the extracted control amount.

Furthermore, when the occupancy flag data is turned off, the blind control command creation unit 24 uses the desk ID as the occupancy detection information as a search key, and reads the non-occupancy control amount and the blind ID associated with the search key from the non-occupancy control amount information storage unit 22. Then, the blind control command creation unit 24 creates the blind control command including the read non-occupancy control amount.

The blind control command creation unit 24 supplies the created blind control command and the blind ID to the blind control unit 25. Then, the blind control command creation unit 24 stores the control amount included in the blind control command by correlating it with the blind ID.

The blind control unit 25 receives the blind control command and the blind ID supplied from the blind control command creation unit 24, and transmits the blind control command to the electric blinds 1A to 1D corresponding to the blind ID.

Each of the electric blinds 1A to 1D is an electric blind which includes an elevation motor elevating multiple layers of slats, a rotation motor rotating the slats to change the angle thereof, and a motor control unit controlling the elevation motor and the rotation motor. The motor control unit receives the blind control command supplied from the blind control unit 25 of the electric blind control apparatus 20, and drives the elevation motor based on the control amount included in the blind control command so that the slats are elevated or drives the rotation motor so that the angle thereof is changed.

FIGS. 3A, 3B, and 3C are diagrams respectively illustrating a data configuration of the blind control amount information.

FIG. 3A is an example of the blind control amount information corresponding to the electric blind 1A (the blind ID="ID01A"), FIG. 3B is an example of the blind control amount information corresponding to the electric blind 1B (the blind ID="ID01B"), and FIG. 3C is an example of the blind control amount information corresponding to the electric blind 1C (the blind ID="ID01C"). Furthermore, an example of the blind control amount information corresponding to the electric blind 1D will be omitted.

As shown in FIGS. 3A, 3B, and 3C, the blind control amount information is a data table associated with the "desk ID", the "priority", and the "control amount" for each electric blinds 1A to 1D. Then, the blind control amount information is associated

with the “blind ID”, and is stored in the blind control amount information storage unit 21. The “desk ID” is identification information of the desk associated with the electric blinds 1A to 1D corresponding to the blind ID. The “priority” is information representing the ranks in which the electric blind control apparatus 20 decides the control amount of the electric blinds 1A to 1D. In the examples of FIGS. 3A, 3B, and 3C, the priority becomes the highest when the rank is “1”, and becomes lower as the number increases.

The priority is set to be higher as the desk is closer to the electric blinds 1A to 1D. That is, the electric blind control apparatus 20 controls the electric blinds 1A to 1D based on the desk closest to the electric blinds 1A to 1D. Furthermore, in FIG. 3C, priority=“-” indicates that the priority is not designated. The “control amount” is data which represents the control amount for shading or dimming the electric blinds 1A to 1D, or data which represents an increase rate or a decrease rate of the slat or a setting angle of the slat of the electric blinds 1A to 1D and is appropriate for suppressing the feel of dazzle at the associated desk. Specifically, the control amount=“65°” of FIG. 3A indicates, for example, that the angle is set to 0° when the slat is horizontal and the convex surface of the slat rotates by 65° in the direction where the convex surface directly receives external light. Furthermore, the control amount=“40%” of FIG. 3B indicates, for example, that the slat is drawn up by 40% from the state where the blind is pulled down.

Furthermore, the blind control amount information may be provided in accordance with a period such as a season, a month, a date, and a time.

FIG. 4 is a diagram illustrating a data configuration of the non-occupancy control amount information. As shown in FIG. 4, the non-occupancy control amount information is a data table in which the “blind ID”, the “desk ID”, and the “non-occupancy control amount” are associated with each other. The “blind ID” is identification information associated with each of the electric blinds 1A to 1D. The “desk ID” is the desk ID of the desk associated with the electric blinds 1A to 1D associated with the blind ID. The “non-occupancy control amount” is a control amount that controls the electric blinds 1A to 1D when nobody sits at four desks. Specifically, the non-occupancy control amount=“100%” of FIG. 4 indicates, for example, that the blind is completely drawn up. Furthermore, the non-occupancy control amount=“-60°” indicates, for example, that the angle is set to 0° when the slat is horizontal and the

convex surface of the slat rotates by 60° in the direction in which the convex surface faces the office floor. That is, the “non-occupancy control amount” is a control amount that appropriately exhibits, for example, the effect of energy saving.

Furthermore, the non-occupancy control amount information may be provided in accordance with a period such as a season, a month, a date, and a time.

FIG. 5 is a diagram illustrating a data configuration of a control table that is created by the blind control command creation unit 24 when the occupancy flag data is turned on. FIG. 5 is a control table corresponding to the electric blind 1A (blind ID=“ID01A”). As shown in FIG. 5, the control table is a data table in which the “desk ID”, the “priority”, and the “control amount” are associated with each other. The “desk ID” is a desk ID that is read from the memory map of the occupancy status registration unit 23 by the blind control command creation unit 24. That is, the desk having the desk ID=“ID_A2” and the desk having the desk ID=“ID_A3” indicate that a person sits at the desk. The “priority”, the “control amount”, and the “blind ID” are the priority, the control amount, and the blind ID, respectively, which are read from the blind control amount information storage unit 21 by the blind control command creation unit 24 in the condition that the desk ID is used as a search key. In the example of the control table of FIG. 5, the electric blind control apparatus 20 extracts a record in which the desk ID is “ID_A2” having the highest priority in the control table, and extracts the control amount=“55°” from the record.

Next, an operation of the electric blind control apparatus 20 will be described. FIG. 6 is a flowchart illustrating a sequence of a process in which the electric blind control apparatus 20 controls the electric blinds 1A to 1D.

First, in step S1, the occupancy status registration unit 23 is in an input reception status until the occupancy detection information is supplied from the occupancy detection device 10 (S1: NO). Then, when the occupancy detection information is supplied from the occupancy detection device 10 (S1: YES), in step S2, the occupancy status registration unit 23 receives and stores the supplied occupancy detection information, that is, registers the occupancy status.

Specifically, when the occupancy status registration unit 23 receives the supplied occupancy detection information, if the occupancy detection information is the desk ID and the personal ID, the occupancy status registration unit 23 newly registers or updates the pair data including the desk ID and the personal ID in the memory map by using the

desk ID as a key. Furthermore, if the occupancy detection information is the desk ID, the occupancy status registration unit 23 sets the personal ID as null data, and newly registers or updates the pair data including the null data and the desk ID as the occupancy detection information using the desk ID as a key.

5 Next, in step S3, the blind control command creation unit 24 investigates the occupancy status of four desks corresponding to the data group including the desk ID included in the occupancy detection information.

 Specifically, the blind control command creation unit 24 reads the pair data including the desk ID and the personal ID instead of the null data in the data group
10 including the desk ID included in the occupancy detection information (any one of the groups 1 to 4) from the memory map. Then, when the blind control command creation unit 24 reads the pair data from the memory map, the blind control command creation unit 24 turns on the occupancy flag data (for example, "1"). Furthermore, when the blind control command creation unit 24 cannot read the pair data including the desk ID
15 and the personal ID instead of the null data from the memory map, the blind control command creation unit turns off the occupancy flag data (for example, "0").

 In step S4, when the blind control command creation unit 24 determines that a person sits at at least one of four desks, that is, the occupancy flag data is turned on (S4: NO), the process in step S5 is performed. Furthermore, when the blind control
20 command creation unit 24 determines that people are absent from all four desks, that is, the occupancy flag data is turned off (S4: YES), the process in step S8 is performed.

 In step S5, the blind control command creation unit 24 creates a control table based on the data of the memory map of the occupancy status registration unit 23 and the blind control amount information stored in the blind control amount information storage
25 unit 21.

 Specifically, the blind control command creation unit 24 uses the desk ID read from the memory map as a search key, and reads the priority, the control amount, and the blind ID associated with the search key from the blind control amount information storage unit 21. Next, the blind control command creation unit 24 uses the desk ID as a
30 key, creates a control table of the priority and the control amount associated with the key, and correlates the control table with the blind ID.

 Next, in step S6, the blind control command creation unit 24 determines whether the corresponding electric blinds 1A to 1D may be controlled based on the control table.

Specifically, the blind control command creation unit 24 extracts a record having the highest priority from the control table, and extracts the control amount from the record. Next, the blind control command creation unit 24 determines whether the extracted control amount is equal to the control amount currently supplied to the electric
5 blinds 1A to 1D corresponding to the blind ID.

When the blind control command creation unit 24 determines that the extracted control amount is different from the control amount currently supplied to the electric blinds 1A to 1D (S6: YES), the process in step S7 is performed. On the other hand, when the blind control command creation unit 24 determined that the extracted control
10 amount is equal to the control amount currently supplied to the electric blinds 1A to 1D (S6: NO), the process in step S1 is performed.

In step S7, the blind control command creation unit 24 creates a blind control command including a control amount extracted from the control table.

On the other hand, in step S8 subsequent to YES of step S4, the blind control
15 command creation unit 24 uses the desk ID as the occupancy detection information as a search key, and reads the non-occupancy control amount and the blind ID associated with the search key from the non-occupancy control amount information storage unit 22. Next, the blind control command creation unit 24 creates the blind control command including the read non-occupancy control amount.

20 In step S9, the blind control command creation unit 24 supplies the created blind control command and the blind ID to the blind control unit 25. Next, the blind control command creation unit 24 stores the control amount included in the blind control command by correlating it with the blind ID. Next, the blind control unit 25 receives the blind control command and the blind ID supplied from the blind control command
25 creation unit 24, and transmits the blind control command to the electric blinds 1A to 1D corresponding to the blind ID. Next, the process in step S1 is performed.

As described above, according to the electric blind control system 100 adopting the electric blind control apparatus 20 of the first embodiment of the invention, the electric blind control apparatus 20 adjusts the angle or the elevation of the slat of the
30 electric blinds 1A to 1D in accordance with a change of the occupancy status of the desk detected by the occupancy detection device 10. At this time, the electric blind control apparatus 20 controls the electric blinds 1A to 1D based on the person sitting at a position closest to the electric blinds 1A to 1D. When the electric blind control apparatus 20 has

the above-described configuration, it is possible to control the electric blinds 1A to 1D in accordance with the occupancy status of the desk without considering that the person sitting at a position closest to the electric blinds 1A to 1D feels dazzle. Furthermore, when the electric blind control apparatus 20 detects that nobody is sitting at the desk associated with the electric blinds 1A to 1D, the electric blind control apparatus 20 controls the electric blinds 1A to 1D by the control amount set in advance to reduce the amount of energy since there is nobody feels dazzle by the sunlight. When the electric blind control apparatus 20 has the above-described configuration, it is possible to appropriately reduce feel of dazzle and to reduce the amount of energy used in a room.

Second Embodiment

In the electric blind control system 100 of the first embodiment, the control amount by which the electric blind control apparatus 20 controls the electric blinds 1A to 1D is a control amount determined in advance for each desk. A second embodiment of the invention is an example in which the control amount is determined based on the combination of the desk and the person associated with the desk.

As a schematic plan view of an office floor having an electric blind control system adopting an electric blind control apparatus of the second embodiment of the invention, FIG. 1 of the first embodiment is used. Accordingly, a description of FIG. 1 will be omitted. Furthermore, in the description of the functional configuration of the embodiment, the same reference numerals will be given to the components having the same functional configurations as those of the first embodiment, and a description thereof will be omitted.

FIG. 7 is a block diagram illustrating a functional configuration of the electric blind control system of the second embodiment. As shown in FIG. 7, an electric blind control system 100a has a configuration in which the electric blind control apparatus 20 of the electric blind control system 100 of the first embodiment is changed as an electric blind control apparatus 20a.

The electric blind control apparatus 20a controls the operation of the electric blind 1A in accordance with the occupancy statuses of the desks A1 to A4, controls the operation of the electric blind 1B in accordance with the occupancy statuses of the desks B1 to B4, controls the operation of the electric blind 1C in accordance with the occupancy statuses of the desks C1 to C4, and controls the operation of the electric blind 1D in accordance with the occupancy statuses of the desks D1 to D4.

Specifically, the electric blind control apparatus 20a stores blind control amount information including a blind control priority for each of four desks as targets respectively corresponding to the electric blinds 1A to 1D and a control amount of the electric blinds 1A to 1D. Furthermore, the electric blind control apparatus 20a stores non-occupancy control amount information including desk IDs of four desks as targets respectively corresponding to the electric blinds 1A to 1D and a non-occupancy control amount as a control amount of the electric blinds 1A to 1D to be controlled when nobody sits at the four desks. Furthermore, the electric blind control apparatus 20a stores preferable control amount information including a preferable value of a control amount of the electric blinds 1A to 1D for each time frame and for each person associated with the desk.

Then, when the electric blind control apparatus 20a receives the occupancy detection information supplied from the occupancy detection device 10, the electric blind control apparatus 20a updates information representing the entire occupancy status of the office floor based on the occupancy detection information. Then, the electric blind control apparatus 20a determines whether the electric blinds 1A to 1D may be controlled based on the information representing the updated occupancy status, the non-occupancy control amount information, the blind control amount information, and the preferable control information. Then, when the electric blind control apparatus 20a determines that the electric blinds 1A to 1D may be controlled, the electric blind control apparatus creates a blind control command and supplies the blind control command to the electric blinds 1A to 1D to be controlled.

More specifically, a functional configuration of the electric blind control apparatus 20a will be described. The electric blind control apparatus 20a has a configuration in which a preferable control amount information storage unit 26 is added to the electric blind control apparatus 20 of the first embodiment and the blind control command creation unit 24 is changed as a blind control command creation unit 24a.

The preferable control amount information storage unit 26 stores the preferable control amount information. The preferable control amount information storage unit 26 is formed as, for example, a magnetic hard disc device and a memory. A detailed example of the preferable control amount information will be described later.

The blind control command creation unit 24a reads the pair data including the desk ID of the desk where the person sits and the personal ID of the person sitting at the

desk in the data group including the desk ID having the occupancy detection information from the memory map. Specifically, when the occupancy detection information supplied from the occupancy detection device 10 is stored in the occupancy status registration unit 23, the blind control command creation unit 24a reads the pair data including the desk ID in the data group (any one of the groups 1 to 4) including the desk ID included in the occupancy detection information and the personal ID instead of the null data from the memory map.

Then, when the blind control command creation unit 24 reads the pair data from the memory map, the blind control command creation unit turns on occupancy flag data (for example, "1").

When all pair data of the data group including the desk ID included in the occupancy detection information is the pair data including the desk ID and the null data, that is, nobody sits at the desk of the group as a target, the blind control command creation unit 24a may not read the pair data including the desk ID and the personal ID instead of the null data from the memory map. In this case, the blind control command creation unit 24a turns off the occupancy flag data (for example, "0").

When the occupancy flag data is turned on, the blind control command creation unit 24a uses the desk ID read from the memory map as a search key, and reads the priority, the control amount, and the blind ID associated with the search key from the blind control amount information storage unit 21. Furthermore, the blind control command creation unit 24a uses the pair data including the personal ID and the desk ID read from the memory map as a search key, and reads the preferable value of the control amount associated with the search key from the preferable control amount information storage unit 26. Then, the blind control command creation unit 24a uses the desk ID as a key, creates a control table of the priority, the control amount, the personal ID, and the preferable value of the control amount associated with the key, and correlates the control table with the blind ID. Then, the blind control command creation unit 24a extracts a record having the highest priority from the control table. Then, when the preferable value of the control amount is stored in the extracted record, the blind control command creation unit 24a extracts the preferable value as the control amount. On the other hand, when the preferable value of the control amount is not stored in the record, the blind control command creation unit 24a extracts the control amount. Then, the blind control command creation unit 24a determines whether the extracted control amount is equal to

the control amount currently supplied to the electric blinds 1A to 1D corresponding to the blind ID. Then, when the blind control command creation unit 24a determines that the extracted control amount is different from the control amount currently supplied to the electric blinds 1A to 1D, the blind control command creation unit creates the blind control command including the extracted control amount.

Furthermore, when the occupancy flag data is turned off, the blind control command creation unit 24a uses the desk ID as the occupancy detection information as a search key, and reads the non-occupancy control amount and the blind ID associated with the search key from the non-occupancy control amount information storage unit 22.

Then, the blind control command creation unit 24a creates the blind control command including the read non-occupancy control amount.

The blind control command creation unit 24a supplies the created blind control command and the blind ID to the blind control unit 25. Then, the blind control command creation unit 24a stores the control amount included in the blind control command by correlating it with the blind ID.

FIG. 8 is a diagram illustrating a data configuration of the preferable control amount information. FIG. 8 is an example of the preferable control amount information corresponding to a person having the personal ID="ID003". As shown in the same drawing, the preferable control amount information is a data table in which the "desk ID" and the "preferable value" are correlated for each person.

Then, the preferable control amount information is associated with the "personal ID", and is stored in the preferable control amount information storage unit 26. The "desk ID" is identification information of the desk used by a person corresponding to the personal ID. That is, in the example of the preferable control amount information of FIG. 8, the person having the personal ID="ID003" uses the desk having the desk ID="ID_A2" and the desk having the desk ID="ID_B4". The "preferable value" is a preferable value of the control amount of the electric blinds 1A to 1D appropriate for suppressing feel of dazzle of the person associated with the personal ID, and may be set in accordance with, for example, a time as shown in FIG. 8. The preferable value of the control amount is data which represents an increase rate or a decrease rate of the slat or a setting angle of the slat of the electric blinds 1A to 1D.

FIG. 9 is a diagram illustrating a data configuration of a control table that is created by the blind control command creation unit 24a when the occupancy flag data is

turned on. FIG. 9 is a control table corresponding to the electric blind 1A (the blind ID="ID01A"). As shown in FIG. 9, the control table in which the "desk ID", the "priority", the "control amount", the "personal ID", and the "preferable value" are associated with each other. The "desk ID" and the "personal ID" are the desk ID and the personal ID which are read from the memory map of the occupancy status registration unit 23 by the blind control command creation unit 24a. The "priority", the "control amount", and the "blind ID" are the priority, the control amount, and the blind ID which are read from the blind control amount information storage unit 21 by the blind control command creation unit 24a in the condition that the desk ID is used as a search key. The "preferable value" is the preferable value of the control amount which is read from the preferable control amount information storage unit 26 by the blind control command creation unit 24a in the condition that the desk ID and the personal ID are used as a search key. In the example of the control table of FIG. 9, the electric blind control apparatus 20a extracts a record having the desk ID of "ID_A2" as the record having the highest priority from the control table, and further extracts the preferable value="60°" as the control amount from the record.

Next, an operation of the electric blind control apparatus 20a will be described. The flowchart illustrating a sequence of a process in which the electric blind control apparatus 20a controls the electric blinds 1A to 1D is the same as the flowchart shown in FIG. 6. Accordingly, this process will be described by referring to the flowchart of FIG. 6.

First, in step S1, the occupancy status registration unit 23 is in an input reception status until the occupancy detection information is supplied from the occupancy detection device 10 (S1: NO). Then, when the occupancy detection information is supplied from the occupancy detection device 10 (S1: YES), in step S2, the occupancy status registration unit 23 receives and stores the supplied occupancy detection information, that is, registers the occupancy status.

Specifically, when the occupancy status registration unit 23 receives the supplied occupancy detection information, if the occupancy detection information is the desk ID and the personal ID, the occupancy status registration unit 23 newly registers or updates the pair data including the desk ID and the personal ID in the memory map by using the desk ID as a key. Furthermore, if the occupancy detection information is the desk ID, the occupancy status registration unit 23 sets the personal ID as null data, and newly

registers or updates the pair data including the null data and the desk ID as the occupancy detection information using the desk ID as a key.

Next, in step S3, the blind control command creation unit 24a investigates the occupancy status of four desks corresponding to the data group including the desk ID included in the occupancy detection information.

Specifically, the blind control command creation unit 24a reads the pair data including the desk ID and the personal ID instead of the null data in the data group including the desk ID included in the occupancy detection information (any one of the groups 1 to 4) from the memory map. Then, when the blind control command creation unit 24a reads the pair data from the memory map, the blind control command creation unit 24a turns on the occupancy flag data (for example, "1"). Furthermore, when the blind control command creation unit 24a may not read the pair data including the desk ID and the personal ID instead of the null data from the memory map, the blind control command creation unit turns off the occupancy flag data (for example, "0").

In step S4, when the blind control command creation unit 24a determines that a person sits at at least one of four desks, that is, the occupancy flag data is turned on (S4: NO), the process in step S5 is performed. Furthermore, when the blind control command creation unit 24a determines that people are absent from all four desks, that is, the occupancy flag data is turned off (S4: YES), the process in step S8 is performed.

In step S5, the blind control command creation unit 24a creates a control table based on the data of the memory map of the occupancy status registration unit 23, the blind control amount information stored in the blind control amount information storage unit 21, and the preferable control amount information stored in the preferable control amount information storage unit 26.

Specifically, the blind control command creation unit 24a uses the desk ID read from the memory map as a search key, and reads the priority, the control amount, and the blind ID associated with the search key from the blind control amount information storage unit 21. Furthermore, the blind control command creation unit 24a uses the pair data including the personal ID and the desk ID read from the memory map as a search key, and reads the preferable value of the control amount associated with the search key from the preferable control amount information storage unit 26. Next, the blind control command creation unit 24a uses the desk ID as a key, creates a control table in which the priority, the control amount, the personal ID, and the preferable value of the control

amount are associated with the key, and correlates the control table with the blind ID.

Next, in step S6, the blind control command creation unit 24a determines whether the corresponding electric blinds 1A to 1D may be controlled based on the control table.

5 Specifically, the blind control command creation unit 24a extracts a record having the highest priority from the control table. Next, when the preferable value of the control amount is stored in the extracted record, the blind control command creation unit 24a extracts the preferable value as the control amount. On the other hand, when the preferable value of the control amount is not stored in the record, the blind control
10 command creation unit 24a extracts the control amount. Next, the blind control command creation unit 24a determines whether the extracted control amount is equal to the control amount currently supplied to the electric blinds 1A to 1D corresponding to the blind ID.

When the blind control command creation unit 24a determines that the extracted
15 control amount is different from the control amount currently supplied to the electric blinds 1A to 1D (S6: YES), the process in step S7 is performed. On the other hand, when the blind control command creation unit 24a determined that the extracted control amount is equal to the control amount currently supplied to the electric blinds 1A to 1D (S6: NO), the process in step S1 is performed.

20 In step S7, the blind control command creation unit 24a creates a blind control command including a control amount extracted from the control table.

On the other hand, in step S8 subsequent to YES of step S4, the blind control command creation unit 24a uses the desk ID as the occupancy detection information as a search key, and reads the non-occupancy control amount and the blind ID associated with
25 the search key from the non-occupancy control amount information storage unit 22.

Next, the blind control command creation unit 24a creates the blind control command including the read non-occupancy control amount.

In step S9, the blind control command creation unit 24a supplies the created blind control command and the blind ID to the blind control unit 25. Next, the blind
30 control command creation unit 24a stores the control amount included in the blind control command by correlating it with the blind ID. Next, the blind control unit 25 receives the blind control command and the blind ID supplied from the blind control command creation unit 24a, and transmits the blind control command to the electric

blinds 1A to 1D corresponding to the blind ID. Next, the process in step S1 is performed.

As described above, according to the electric blind control system 100a adopting the electric blind control apparatus 20a of the second embodiment of the invention, the electric blind control apparatus 20a adjusts the angle or the elevation of the slat of the electric blinds 1A to 1D in accordance with a change of the occupancy status of the desk detected by the occupancy detection device 10. At this time, the electric blind control apparatus 20a controls the electric blinds 1A to 1D based on the person sitting at a position closest to the electric blinds 1A to 1D. When the electric blind control apparatus 20a has the above-described configuration, it is possible to control the electric blinds 1A to 1D in accordance with the occupancy status of the desk without considering that the person sitting at a position closest to the electric blinds 1A to 1D feels dazzle. Furthermore, when the electric blind control apparatus 20a detects that nobody sits at the desk associated with the electric blinds 1A to 1D, the electric blind control apparatus 20a controls the electric blinds 1A to 1D by the control amount set in advance to reduce the amount of energy since there is nobody feels dazzle by the sunlight. When the electric blind control apparatus 20a has the above-described configuration, it is possible to appropriately reduce feel of dazzle and to reduce the amount of energy used in a room.

Furthermore, the occupancy detection device 10 of the first and second embodiments may include, for example, an imaging device which images the office floor and an image recognition processing device which detects the occupancy status by performing an image recognition on image data obtained by the imaging device.

Furthermore, the occupancy detection device 10 may include, for example, a human detection sensor which is provided for each desk. Accordingly, when a person sits at the desk, the human detection sensor provided at the desk may detect the person, and inform the electric blind control apparatus 20 of the detection result.

Furthermore, each of the electric blinds 1A to 1D may be an electric roller curtain instead of a venetian blind having multiple layers of slats.

Furthermore, the function of the electric blind control apparatus of the first and second embodiments may be realized by a computer. In this case, an electric blind control program for realizing this function may be stored in a computer readable storage medium, and a computer system may read and execute the electric blind control program stored in the storage medium. Furthermore, the "computer system" mentioned herein

includes hardware of an OS (Operating System) or a peripheral device. Furthermore, the “computer readable storage medium” indicates a portable storage medium such as a flexible disc, an optical magnetic disc, an optical disc, or a memory card, and a storage device such as a magnetic hard disc built in the computer system. Furthermore, the

- 5 “computer readable storage medium” may include a storage medium which dynamically holds a program for a short time like a communication line when the program is transmitted via a network such as an internet or a communication line such as a telephone line or a storage medium which holds a program for a predetermined time like a volatile memory inside a computer system as a server device or a client in that case.
- 10 Furthermore, the program may realize a part of the above-described function and realize the above-described function by the combination with a program already stored in the computer system.

- While preferred embodiments of the invention have been described and illustrated above, it should be understood that these are exemplary of the invention and
- 15 are not to be considered as limiting. Additions, omissions, substitutions, and other modifications can be made without departing from the spirit or scope of the present invention. Accordingly, the invention is not to be considered as being limited by the foregoing description, and is only limited by the scope of the appended claims.

What is claimed is:

1. An electric blind control apparatus comprising:

5 a blind control amount information storage unit configured to store a control amount for shielding or dimming an electric blind at an occupied position associated with the electric blind;

an occupancy status registration unit configured to register a person occupancy status at the occupied position;

10 a blind control command creation unit configured to read the control amount from the blind control amount information storage unit based on the occupancy status registered in the occupancy status registration unit, and creates a blind control command operating the electric blind based on the read control amount; and

15 a blind control unit configured to control the electric blind by supplying the blind control command created by the blind control command creation unit to the electric blind.

2. The electric blind control apparatus according to claim 1, wherein when a seated status of a person is included in the occupancy status registered in the occupancy status registration unit, the blind control command creation unit reads the electric blind control amount at a position closest to the electric blind in the occupied position corresponding to the seated status from the blind control amount information storage unit.

3. The electric blind control apparatus according to claim 1, further comprising:

25 a non-occupancy control amount information storage unit configured to store a non-occupancy control amount as a control amount of the electric blind when a person does not sit at the occupied position,

wherein when a seated status of a person is not included in the occupancy status registered in the occupancy status registration unit, the blind control command creation unit reads the non-occupancy control amount from the non-occupancy control amount information storage unit, and creates a blind control command operating the electric blind based on the read non-occupancy control amount.

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4. An electric blind control program that allows a computer including a blind control

amount information storage unit configured to store a control amount for shading or dimming an electric blind at an occupied position associated with the electric blind to serve as:

5 an occupancy status registration unit configured to register a person occupancy status at the occupied position;

 a blind control command creation unit configured to read the control amount from the blind control amount information storage unit based on the occupancy status registered in the occupancy status registration unit, and creates a blind control command operating the electric blind based on the read control amount; and

10 a blind control unit configured to control the electric blind by supplying the blind control command created by the blind control command creation unit to the electric blind.