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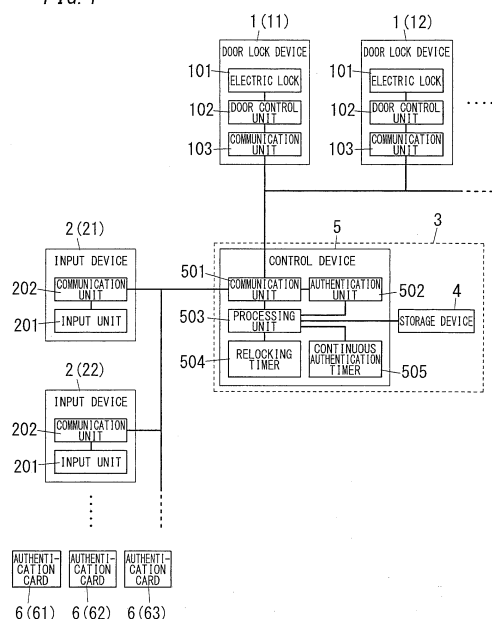
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(54) **DOOR OPENING/CLOSING CONTROL SYSTEM AND DOOR OPENING/CLOSING CONTROL DEVICE**

(57) The door lock control system includes: door lock devices configured to lock and unlock corresponding doors respectively; a door lock control device configured to control the plural door lock devices; and input devices configured to, upon receiving identification information, send the received identification information to the door lock control device. The door lock control device includes a storage device and a control device. The storage device stores a correspondence relation between a combination of the identification information and the input device and the door lock device. Upon receiving the identification information from the input device, the control device refers to the correspondence relation stored in the storage device, and selects the door lock device associated with the combination of the received identification information and the input device which has sent this identification information, and controls the selected door lock device to unlock the corresponding door.

FIG. 1



Description

Technical Field

[0001] The present invention relates to a door lock control system and a door lock control device configured to control unlocking of each of plural door lock devices installed in associated with respective different doors.

Background Art

[0002] In the past, there has been known an electric lock system designed to control electric locks (electronic locks) constituting door lock devices provided to doors. Such an electric lock system performs personal authentication based on an authentication card preliminarily registered, and unlocks the electric lock according to an authentication result, for example.

[0003] As to the aforementioned electric lock system, to unlock the plural electric locks, the personal authentication based on the authentication card is necessary for each of the plural electric locks. Thus, there is a problem that it is troublesome for a user to perform the personal authentication based on the authentication card for each electric lock.

[0004] As means for solving the above problem, there has been known an electric lock control device capable of unlocking two or more electric locks in response to one process of reading information and authenticating the read information (see document 1 [JP 5-321524 A]). The electric lock control device disclosed in document 1 selects the electric lock from the plural electric locks according to the inputted information, as an unlocking object. According to the electric lock control device disclosed in document 1, it is possible to select different electric locks in response to different inputted information.

[0005] However, a system employing the electric lock control device disclosed in document 1 includes only one electric lock control device which reads the inputted information and authorizes it. Hence, it is incapable of fulfilling a request to change the electric lock designated as the unlocking object according to a location of a user.

[0006] According to the system employing the electric lock control device disclosed in document 1, irrespective of a case where a user is in front of a main entrance and a case where a user is in front of a side exit different from the main entrance, the same electric lock is selected as the electric lock designated as the unlocking object. Therefore, the electric locks should be unlocked without causing any disadvantages for both cases. However, the electric lock which is necessary to one case but is unnecessary to the other case is likely to be included in the electric locks designated as the unlocking objects. This may cause a security problem. For example, when a user is in front of the main entrance, the electric lock at the side exit is likely to be unlocked in addition to the electric lock at the main entrance.

Summary of Invention

[0007] In view of the above insufficiency, the objective of the present invention is to propose a door lock control system and a door lock control device which are capable of avoiding unnecessary unlocking of the door lock devices to improve security.

[0008] The door lock control system of the first aspect in accordance with the present invention includes: plural door lock devices configured to lock and unlock corresponding doors respectively; a door lock control device configured to control the plural door lock devices; and plural input devices configured to, upon receiving identification information, send the received identification information to the door lock control device. The door lock control device includes a storage device and a control device. The storage device is configured to store a correspondence relation between a combination of the identification information and the input device and the door lock device. The control device is configured to: upon receiving the identification information from the input device, refer to the correspondence relation stored in the storage device; and select the door lock device associated with the combination of the received identification information and the input device which has sent this identification information; and control the selected door lock device in such a manner to unlock the corresponding door.

[0009] As for the door lock control system of the second aspect in accordance with the present invention, in addition to the door lock control system of the first aspect, the storage device is configured to store a relocking period for each of the door lock devices. The control device is configured to: retrieve the relocking period corresponding to the selected door lock device from the storage device; and after passage of the retrieved relocking period from time at which the selected door lock device has unlocked the corresponding door, control the selected door lock device in such a manner to lock the corresponding door.

[0010] As for the door lock control system of the third aspect in accordance with the present invention, in addition to the door lock control system of the first aspect, the storage device is configured to store a relocking period for each combination of the identification information and the door lock device. The control device is configured to: retrieve the relocking period corresponding to the combination of the received identification information and the selected door lock device from the storage device; and after passage of the retrieved relocking period from time at which the selected door lock device has unlocked the corresponding door, control the selected door lock device in such a manner to lock the corresponding door.

[0011] As for the door lock control system of the fourth aspect in accordance with the present invention, in addition to the door lock control system of the first aspect, the storage device is configured to store a relocking period for each piece of the identification information. The

control device is configured to: retrieve the relocking period corresponding to the received identification information from the storage device; and after passage of the retrieved relocking period from time at which the selected door lock device has unlocked the corresponding door, control the selected door lock device in such a manner to lock the corresponding door.

[0012] As for the door lock control system of the fifth aspect in accordance with the present invention, in addition to the door lock control system of any one of the first to fourth aspects, the storage device is configured to store a priority for each piece of the identification information. The control device is configured to, upon receiving the identification information from the input device, judge whether or not a predetermined period passes from a time of receiving the previous identification information from the same input device. The control device is configured to, upon concluding that the predetermined period does not pass from the time of receiving the previous identification information, retrieve the priority of the present identification information from the storage device and compare the retrieved priority of the present identification information with the priority of the previous identification information. The control device is configured to, upon concluding that the priority of the present identification information is lower than the priority of the previous identification information, select as an unlocking object the door lock device associated with the present identification information with regard to the same input device and control the door lock device selected as the unlocking object in such a manner to unlock the corresponding door, and select as a locking object the door lock device which is associated with the previous identification information but is not associated with the present identification information with regard to the same input device and control the door lock device selected as the locking object in such a manner to lock the corresponding door.

[0013] As for the door lock control system of the sixth aspect in accordance with the present invention, in addition to the door lock control system of any one of the first to fourth aspects, the control device is configured to judge whether or not an event where plural pieces of the identification information are inputted into the same input device before passage of a predetermined period has occurred. The control device is configured to, upon concluding that the event has occurred, refer to the correspondence relation stored in the storage device and select the door lock device associated with at least one of the plural pieces of the identification information with regard to the same input device.

[0014] As for the door lock control system of the seventh aspect in accordance with the present invention, in addition to the door lock control system of any one of the first to fourth aspects, the control device is configured to judge whether or not an event where plural pieces of the identification information are inputted into the same input device before passage of a predetermined period has occurred. The control device is configured to, upon con-

cluding that the event has occurred, refer to the correspondence relation stored in the storage device and select the door lock device associated with all of the plural pieces of the identification information with regard to the same input device.

[0015] The door lock control device in accordance with the present invention is defined as a door lock control device connected to plural door lock devices configured to lock and unlock corresponding doors respectively and plural input devices configured to receive identification information. Each of the plural input devices is configured to, upon receiving the identification information, send the received identification information to the door lock control device. The door lock control device includes: a storage device configured to store a correspondence relation between a combination of the identification information and the input device and the door lock device; and a control device is configured to: upon receiving the identification information from the input device, refer to the correspondence relation stored in the storage device; and select the door lock device associated with the combination of the received identification information and the input device which has sent this identification information; and control the selected door lock device in such a manner to unlock the corresponding door.

Brief Description of the Drawings

[0016]

FIG. 1 is a block diagram illustrating a configuration of the door lock control system in accordance with an embodiment,

FIG. 2 is a schematic diagram illustrating a building in which the door lock control system in accordance with the above embodiment is installed,

FIG. 3 is a diagram illustrating a correspondence table used in the door lock control system in accordance with the above embodiment,

FIG. 4 is a flowchart illustrating an operation of the door lock control system in accordance with the above embodiment,

FIG. 5 is a flowchart illustrating the operation of the door lock control system in accordance with the above embodiment,

FIG. 6 is a flowchart illustrating the operation of the door lock control system in accordance with the above embodiment, and

FIG. 7 is a block diagram illustrating a configuration of the door lock control system in accordance with a modified example of the above embodiment.

Description of Embodiments

[0017] With regard to the following embodiment in accordance with the present invention, an explanation is made to a door lock control system (lock control system) and a door lock control device (lock control device) con-

figured to control locks of plural door lock devices (lock devices) installed in association with different doors respectively.

[0018] As shown in FIG. 1, the door lock control system in accordance with the present embodiment includes plural door lock devices **1** provided in association with different doors respectively, plural input devices **2** for receiving personal identification information (key ID), and a door lock control device **3** configured to control an locking operation and unlocking operation of each of the plural door lock control devices **1**.

[0019] Each authentication card **6** shown in FIG. 1 is a contactless card key, for example. The authentication card **6** stores peculiar identification information as the personal identification information. The personal identification information includes class information indicative of a class of a user (e.g., "officer", "manager", and "staff"). Unlocking authority is given for each kind of the class information. To unlock the door lock device **1** corresponding to the given unlocking authority, a user has a corresponding one of the authentication cards **6** respectively associated with mutually different pieces of the personal identification information. Note that, the authentication card **6** may be a passive type card necessitating power supply or an active type card which includes a built-in battery.

[0020] Each of the door lock devices **1** includes an electric lock **101**, a door control unit **102** configured to control the door lock device **1**, and a communication unit **103** configured to communicate with a control device **5**. The communication unit **103** is configured to receive, from the control device **5**, an unlocking signal and a locking signal which are mentioned below. The door control unit **102** is configured to unlock the electric lock **101** according to an instruction defined by the unlocking signal received via the communication unit **103**. The door control unit **102** is configured to lock the electric lock **101** according to an instruction defined by the locking signal received via the communication unit **103**. The electric lock **101** is activated or deactivated according to control of the door control unit **102**.

[0021] FIG. 2 shows a building as an example of a structure where the door lock devices **1** are installed, and this building shown in FIG. 2 includes a first office **71**, a second office **72**, a storeroom **73**, an executive room **74**, a reception room **75**, and a strong room **76**. Further, this building has a passageway **77** allowing access between a main entrance (first door) **81**, a side exit (eighth door **88**), and the rooms **71** to **76** (except the executive room **74**).

[0022] In the above building, the first door lock device **11** is provided to the main entrance corresponding to the first door **81** located between an outdoor space **78** and the passageway **77**. To enter the passageway **77** from the outdoor space **78**, a user is required to take an action for controlling the door lock control device **3** to unlock the first door lock device **11** so as to switch the first door **81** to an open-state. In contrast, when a user intends to move

to the outdoor space **78** from the passageway **77**, a user is allowed to open the first door **81** freely.

[0023] The eighth door lock device **18** is provided to the side exit corresponding to the eighth door **88** located between the outdoor space **78** and the passageway **77**. To enter the passageway **77** from the outdoor space **78**, a user is required to take an action for controlling the door lock control device **3** to unlock the eighth door lock device **18** so as to switch the eighth door **88** to the open-state. In contrast, when a user intends to move to the outdoor space **78** from the passageway **77**, a user is allowed to open the eighth door **88** freely.

[0024] The second door lock device **12** is provided to a second door **82** located between the reception room **75** and the passageway **77**. To enter the reception room **75** from the passageway **77**, a user is required to take an action for controlling the door lock control device **3** to unlock the second door lock device **12** so as to switch the second door **82** to the open-state. In contrast, when a user intends to move to the passageway **77** from the reception room **75**, a user is allowed to open the second door **82** freely.

[0025] The third door lock device **13** is provided to a third door **83** located between the second office **72** and the passageway **77**. To enter the second office **72** from the passageway **77**, a user is required to take an action for controlling the door lock control device **3** to unlock the third door lock device **13** so as to switch the third door **83** to the open-state. In contrast, when a user intends to move to the passageway **77** from the second office **72**, a user is allowed to open the third door **83** freely.

[0026] The fourth door lock device **14** is provided to a fourth door **84** located between the first office **71** and the passageway **77**. To enter the first office **71** from the passageway **77**, a user is required to take an action for controlling the door lock control device **3** to unlock the fourth door lock device **14** so as to switch the fourth door **84** to the open-state. In contrast, when a user intends to move to the passageway **77** from the first office **71**, a user is allowed to open the fourth door **84** freely.

[0027] The seventh door lock device **17** is provided to a seventh door **87** located between the storeroom **73** and the passageway **77**. To enter the storeroom **73** from the passageway **77**, a user is required to take an action for controlling the door lock control device **3** to unlock the seventh door lock device **17** so as to switch the seventh door **87** to the open-state. In contrast, when a user intends to move to the passageway **77** from the storeroom **73**, a user is allowed to open the seventh door **87** freely.

[0028] The sixth door lock device **16** is provided to a sixth door **86** located between the strong room **76** and the passageway **77**. To enter the strong room **76** from the passageway **77**, a user is required to take an action for controlling the door lock control device **3** to unlock the sixth door lock device **16** so as to switch the sixth door **86** to the open-state. In contrast, when a user intends to move to the passageway **77** from the strong room **76**, a user is allowed to open the sixth door **86** freely.

[0029] The fifth door lock device **15** is provided to a fifth door **85** located between the executive room **74** and the first office **71**. To enter the executive room **74** from the first office **71**, a user is required to take an action for controlling the door lock control device **3** to unlock the fifth door lock device **15** so as to switch the fifth door **85** to the open-state. In contrast, when a user intends to move to the first office **71** from the executive room **74**, a user is allowed to open the fifth door **85** freely.

[0030] Each of the input devices **2** is a contactless card reader (contactless key reader) configured to read personal identification information from the authentication card **6** serving as a contactless card, for example. The input devices **2** are provided to the different doors **81** to **88**, respectively. In brief, the input devices **2** are installed respectively associated with the different door lock devices **1**. Each of the input devices **2** includes, as shown in FIG. 1, an input unit **201** and a second communication unit **202**. Individual input device identification information (key reader number) is allocated uniquely to each of the input devices **2**. The input unit **201** is configured to read the personal identification information from the authentication card **6**. The communication unit **202** is configured to send the personal identification information read by the input unit **201** to the control device **5** (door lock control device **3**) explained below.

[0031] As shown in FIG. 2, the first input device **21** is installed on a side of the first door **81** facing the outdoor space **78**. The second input device **21** reads the personal identification information from the authentication card **6** in a case where a user enters the passageway **77** from the outdoor space **78**. The second input device **22** is installed on a side of the second door **82** facing the passageway **77**. The second input device **22** reads the personal identification information from the authentication card **6** in a case where a user enters the reception room **75** from the passageway **77**. The third input device **23** is installed on a side of the third door **83** facing the passageway **77**. The third input device **23** reads the personal identification information from the authentication card **6** in a case where a user enters the second office **72** from the passageway **77**. The fourth input device **24** is installed on a side of the fourth door **84** facing the passageway **77**. The fourth input device **24** reads the personal identification information from the authentication card **6** in a case where a user enters the first office **71** from the passageway **77**. The fifth input device **25** is installed on a side of the fifth door **85** facing the first office **71**. The fifth input device **25** reads the personal identification information from the authentication card **6** in a case where a user enters the executive room **74** from the first office **71**. The sixth input device **26** is installed on a side of the sixth door **86** facing the passageway **77**. The sixth input device **26** reads the personal identification information from the authentication card **6** in a case where a user enters the strong room **76** from the passageway **77**. The seventh input device **27** is installed on a side of the seventh door **87** facing the passageway **77**. The seventh input device

27 reads the personal identification information from the authentication card **6** in a case where a user enters the storeroom **73** from the passageway **77**. The eighth input device **28** is installed on a side of the eighth door **88** facing the outdoor space **78**. The eighth input device **28** reads the personal identification information from the authentication card **6** in a case where a user enters the passageway **77** from the outdoor space **78**.

[0032] The door lock control device **3** shown in FIG. 1 is a software embedded device including a CPU (Central Processing Unit) and a memory, for example. The door lock control device **3** includes a storage device **4** and the control device **5**. The storage device **4** is configured to store a correspondence table (correspondence relation) designating the door lock devices **1** selected as unlocking objects. The control device **5** is configured to control the respective door lock devices **1**.

[0033] The storage device **4** preliminarily stores the correspondence table as shown in FIG. 3. In the correspondence table illustrated in FIG. 3, each combination of the class information ("officer", "manager", and "staff", in FIG. 3) included in the personal identification information and the input device **2** (i.e., the input device identification information) having read this personal identification information is associated with the one or more door lock devices **1** designated as the unlocking objects. In other words, the storage device **4** is configured to store the correspondence relation between the door lock device **1** and the combination of the identification information (personal identification information) and the input device **2**.

[0034] The leftmost column in FIG. 3 shows the input devices **2**. "Sn" ($n = 1$ to 8) represents the nth input device **2n** (e.g., "S1" represents the first input device **21**, and "S2" represents the second input device **22**). The second column from the left in FIG. 3 shows the class information of a user. The uppermost row in FIG. 3 shows the door lock devices **1**. "Dn" ($n = 1$ to 8) represents the nth door lock device **1n** (e.g., "D1" represents the first door lock device **11**, and "D2" represents the second door lock device **12**). A numerical value shown in the third to tenth columns from the left in FIG. 3 represents a relocking period (the unit is "minutes") defining a period between locking time and unlocking time of the door lock device **1**. Note that, a blank in FIG. 3 represents that the corresponding door lock device is not unlocked.

[0035] A priority of the unlocking authority given to a user is determined based on the class information of the user. In the instance shown in FIG. 3, the priority of the unlocking authority becomes higher in the order of "staff", "manager", and "officer". For example, when the fourth input device **24** ("S4" in FIG. 3) reads out the personal identification information indicative of "officer", the fourth door lock device **14** ("D4" in FIG. 3) and the fifth door lock device **15** ("D5" in FIG. 3) are designated as the unlocking objects and unlocking states thereof are kept for 10 minutes from the unlocking. When the fourth input device **24** reads out the personal identification informa-

tion indicative of "staff", only the fourth door lock device **14** is designated as the unlocking object.

[0036] The control device **5** shown in FIG. 1 includes a communication unit **501**, an authentication unit **502**, a processing unit **503**, a relocking timer **504**, and a continuous authentication timer **505**.

[0037] The communication unit **501** communicates with the plural door lock devices **1** and the plural input devices **2**. The communication unit **501** receives the personal identification information (key ID) from each input device **2**. For example, the communication unit **501** can uniquely identify the input device **2** selected as a communication partner by using a connection port. In this regard, the communication unit **501** outputs identification information of the connection port to the authentication unit **502** and the processing unit **503** as the input device identification information (key reader number) of the input device **2**. For example, the communication unit **501** is provided with the eighth connection ports for making connection with the input devices **2**. The first to eighth input devices **21** to **28** are connected to the first to eighth connection ports, respectively. In this case, the communication unit **501** (door lock control device **3**) is enabled to identify the input device **2** acting as a sender of the identification information.

[0038] The authentication unit **502** analyzes the personal identification information received by the communication unit **501** to perform personal authentication. An authentication result of the authentication unit **502** is outputted to the processing unit **503**. The authentication result includes the personal identification information and the input device identification information of the input device **2** which has read out this personal identification information.

[0039] The processing unit **503** refers to the correspondence table (see FIG. 3) and selects, as the unlocking object, the door lock device **1** associated with a combination of the identification information and the input device identification information included in the authentication result. In brief, processing unit **503** refers to the correspondence relation stored in the storage device **4** and selects the door lock device **1** associated with the combination of the received identification information (personal identification information) and the input device **2** which has sent this identification information (personal identification information). Upon selecting the door lock device **1** as the unlocking object, the processing unit **503** controls the communication unit **501** in such a manner to send the unlocking signal to the door lock device **1** designated as the unlocking object in order to unlock the door lock device **1** designated as the unlocking object.

[0040] After passage (a lapse) of the relocking period from the time of unlocking the door lock device **1** designated as the unlocking object, the processing unit **503** locks the door lock device **1** in the unlocked state. After sending the unlocking signal to the selected door lock device **1**, the processing unit **503** searches for the relocking period from the storage device **4** based on the

personal identification information used for the current unlocking. The processing unit **503** counts the relocking period obtained from the search result by use of the relocking timer **504**.

[0041] The relocking timer **504** counts elapsed time from the time of unlocking until the relocking time in response to the processing of the processing unit **503**. The relocking period is defined as a time period (see FIG. 3) which is selected to be sufficient to allow an authenticated user to pass through a predetermined door and to be capable of reducing the possibility that another person passes through the door without authentication. In response to an instruction from the processing unit **503**, the relocking timer **504** starts to count or changes a count value, for example. When the counter shows the count value of 0, the relocking timer **504** notifies the processing unit **503** of an event where the counter shows the count value of 0.

[0042] When the relocking period has been counted by the relocking timer **504**, the processing unit **503** receives, from the relocking timer **504**, a notice of the event where the count value becomes zero. Thereafter, the processing unit **503** sends the locking signal to the door lock device **1** designated as the unlocking object corresponding to the personal identification information used for the current unlocking, and thus the corresponding door lock device **1** is switched to the locking state. In this manner, a user is not required to manually lock the door lock device **1**. Hence, the high security level can be maintained.

[0043] Note that, the door lock control system may include the relocking timer **504** configured to count the relocking time, for each door lock device **1**, and the relocking timer **504** may be provided to not the control device **5** but the door lock device **1**. In this case, the control device **5** sends information indicative of the relocking period to the door lock device **1** in addition to the unlocking signal. Each of the door lock devices **1** is configured to count the relocking period by use of the relocking timer **504** provided thereto. When the relocking period has passed, the door lock device **1** locks the electric lock **101** thereof.

[0044] Besides, when plural pieces of the personal identification information are inputted into the same input device **2** within a predetermined period, the processing unit **503** of the present embodiment unlocks the door lock device **1** designated as the unlocking object which is stored in the storage device **4** in association with at least one of the plural pieces of the person identification information inputted into the input device **2**.

[0045] Upon receiving the personal identification information from the input device **2**, the processing unit **503** checks whether or not the continuous authentication timer **505** associated with the input device identification information of the input device **2** has been activated. When the continuous authentication timer **505** has not yet been activated, the processing unit **503** activates this continuous authentication timer **505** and stores the personal

identification information received from the input device **2** as a candidate for a member of a group (continuous authentication object ID) associated with the input device **2**. In contrast, when the continuous authentication timer **505** has already been activated, the processing unit **503** adds and stores the personal identification information received from the input device **2** as a candidate for a member of a group associated with the input device **2**.

[0046] The continuous authentication timer **505** counts a group authentication period associated with the input device **2** in response to the processing of the processing unit **503**. The group authentication period is defined as a time period (e.g., **5** seconds and **10** seconds) which is selected in consideration of a situation where plural users recognized as the same group take authentication actions continuously by use of the same input device **2**. For example, when time (a group authentication interval) between the input of the previous personal identification information and the input of the next personal identification information is shorter than the group authentication period, these pieces of the personal identification information are regarded as being included in the same group. In response to an instruction from the processing unit **503**, the continuous authentication timer **505** starts to count or changes a count value, for example. When the counter shows the count value of **0**, the continuous authentication timer **505** notifies the processing unit **503** of an event where the counter shows the count value of **0**.

[0047] The processing unit **503** receives, from the continuous authentication timer **505**, a notice of the event where the count value becomes zero. In brief, the processing unit **503** checks whether or not there is the continuous authentication timer **505** which has counted the predetermined group authentication period with regard to the continuous authentication timers **505** which are currently activated. When there is the continuous authentication timer **505** which has counted the group authentication period, the processing unit **503** concludes that the members of the group corresponding to the input device **2** associated with the continuous authentication timer **505** are determined. Thereafter, based on the personal identification information of each of the determined members of the group and the input device identification information of the input device **2**, the processing unit **503** obtains a union (logical sum) of sets of the door lock devices **1** designated as the unlocking objects and stored in the storage device **4** in association with the personal identification information. After obtaining the union, the processing unit **503** sends the unlocking signal to the door lock device **1** designated as the unlocking object included in the obtained union.

[0048] In other words, the control device **5** is configured to judge whether or not an event where plural pieces of the identification information (personal identification information) are inputted from the same input device **2** before passage of a predetermined period has occurred. The control device **5** is configured to, upon concluding that the event has occurred, refer to the correspondence

relation stored in the storage device **4** and select the door lock device **1** associated with at least one of the plural pieces of the identification information (personal identification information) with regard to the same input device **2**.

[0049] For example, when the plural pieces of the identification information (personal identification information) "officer", "manager", and "staff" are inputted into the first input device **21** within the predetermined period, the control device **5** selects the six door lock devices **11**, **13** to **17** each associated with at least one of the plural pieces of the identification information (personal identification information) "officer", "manager", and "staff" with regard to the same input device **2** (first input device **21**). Thus, the six doors **81**, **83** to **87** respectively associated with the six door lock devices **11**, **13** to **17** are unlocked.

[0050] Further, in a situation where the new personal identification information is inputted into the input device **2** after the door lock device **1** designated as the unlocking object has been unlocked, when the priority of the new personal identification information is lower than that of the previous personal identification information, the processing unit **503** of the present embodiment unlocks the door lock device **1** designated as the unlocking object stored in the storage device **4** in association with the new personal identification information. Further, the processing unit **503** locks the door lock device **1** which has been unlocked but is not associated with the new personal identification information. The priority of the unlocking authority allocated to the class information of the personal identification information is preliminarily stored in the storage device **4**.

[0051] To unlock the door lock device **1** in response to another input of the personal identification information within a period when the relocking timer **504** counts the relocking period, the processing unit **503** compares the priority of the unlocking authority allocated to the class information of the personal identification information of the person who intends to unlock the desired door with the priority of the unlocking authority allocated to the class information of the personal identification information which has caused the count of the current relocking period, and determines which one is higher than the other.

[0052] In other words, upon receiving the identification information (personal identification information) from the input device **2**, the processing unit **503** (control device **5**) judges whether or not the predetermined period passes from the time of receiving the previous identification information (personal identification information) from the same input device **2**. The predetermined period is identical to the longest one of the relocking periods of the door lock devices **1** selected according to the combinations of the input device **2** and the identification information, for example. Upon concluding that the predetermined period does not pass from the time of receiving the previous identification information (personal identification information), the processing unit **504** retrieves the priority of the present identification information (personal identification information) from the storage device **4** and

compares the retrieved priority of the present identification information (personal identification information) with the priority of the previous identification information (personal identification information).

[0053] When the priority of the unlocking authority allocated to the personal identification information of the person who intends to unlock the desired door is equal to or higher than the priority of the unlocking authority allocated to the class information of the personal identification information causing the count of the current relocking period, the processing unit **503** sends the unlocking information via the communication unit **501** to the door lock device **1** identified by the personal identification information of the person who intends to unlock the desired door. When the relocking period is being counted with regard to the door lock device **1** identified by the personal identification information of the person who intends to unlock the desired door, the unlocking signal may be sent again, or the counted value of the relocking period may be initialized.

[0054] In contrast, when the priority of the unlocking authority allocated to the class information of the personal identification information causing the count of the current relocking period is higher than the priority of the unlocking authority allocated to the personal identification information of the person who intends to unlock the desired door, the processing unit **503** sends the unlocking signal, via the communication unit **501**, to the door lock device **1** corresponding to the personal identification information of the person who intends to unlock the desired door, and at the same time, controls the relocking timer **504** to start to count the relocking period. With regard to the door lock devices **1** respectively corresponding to the relocking timers **504** which are counting the relocking periods, the processing unit **503** sends the locking signal via the communication unit **501** to the door lock devices **1** other than the door lock device **1** which is unlocked based on the present personal identification information.

[0055] In other words, upon concluding that the priority of the present identification information (personal identification information) is lower than the priority of the previous identification information (personal identification information), the processing unit **503** selects, as the unlocking object, the door lock device **1** associated with the present identification information (personal identification information) with regard to the same input device **2** and controls the door lock device **1** designated as the unlocking object in such a manner to unlock the corresponding door. Further, the processing unit **503** selects, as the locking object, the door lock device **1** which is associated with the previous identification information (personal identification information) but is not associated with the present identification information (personal identification information) with regard to the same input device **2** and controls the door lock device **1** designated as the locking object in such a manner to lock the corresponding door.

[0056] Besides, with regard to plural pieces of the personal identification information, the priority of the unlock-

ing authority is allocated to a group of the personal identification information in conformity with a predetermined criterion. For example, the unlocking authority having the highest priority out of pieces of the unlocking authority allocated to pieces of class information of pieces of the personal identification information included in the group is selected as the unlocking authority of this group.

[0057] The following explanation referring to FIGS. 4 to 6 is made to an operation of the door lock control system in accordance with the present invention.

[0058] First, the control device **5** receives, from the input device **2**, the key reader number (input device identification information) and the key ID (personal identification information) inputted into this input device **2** (**S1** in FIG. 4). When the continuous authentication is not being performed (**S2**), the continuous authentication timer **505** starts to count (**S3**). Thereafter, the control device **5** adds the received key ID to a continuous authentication object ID list (**S4**).

[0059] In contrast, in the step **S2**, when the continuous authentication is being performed, the control device **5** adds the received key ID to the continuous authentication object ID list (**S4**).

[0060] After that, when the continuous authentication timer **505** completes the count (**S11** in FIG. 5), the control device **5** refers to the storage device **4** and selects the door lock device **1** designated as the unlocking object, for each key ID included in the continuous authentication object ID list (**S12**). The control device **5** determines the key ID related to the unlocking authority having the highest priority with regard to the key IDs included in the continuous authentication object ID list (**S13**). Thereafter, the control device **5** creates a list (list of the door lock devices **1**) indicating the logical sum (union) of the sets of the door lock devices **1** selected for the respective key IDs (**S14**). The control device **5** compares the present unlocking authority with the previous unlocking authority (**S15**). When the present unlocking authority has the priority higher than that of the previous unlocking authority or the unlocking authority is not yet set, the control device **5** selects the present unlocking authority as the unlocking authority with regard to the door lock device **1** (**S16**), and restarts the relocking timer **504** associated with the door lock device **1** designated as the unlocking object (**S17**). The control device **5** sends the unlocking signal to the door lock device **1** designated as the unlocking object (**S18**). When the present unlocking authority has the same priority as the previous unlocking authority, the control device **5** restarts the relocking timer **504** associated with the door lock device **1** (**S19**). When the present unlocking authority has the priority lower than that of the previous unlocking authority, the control device **5** selects zero as the count value of the relocking timer **504** associated with the door lock device **1** not included in the union list out of the door lock devices **1** being unlocked (**S20**).

[0061] When the relocking timer **504** completes the count (**S31** in FIG. 6), the control device **5** deletes the

unlocking authority related to the door lock device **1** (**S32**). Subsequently, the control device **5** sends the locking signal to the door lock device **1** which is unlocked (**S33**). Upon receiving the locking signal, the door lock device **1** locks its electric lock **101**.

[0062] Next, a usage example of the door lock control system in accordance with the present invention is explained with reference to FIG. 2. In this example, persons working in the building shown in FIG. 2 are classified into an officer, a staff working at the first office **71**, a manager working at the first office **71**, a staff working at the second office **72**, and a manager working at the second office **72**. The class information used in the door lock control system includes three of "officer", "manager", and "staff". The priority of the unlocking authority becomes higher in the order of "staff", "manager", and "officer". Each person has the authentication card **6** storing the personal identification information associated with the locking authority according to a post thereof. For example, the officer has the first authentication card **61**, and the manager has the second authentication card **62**, and the staff has the third authentication card **63**.

[0063] First, an explanation is made to a situation where the staff enters the building after the officer enters the building via the main entrance. In this example, the group authentication period is four minutes. In the morning, the officer performs card authentication by the first input device **21**. Hence, the personal identification information including the class information indicative of "officer" is inputted into the first input device **21**. In this case, the first input device **21** sends the inputted personal identification information ("officer") to the door lock control device **3**. Upon receiving the personal identification information "officer" from the first input device **21**, the control device **5** (processing unit **503**) refers to the correspondence relation stored in the storage device **4**, and selects the door lock device **1** associated with the combination of the received personal identification information "officer" and the input device **2** (the input device identification information of the first input device **21**) which has sent this personal identification information "officer". In this instance, the control device **5** selects the six door lock devices **11**, **13** to **17**. The control device **5** controls the six door lock devices **11**, **13** to **17** in such a manner to unlock the respective corresponding doors **81**, **83** to **87**. Therefore, in this instance, according to the correspondence table (see FIG. 3), the first, third to seventh door lock devices **11**, **13** to **17** are unlocked. Further, the relocking timers **504** respectively corresponding to the first, third to seventh door lock devices **11**, **13** to **17** are activated.

[0064] After 3 minutes, the staff comes to the building and performs the card authentication with the first input device **21**. At this time, only the first door lock device **11** has been relocked. The control device **5** sends the unlocking signal to only the first door lock device **11**. The relocking timers **504** of the respective third, fourth, and seventh door lock devices **13**, **14**, and **17** are reset and

start to count again. Besides, the relocking timers **504** of the respective fifth and sixth door lock devices **15** and **16** continue to count.

[0065] The first door lock device **11** is locked again in 1 minute from the time the staff has entered the building. The sixth door lock device **16** is locked again in 1 minute from the time the first door lock device **11** is relocked. The third, fourth, and seventh door lock devices **13**, **14** and **17** are locked again in 3 minutes from the time the sixth door lock device **16** is relocked. Subsequently, the fifth door lock device **15** is locked again in 2 minutes (10 minutes from the time the officer has entered the building).

[0066] The following explanation relates to the situation where the staff enters the building after the officer enters the building via the main entrance, but the group authentication period is 5 seconds. In the morning, the officer performs the card authentication by the first input device **21**. According to the correspondence table (see FIG. 3), the first, third to seventh door lock devices **11**, **13** to **17** are unlocked. Further, the relocking timers **504** respectively corresponding to the first, third to seventh door lock devices **11**, **13** to **17** are activated. Note that, after the authentication by the officer, the card authentication is not performed before the passage of 5 seconds corresponding to the group authentication period.

[0067] After 3 minutes, the staff comes to the building and performs the card authentication with the first input device **21**. At this time, only the first door lock device **11** has been relocked.

[0068] Upon receiving the identification information (personal identification information) from the first input device **21**, the processing unit **503** (control device **5**) judges whether or not the predetermined period (10 minutes) passes from a time of receiving the previous identification information (personal identification information) from the same input device **2** (the first input device **21**).

[0069] In this case, the processing unit **503** concludes that the predetermined period does not pass from the time of receiving the previous identification information (personal identification information) "officer". Hence, the processing unit **503** retrieves the priority of the present identification information (personal identification information "staff") from the storage device **4** and compares the retrieved priority of the present identification information with the priority of the previous identification information (personal identification information "officer").

[0070] The priority of the personal identification information "staff" is lower than the priority of the personal identification information "officer". Therefore, the processing unit **503** selects the four door lock devices **11**, **13**, **14** and **17** associated with the present identification information (personal identification information "staff") with regard to the same input device **2** (in this case, the first input device **21**) as the unlocking objects, and controls the door lock devices **11**, **13**, **14** and **17** selected as the unlocking objects in such a manner to unlock the respective corresponding doors **81**, **83**, **84**,

and **87**. Besides, with regard to each of the doors **83**, **84**, and **87**, the relocking period does not elapse yet. Hence, with regard to the doors **83**, **84**, and **87**, the count for the relocking period is reset, instead of sending the unlocking signal. Further, the processing unit **503** selects, as the locking objects, the two door lock devices **15** and **16** which are associated with the previous identification information (personal identification information) "officer" but are not associated with the present identification information (personal identification information) "staff" with regard to the same input device **2** (in this case, the first input device **21**), and controls the door lock devices **15** and **16** selected as the locking objects in such a manner to lock the respective corresponding doors **85** and **86**.

[0071] Consequently, since the unlocking authority of the staff has the lower priority relative to that of the officer, the control device **5** sends the unlocking signal to only the first door lock device **11** and sends the locking signals to the respective fifth and sixth door lock devices **15** and **16**. The relocking timers **504** of the respective third, fourth, and seventh door lock devices **13**, **14**, and **17** are reset and start to count again.

[0072] The first door lock device **11** is locked again in **1** minute from the time the staff has entered the building. The third, fourth, and seventh door lock devices **13**, **14** and **17** are locked again in **4** minutes from the time the first door lock device **11** is relocked.

[0073] Next, an explanation is made to a situation where the staff and the officer enter the building via the main entrance simultaneously. The staff and the officer perform the card authentication by the first input device **21** together. First, the staff performs the card authentication. While the control device **5** performs the count by the continuous authentication timer **505**, the officer performs the card authentication. After the passage of **5** seconds, in accordance with the unlocking process, the control device **5** sends the unlocking signals to the first, third, and seventh door lock devices **11**, **13** to **17** designated as the unlocking objects included in the union of the sets of the staff and the officer.

[0074] The door lock control system of the present embodiment as mentioned above includes the plural door lock devices **1**, the plural input devices **2**, the storage device **4**, and the control device **5**. The plural door lock devices **1** are provided to the respective different doors, and are configured to allow the respective doors to be in the unlocked-state. The input device **2** is configured to receive the identification information (personal identification information). The storage device **4** is configured to store the correspondence relation between the combination of the identification information and the input device **2** and a set of one or more door lock devices **1** designated as the unlocking objects. The control device **5** is configured to unlock the door lock device **1** designated as the unlocking object which is stored in the storage device **4** in association with the combination of the identification information inputted into the input device **2** and this input device **2**, so as to allow the door associated

with the door lock device **1** designated as the unlocking object to be in the unlocked-state.

[0075] In other words, the door lock control system (lock control system) of the present embodiment includes: the plural door lock devices (lock devices) **1** configured to lock and unlock corresponding doors respectively; the door lock control device (lock control device) **3** configured to control the plural door lock devices **1**; and the plural input devices **2** configured to, upon receiving identification information, send the received identification information to the door lock control device **3**. The door lock control device **3** includes the storage device **4** and the control device **5**. The storage device **4** is configured to store the correspondence relation between the combination of the identification information and the input device **2** (i.e., the input device identification information), that is, the combination of the personal identification information and the input device identification information, and the door lock device **1**. The control device **5** is configured to: upon receiving the identification information (personal identification information) from the input device **2**, refer to the correspondence relation stored in the storage device **4**; and select the door lock device **1** associated with the combination of the received identification information (personal identification information) and the input device **2** which has sent this identification information (personal identification information); and control the selected door lock device **1** in such a manner to unlock the corresponding door. Especially, in the present embodiment, the plural door lock devices **1** are configured to lock and unlock mutually different doors. Further, the plural input devices **2** are located at mutually different sites.

[0076] Further, the door lock control device **3** of the present embodiment is defined as a door lock control device which is used together with the plural door lock devices **1** and the plural input devices **2**. The plural door lock devices **1** are provided to the respective different doors, and are configured to allow the respective doors to be in the unlocked- state. The input device **2** is configured to receive the identification information (personal identification information) . The door lock control device **3** includes the storage device **4** and the control device **5**. The storage device **4** is configured to store the correspondence relation between the combination of the identification information and the input device **2** and the set of the one or more door lock devices **1** designated as the unlocking objects. The control device **5** is configured to unlock the door lock device **1** designated as the unlocking object which is stored in the storage device **4** in association with the combination of the identification information inputted into the input device **2** and this input device **2**, so as to allow the door associated with the door lock device **1** designated as the unlocking object to be in the unlocked- state.

[0077] In other words, the door lock control device (lock control device) is defined as a door lock control device which is connected to the plural door lock devices **1** con-

figured to lock and unlock corresponding doors respectively and the plural input devices **2** configured to receive the identification information (personal identification information). Each of the plural input devices **2** is configured to, upon receiving the identification information (personal identification information), send the received identification information (personal identification information) to the door lock control device **3**. The door lock control device **3** includes the storage device **4** and the control device **5**. The storage device **4** is configured to store the correspondence relation between the combination of the identification information (personal identification information) and the input device **2** and the door lock device **1**. The control device **5** is configured to: upon receiving the identification information (personal identification information) from the input device **2**, refer to the correspondence relation stored in the storage device **4**; and select the door lock device **1** associated with the combination of the received identification information (personal identification information) and the input device **2** which has sent this identification information (personal identification information); and control the selected door lock device **1** in such a manner to unlock the corresponding door.

[0078] According to the door lock control system of the present embodiment as mentioned above, when a user inputs the personal identification information into the input device **2**, the plural door lock devices **1** corresponding to the inputted personal identification information are unlocked at one time. Consequently, to reach a desired place, a user is not required to input the personal identification information for each door through which the user intends to pass, yet the improved security of the door lock control system can be maintained.

[0079] Additionally, according to the door lock control system of the present embodiment, the door lock device **1** designated as the unlocking object can be selected for each combination of the personal identification information and the input device **2**. Hence, for example, with regard to an instance where there are plural routes to a desired place in a building with plural entrances, the door lock control system can unlock the doors in one selected from the routes without unlocking the unnecessary doors in the remaining routes. Therefore, the security can be improved.

[0080] Further, in the door lock control system of the present embodiment, the storage device **4** stores the relocking period defining a period between the unlocked time and the relocked time for each of the plural door lock devices **1**. The control device **5** selects the relocking period stored in the storage device **4** according to the door lock device **1** designated as the unlocking object. After the passage of the selected relocking period from the time of unlocking the door lock device **1** designated as the unlocking object, the control device **5** locks the door lock device **1** designated as the unlocking object.

[0081] In other words, the storage device **4** is configured to store the relocking period for each of the door

lock devices **1**. The control device **5** is configured to: retrieve the relocking period corresponding to the selected door lock device **1** from the storage device **4**; and, after passage of the retrieved relocking period from time at which the selected door lock device **1** has unlocked the corresponding door, control the selected door lock device **1** in such a manner to lock the corresponding door.

[0082] Thus, according to the door lock control system of the present embodiment, the relocking periods can be individually selected for the respective corresponding door lock devices **1**, and each of the door lock device **1** can be locked after the passage of the corresponding relocking period. For example, to improve the security for a section which a user can reach through a particular door, a short time is selected as the relocking period of the door lock device **1** corresponding to the particular door. Consequently, the security can be improved. Note that, the door lock control system of the present embodiment need not necessarily include this configuration.

[0083] The configuration of relocking a designated door after the passage of the predetermined period is employed to achieve two objectives. One of the two objectives is to maintain the security in a building by terminating the unlocked-state of the door lock device **1** after the passage of a prescribed time. The other objective is to improve the convenience by keeping the necessary door lock device **1** in the unlocked-state until a user reaches a desired section or until a user finishes a job at the desired section and leaves the desired section.

[0084] Further, in the door lock control system of the present embodiment, the storage device **4** stores the relocking period for each of the plural door lock devices **1** with regard to each piece of the identification information (personal identification information). The control device **5** selects the relocking period stored in the storage device **4** according to the combination of the identification information (personal identification information) inputted into the input device **2** and the door lock device **1** designated as the unlocking object. After the passage of the selected relocking period from the time of unlocking the door lock device **1** designated as the unlocking object, the control device **5** locks the door lock device **1** designated as the unlocking object.

[0085] In other words, the storage device **4** is configured to store the relocking period for each combination of the identification information (personal identification information) and the door lock device **1**. The control device **5** is configured to: retrieve the relocking period corresponding to the combination of the received identification information (personal identification information) and the selected door lock device **1** from the storage device **4**; and, after passage of the retrieved relocking period from time at which the selected door lock device **1** has unlocked the corresponding door, control the selected door lock device **1** in such a manner to lock the corresponding door.

[0086] According to the door lock control system of the present embodiment, the time to relocking can be select-

ed for each piece of the personal identification information allocated to users. The aforementioned objectives can be achieved by selecting the relocking period suitable for the user to which the personal identification information is given. Note that, the door lock control system of the present embodiment need not necessarily include this configuration.

[0087] Further, in the door lock control system of the present embodiment, the priority is preliminarily allocated to the identification information (personal identification information). When the new identification information (personal identification information) is inputted into the input device **2** after the door lock device **1** designated as the unlocking object is unlocked in response to the input of the identification information (personal identification information) into the input device **2**, and when the new identification information has the lower priority than that of the previous identification information, the control device **5** unlocks the door lock device **1** designated as the unlocking object which is stored in the storage device **4** in association with the new identification information, and locks the door lock device **1** which is being unlocked but is not stored in the storage device **4** as the unlocking object in association with the new identification information.

[0088] In other words, the storage device **4** is configured to store the priority for each piece of the identification information (personal identification information). The control device **5** is configured to, upon receiving the identification information (personal identification information) from the input device **2**, judge whether or not the predetermined period passes from a time of receiving the previous identification information (personal identification information) from the same input device **2**. The control device **5** is configured to, upon concluding that the predetermined period does not pass from the time of receiving the previous identification information, retrieve the priority of the present identification information from the storage device **4** and compare the retrieved priority of the present identification information with the priority of the previous identification information. The control device **5** is configured to, upon concluding that the priority of the present identification information is lower than the priority of the previous identification information, select as the unlocking object the door lock device **1** associated with the present identification information with regard to the same input device **2** and control the door lock device **1** selected as the unlocking object in such a manner to unlock the corresponding door, and select as the locking object the door lock device **1** which is associated with the previous identification information but is not associated with the present identification information with regard to the same input device **2** and control the door lock device **1** selected as the locking object in such a manner to lock the corresponding door.

[0089] According to the door lock control system of the present embodiment, even when a user having the unlocking authority with the lower priority comes subse-

quent to a user having the unlocking authority with the higher priority, the user having the unlocking authority with the lower priority can be prevented from entering a section which the user having the unlocking authority with the lower priority is not allowed to enter. Thus, the security can be improved. Note that, the door lock control system of the present embodiment need not necessarily include this configuration.

[0090] Further, in the door lock control system of the present embodiment, when plural pieces of the identification information (personal identification information) are inputted into the same input device **2** before a lapse of a predetermined period, the control device **5** selects the door lock device **1** designated as the unlocking object which is stored in the storage device **4** in association with at least one of the plural pieces of the identification information inputted into the input device **2**, and unlocks the selected door lock device **1** designated as the unlocking object.

[0091] In other words, the control device **5** is configured to judge whether or not an event where plural pieces of the identification information (personal identification information) are inputted into the same input device **2** before passage of a predetermined period has occurred.

The control device **5** is configured to, upon concluding that the event has occurred, refer to the correspondence relation stored in the storage device **4** and select the door lock device **1** associated with at least one of the plural pieces of the identification information (personal identification information) with regard to the same input device **2**.

[0092] As mentioned above, when the plural pieces of the personal identification information are inputted into the same input device **2**, the door lock control system of the present embodiment determines the union of sets of the door lock devices **1** designated as the unlocking objects respectively corresponding to the plural pieces of the personal identification information, and thereafter the door lock control system sends the unlocking signal to the door lock device **1** designated as the unlocking object.

Therefore, when unlocking ranges of respective plural users overlap with each other,

it is possible to reduce a waste of a communication resource in contrast to an instance where the unlocking signals are sent to all of the door lock devices **1** designated as the unlocking objects for each user. Note that, the door lock control system of the present embodiment need not necessarily include this configuration.

[0093] When plural pieces of the personal identification information are inputted into the same input device **2**, the door lock control system may determine a product set of plural sets of the door lock devices **1** designated as the unlocking objects instead of the union of sets of the door lock devices **1** designated as the unlocking objects respectively corresponding to the plural pieces of the personal identification information, and thereafter the door lock control system may send the unlocking signal to the door lock device **1** designated as the unlocking object.

[0094] In the door lock control system of the present

embodiment, when plural pieces of the identification information (personal identification information) are inputted into the same input device **2** within the predetermined period, the control device **5** may select the door lock device **1** designated as the unlocking object which is stored in the storage device **4** in association with all of the plural pieces of the identification information (personal identification information) inputted into the input device **2**, and may unlock the selected door lock device **1** designated as the unlocking object.

[0095] More specifically, when plural pieces of the personal identification information are inputted into the same input device **2** before a lapse of the predetermined period, the control device **5** selects the door lock device **1** designated as the unlocking object which is stored in the storage device **4** in association with all of the plural pieces of the personal identification information inputted into the input device **2**. After selecting the door lock device **1** designated as the unlocking object, the control device **5** sends the unlocking signal to the selected door lock device **1** designated as the unlocking object, for the purpose of unlocking the selected door lock device **1** designated as the unlocking object.

[0096] In other words, the control device **5** is configured to judge whether or not an event where plural pieces of the identification information (personal identification information) are inputted into the same input device **2** before passage of a predetermined period has occurred. The control device **5** is configured to, upon concluding that the event has occurred, refer to the correspondence relation stored in the storage device **4** and select the door lock device **1** associated with all of the plural pieces of the identification information (personal identification information) with regard to the same input device **2**.

[0097] For example, when plural pieces of the identification information (personal identification information) "officer", "manager", and "staff" are inputted into the first input device **21** before a lapse of the predetermined period, the control device **5** selects the four door lock devices **11**, **13**, **14**, and **17** each associated with all of the plural pieces of the identification information (personal identification information) "officer", "manager", and "staff" with regard to the same input device **2** (first input device **21**). Consequently, the four doors **81**, **83**, **84**, and **87** respectively corresponding to the four door lock devices **11**, **13**, **14**, and **17** are unlocked.

[0098] Note that, the door lock control system of the present embodiment need not necessarily include this configuration.

[0099] With regard to the correspondence table stored in the storage device **4**, all of the door lock devices **1** may be associated with the same relocking period, and the door lock control device **1** designated as the unlocking object may be associated with each piece of the personal identification information.

[0100] In the present embodiment, the storage device **4** may store the relocking period defining a period between the unlocked time and the relocked time for the

plural door lock devices **1** with regard to each piece of the identification information (personal identification information). The control device **5** may select the relocking period stored in the storage device **4** according to the identification information (personal identification information) inputted into the input device **2**. After the passage of the selected relocking period from the time of unlocking the door lock device **1** designated as the unlocking object, the control device **5** may lock the door lock device **1** designated as the unlocking object.

[0101] In other words, the storage device **4** is configured to store the relocking period for each piece of the identification information (personal identification information). The control device **5** is configured to: retrieve the relocking period corresponding to the received identification information (personal identification information) from the storage device **4**; and, after passage of the retrieved relocking period from time at which the selected door lock device **1** has unlocked the corresponding door, control the selected door lock device **1** in such a manner to lock the corresponding door.

[0102] Note that, the door lock control system of the present embodiment need not necessarily include this configuration.

[0103] The continuous authentication timer **505** may be provided to not the control device **5** but each of the input devices **2**. In this case, the input device **2** considers plural pieces of the personal identification information received within the group authentication period as the same group and sends them to the control device **5**.

[0104] As for the door lock control system of the present embodiment, a configuration of measuring the relocking period defining a period between the unlocked time and the relocked time of the door lock device **1** designated as the unlocking object is optional. Further, the configuration of unlocking all of the door lock devices **1** designated as the unlocking objects associated with at least one of the plural pieces of the personal identification information when the plural pieces of the personal identification information are inputted within the predetermined period is optional. In this case, as shown in FIG. 7, the control device **5** of the door lock control device **3** may not include the relocking timer **504** and the continuous authentication timer **505**.

[0105] In the present embodiment, to allow the control device **5** to identify the input device identification information of the input device **2**, the communication unit **501** of the control device **5** is configured to uniquely identify the input device identification information of the input device **2**. As for a modification of the present embodiment, a builder may preliminarily give the input device identification information of the input device **2** to the control device **5** by use of a set up device (not shown). In this modification, upon receiving the personal identification information, the input device **2** sends its own input device identification information to the control device **5** together with the personal identification information. In other words, the input device **2** may be configured to,

upon receiving the identification information (personal identification information), send the received identification information (personal identification information) and its own input device identification information to the door lock control device **3**. In this modification, the control device **5** may be configured to, upon receiving the identification information (personal identification information) and the input device identification information from the input device **2**, refer to the correspondence relation stored in the storage device **4** and select the door lock device **1** associated with the combination of the identification information (personal identification information) and the input device identification information which are received, and control the selected door lock device **1** in such a manner to unlock the corresponding door.

[0106] The door lock control system may adopt face authentication using a user's face or fingerprint authentication using a user's fingerprint as the authentication means instead of the authentication using the authentication card **6** storing the personal identification information. In this case, not the key ID but a personal ID is used as the personal identification information.

[0107] The door lock device **1** is not limited to a configuration employing the electric lock **101**, but may be a device designed to open and close a door such as an automatic door. In other words, the door lock device **1** may lock and unlock a door which has no knob and which a user cannot open by hand once it is closed.

[0108] In the present embodiment, the explanation is made based on the building of a company. The present embodiment need not necessarily be applied to the building of a company. For example, the present embodiment can be used in an SOHO (Small Office Home Office), a case where a culture class (e.g., a flower arrangement class) is held at one's home, and a case where a friend visits one's home. In such cases, it is possible to obtain the same advantage as the present embodiment.

Claims

1. A door lock control system comprising:

plural door lock devices configured to lock and unlock corresponding doors respectively;
a door lock control device configured to control the plural door lock devices;
and
plural input devices configured to, upon receiving identification information, send the received identification information to the door lock control device,
wherein:

the door lock control device includes a storage device and a control device;
the storage device is configured to store a correspondence relation between a combi-

nation of the identification information and the input device and the door lock device;
the control device is configured to:

upon receiving the identification information from the input device, refer to the correspondence relation stored in the storage device; and
select the door lock device associated with the combination of the received identification information and the input device which has sent this identification information; and
control the selected door lock device in such a manner to unlock the corresponding door.

2. The door lock control system as set forth in claim 1, wherein:

the storage device is configured to store a relocking period for each of the door lock devices; and
the control device is configured to:

retrieve the relocking period corresponding to the selected door lock device from the storage device; and
after passage of the retrieved relocking period from time at which the selected door lock device has unlocked the corresponding door, control the selected door lock device in such a manner to lock the corresponding door.

3. The door lock control system as set forth in claim 1, wherein:

the storage device is configured to store a relocking period for each combination of the identification information and the door lock device; and
the control device is configured to:

retrieve the relocking period corresponding to the combination of the received identification information and the selected door lock device from the storage device; and
after passage of the retrieved relocking period from time at which the selected door lock device has unlocked the corresponding door, control the selected door lock device in such a manner to lock the corresponding door.

4. The door lock control system as set forth in claim 1, wherein:

the storage device is configured to store a relocking period for each piece of the identification information; and
the control device is configured to:

retrieve the relocking period corresponding to the received identification information from the storage device; and
after passage of the retrieved relocking period from time at which the selected door lock device has unlocked the corresponding door, control the selected door lock device in such a manner to lock the corresponding door.

5. The door lock control system as set forth in claim 1, wherein:

the storage device is configured to store a priority for each piece of the identification information;

the control device is configured to, upon receiving the identification information from the input device, judge whether or not a predetermined period passes from a time of receiving the previous identification information from the same input device;

the control device is configured to, upon concluding that the predetermined period does not pass from the time of receiving the previous identification information, retrieve the priority of the present identification information from the storage device and compare the retrieved priority of the present identification information with the priority of the previous identification information; and

the control device is configured to, upon concluding that the priority of the present identification information is lower than the priority of the previous identification information, select as an unlocking object the door lock device associated with the present identification information with regard to the same input device and control the door lock device selected as the unlocking object in such a manner to unlock the corresponding door, and select as a locking object the door lock device which is associated with the previous identification information but is not associated with the present identification information with regard to the same input device and control the door lock device selected as the locking object in such a manner to lock the corresponding door.

6. The door lock control system as set forth in any one of claims 1 to 4, wherein:

the control device is configured to judge whether or not an event where plural pieces of the identification information are inputted into the same

input device before passage of a predetermined period has occurred; and

the control device is configured to, upon concluding that the event has occurred, refer to the correspondence relation stored in the storage device and select the door lock device associated with at least one of the plural pieces of the identification information with regard to the same input device.

7. The door lock control system as set forth in any one of claims 1 to 4, wherein:

the control device is configured to judge whether or not an event where plural pieces of the identification information are inputted into the same input device before passage of a predetermined period has occurred; and

the control device is configured to, upon concluding that the event has occurred, refer to the correspondence relation stored in the storage device and select the door lock device associated with all of the plural pieces of the identification information with regard to the same input device.

8. A door lock control device connected to plural door lock devices configured to lock and unlock corresponding doors respectively and plural input devices configured to receive identification information, wherein:

each of the plural input devices is configured to, upon receiving the identification information, send the received identification information to the door lock control device; and
the door lock control device comprises:

a storage device configured to store a correspondence relation between a combination of the identification information and the input device and the door lock device; and
a control device is configured to:

upon receiving the identification information from the input device, refer to the correspondence relation stored in the storage device; and
select the door lock device associated with the combination of the received identification information and the input device which has sent this identification information; and
control the selected door lock device in such a manner to unlock the corresponding door.

FIG. 1

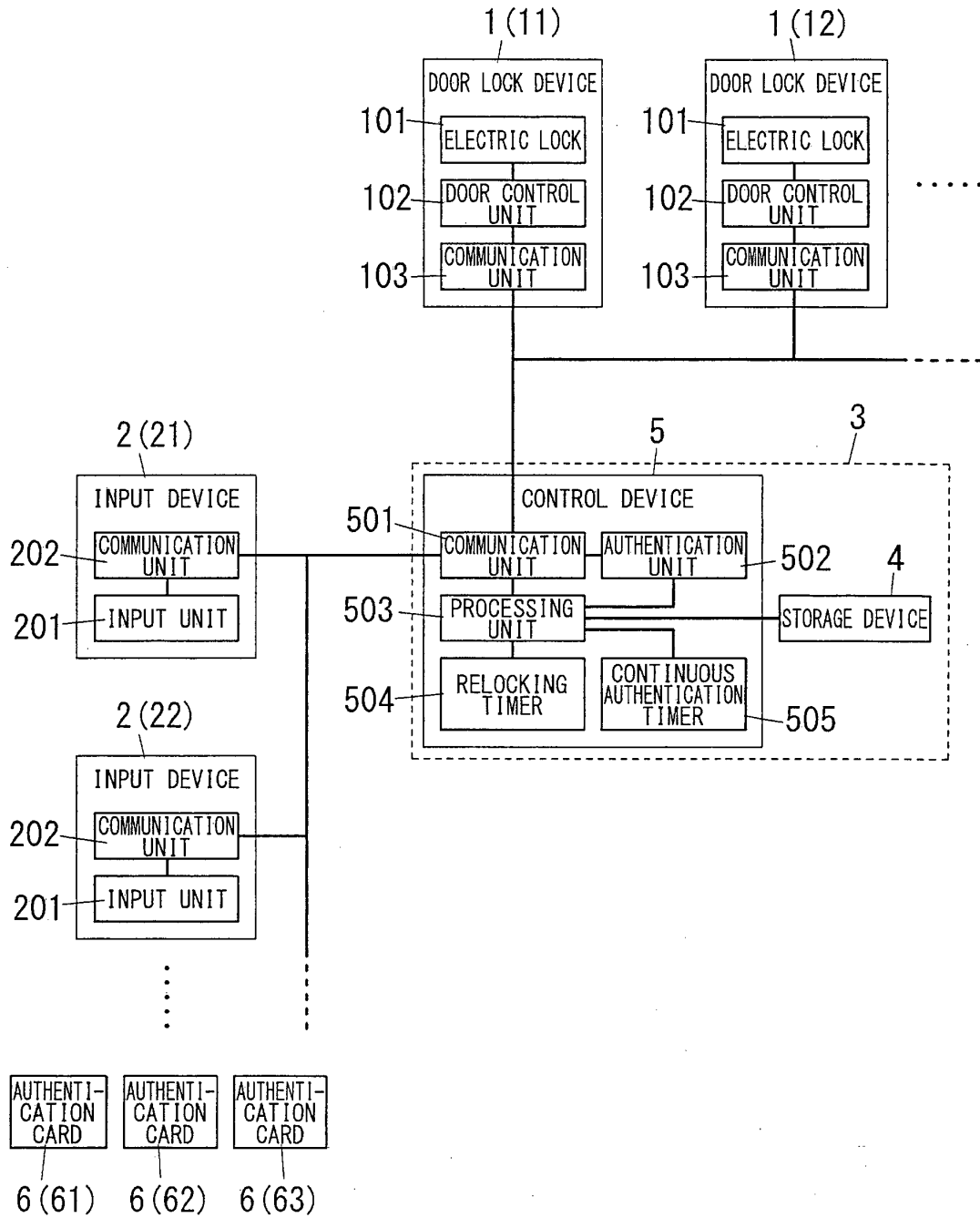


FIG. 2

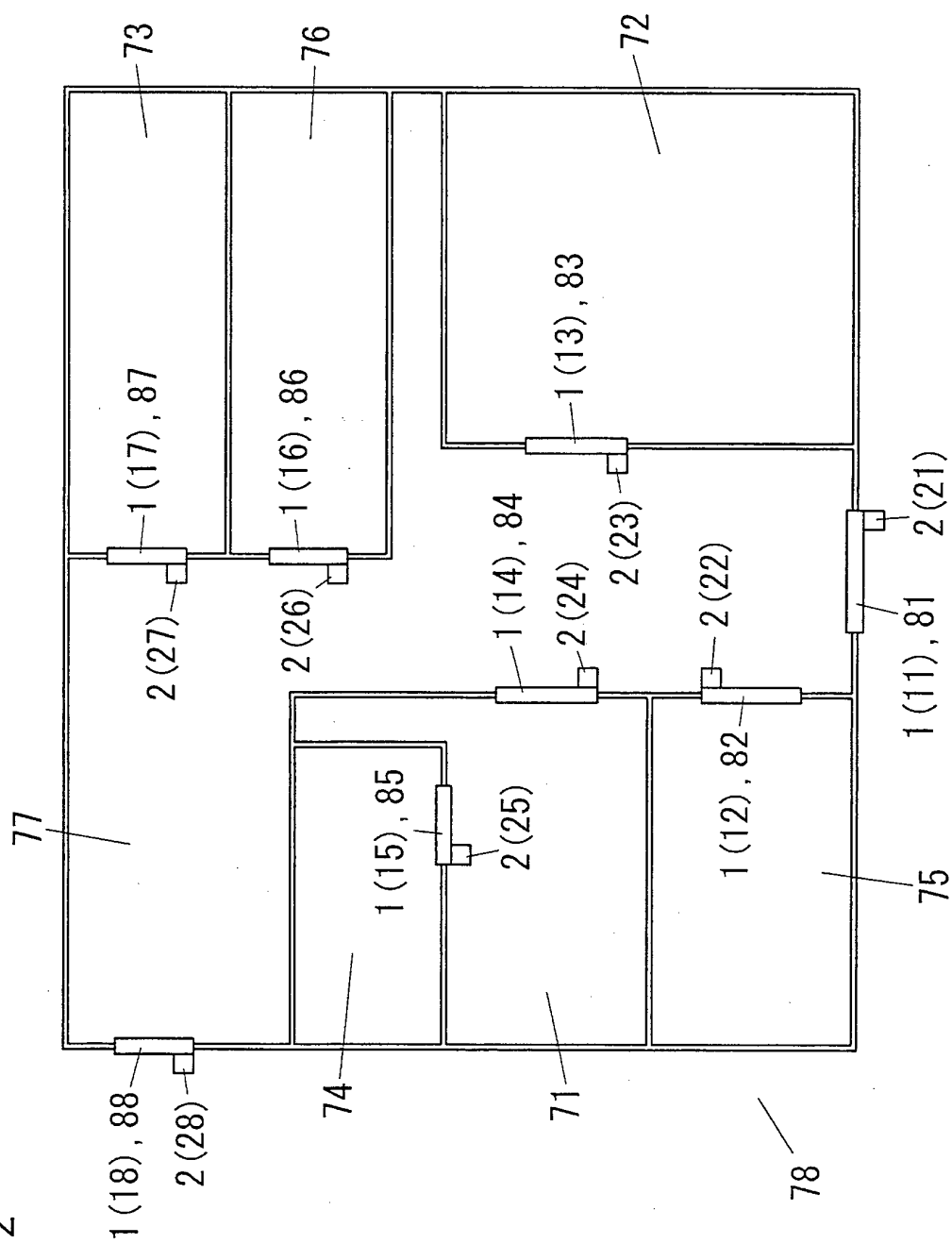


FIG. 3

INPUT DEVICE	CLASS INFORMATION	DOOR LOCK DEVICE							
		D 1	D 2	D 3	D 4	D 5	D 6	D 7	D 8
S 1	OFFICER	1		5	5	1 0	5	5	
"	MANAGER	1		5	5		5	5	
"	STAFF	1		5	5			5	
S 2	OFFICER		1 0						
"	MANAGER		1 0						
"	STAFF		1 0						
S 3	OFFICER			1 0					
"	MANAGER			1 0					
"	STAFF			1 0					
S 4	OFFICER				1 0	1 0			
"	MANAGER				1 0				
"	STAFF				1 0				
S 5	OFFICER					1 0			
"	MANAGER								
"	STAFF								
S 6	OFFICER						1 0		
"	MANAGER						1 0		
"	STAFF								
S 7	OFFICER							1 0	
"	MANAGER							1 0	
"	STAFF							1 0	
S 8	OFFICER			5	5	1 0	2	2	1
"	MANAGER			5	5		2	2	1
"	STAFF			5	5			2	1

FIG. 4

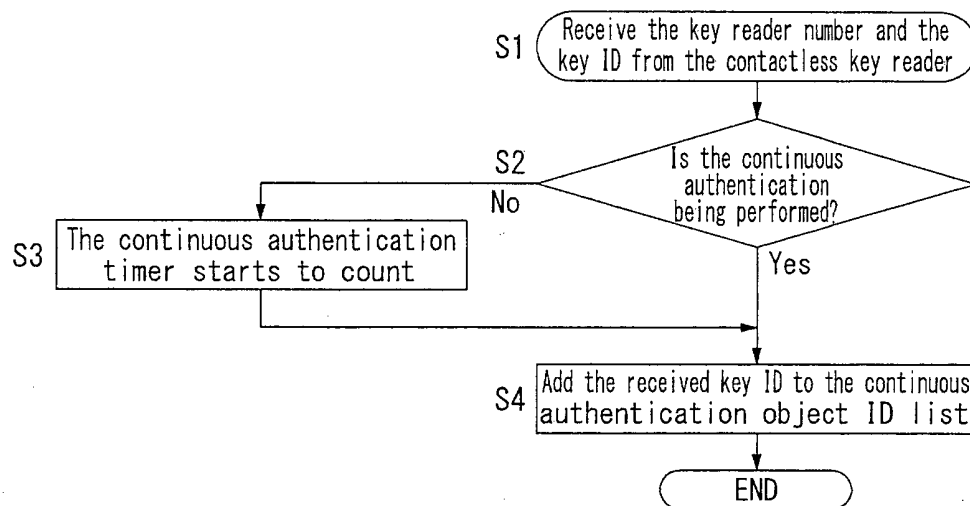


FIG. 5

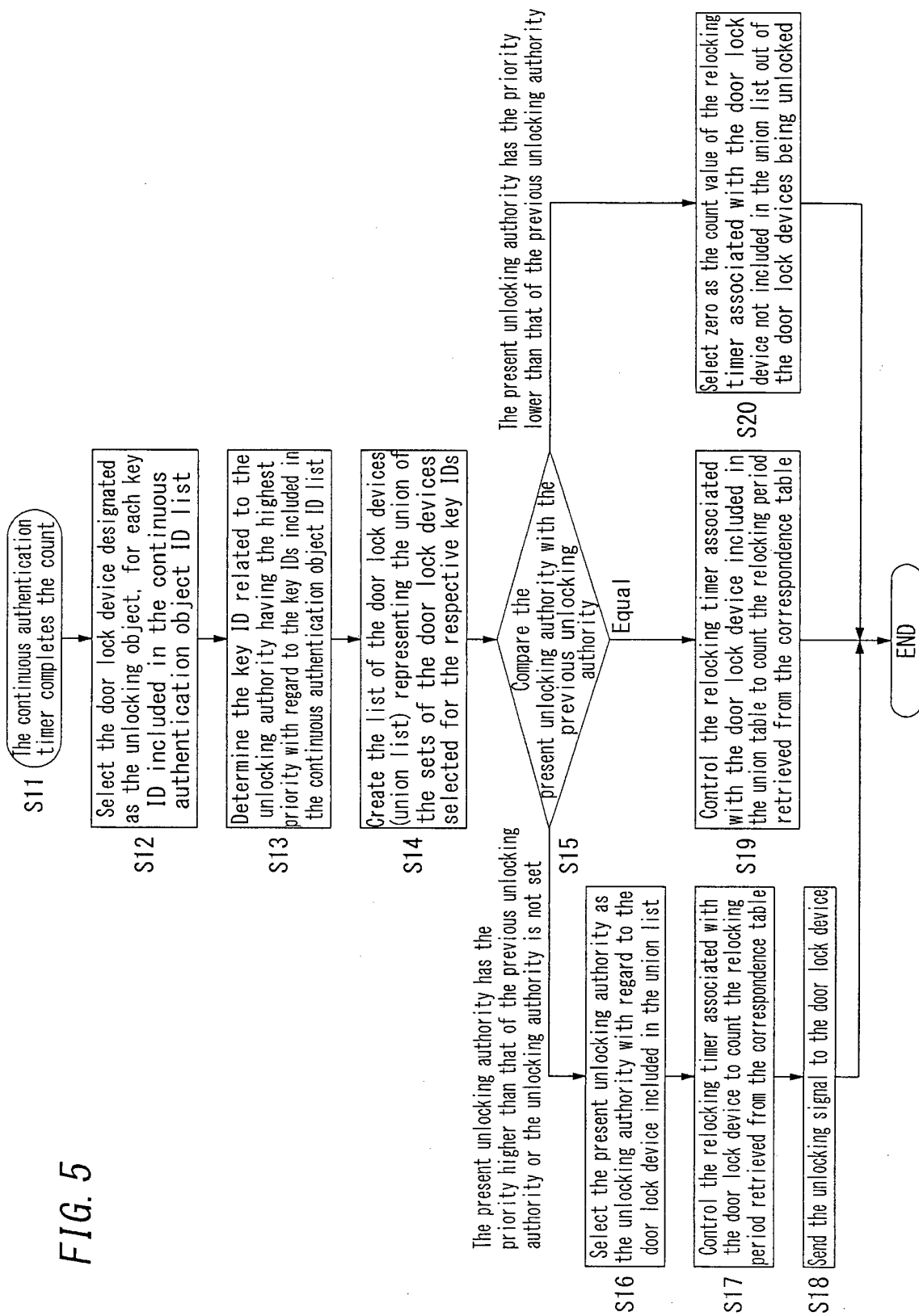


FIG. 6

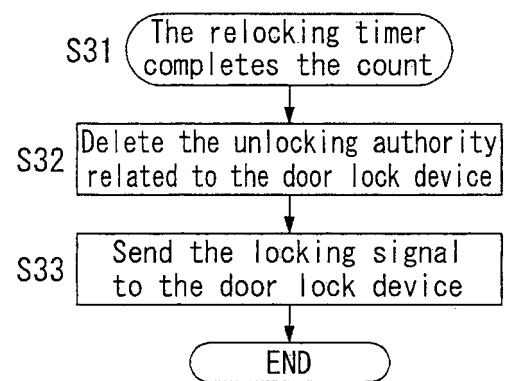
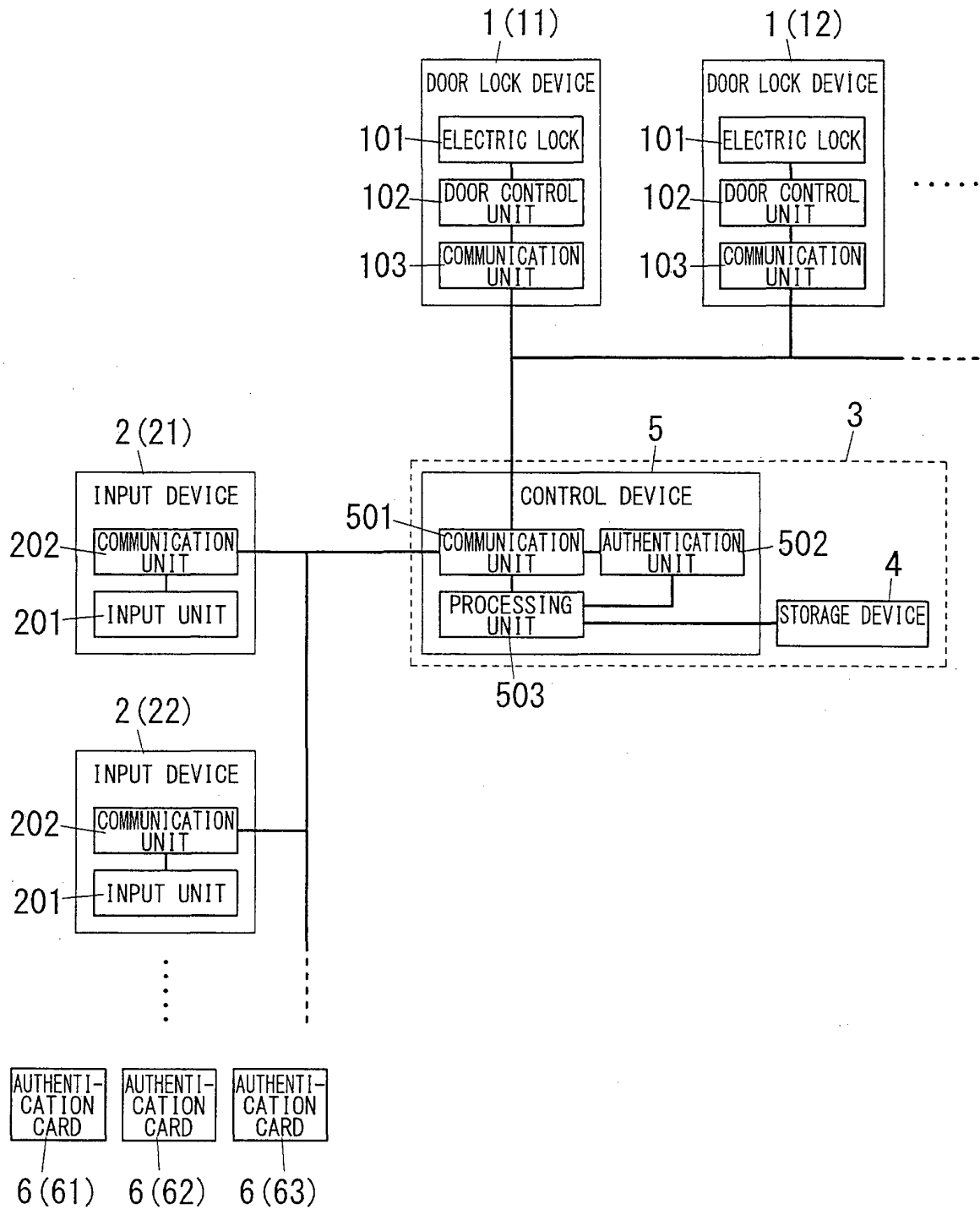


FIG. 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/078540

A. CLASSIFICATION OF SUBJECT MATTER

E05B49/00(2006.01)i, G06K17/00(2006.01)i, H04Q9/00(2006.01)i

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)

E05B49/00, G06K17/00, H04Q9/00

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2012

Kokai Jitsuyo Shinan Koho 1971-2012 Toroku Jitsuyo Shinan Koho 1994-2012

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X A	JP 2011-140843 A (Hitachi, Ltd.), 21 July 2011 (21.07.2011), fig. 1, 2, 3, 4; paragraphs [0009], [0011], [0027] to [0032] (Family: none)	1, 8 2-7
A	JP 5-321524 A (Mitsubishi Electric Corp.), 07 December 1993 (07.12.1993), fig. 1, 6; paragraphs [0015] to [0017] (Family: none)	1-8
A	JP 2000-259968 A (Hitachi Information Technology Co., Ltd.), 22 September 2000 (22.09.2000), fig. 5, 6, 7; paragraphs [0013] to [0039] (Family: none)	1-8

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search
06 March, 2012 (06.03.12)Date of mailing of the international search report
13 March, 2012 (13.03.12)Name and mailing address of the ISA/
Japanese Patent Office

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/078540

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 7-049985 A (Mitsubishi Electric Corp.), 21 February 1995 (21.02.1995), fig. 1, 2, 3; paragraphs [0023] to [0038] (Family: none)	1-8

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 5321524 A [0004]