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(54) SYSTEM AND METHOD FOR CONTROL OF THE ACCESSES TO A DELIMITED PUBLIC PLACE

(57) System for control (99) of the accesses to a delimited public place (300), comprising an access door (1), a portal (2) arranged in proximity to the access door (1), wherein the portal (2) comprises a frame (3) defining a passage area (500), a barrier (9) mounted on the frame (3) to assume an opening configuration in which it leaves the passage area (500) clear, and an encumbrance configuration, in which it encumbers a portion of the passage area (500), wherein the system (99) further comprises a people detection device (16) for detecting each crossing of the portal (2) by incoming and outcoming users, a measuring device (17) for measuring a body temperature of each user before crossing the portal (2), a command and control unit (18) programmed for: calculating in real time a total number of users inside the place (300) and arranging the barrier (9) in the opening configuration only on condition that the total number of users is less than the predetermined maximum number of users and that the body temperature is less than the reference value.

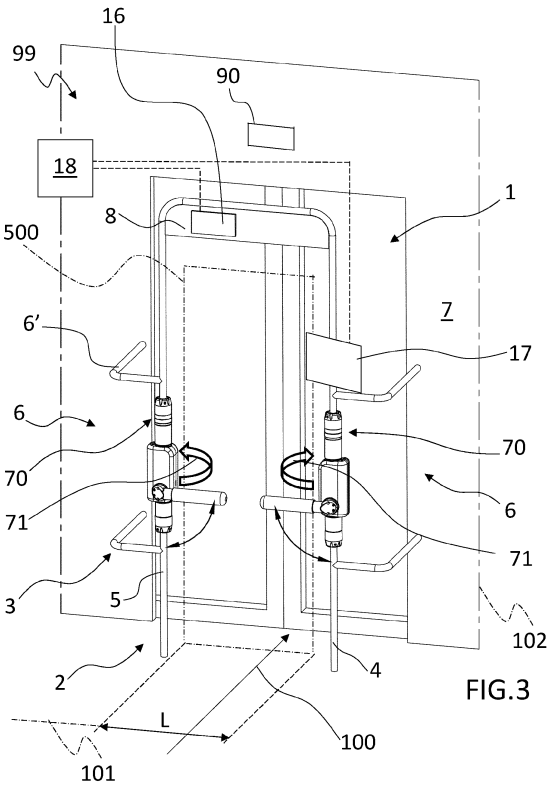

FIG.3

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Description

Technical field of the invention

[0001] The present invention relates to a system and a method for control of the accesses to a delimited public place, in particular capable of dissuading the user's access to that place if given access conditions are not verified.

State of the art

[0002] The current trend regarding the access to certain delimited public places (e.g. banks, post offices, pharmacies, shops, stadiums, concert spaces, etc.) is to allow the users to access freely, or after validation of a valid access right, through an access door (e.g. with automatic sliding wing/s, with push opening) to an inner area (where, for example, branches or offices manned by employees are located) in the permitted times, for example when the employees are on duty.

Summary of the invention

[0003] The Applicant has noted that in the aforesaid delimited public places the turnout of the users can significantly vary depending on the day and/or time, which may at certain times also lead to crowding of the inner areas of such places, with consequent sensation of unease and lack of comfort felt by both the users and the employees, and/or an impossibility of respecting an adequate social distancing for health and hygiene purposes.

[0004] The Applicant has also realized that, regardless of the number of users inside the delimited public place, access to the place by a user with altered health conditions due to a disease that can be contagious for other people, can entail a serious risk of contagion for the other users and/or for the employees inside the place. It also follows that in the presence of the aforementioned conditions of crowding/insufficient spacing, the risk of contagion of other people further increases.

[0005] The Applicant has therefore faced the problem of limiting the crowding of a delimited public place and limiting the risk of contagion for people inside that place.

[0006] According to the Applicant, the above problem is solved by a system and a method for control of the accesses to a delimited public place according to the attached claims and/or having one or more of the following features.

[0007] According to an aspect, the invention relates to system for control of the accesses to a delimited public place, the system comprising:

- an access door for accessing said place, said access door defining an access direction to said place, said access direction being horizontal (parallel to the ground);
- a portal arranged in proximity of said access door along said access direction to be crossed by each user, in time sequence with a crossing of said access door, to access said place, said portal comprising:
  - a frame defining a passage area having development on a plane perpendicular to said access direction;
  - a barrier mounted on the frame and structured to assume an opening configuration in which it leaves said passage area clear to allow the crossing of the passage area by the user, and an encumbrance configuration, in which it encumbers a portion of said passage area;
  - a movement system mounted on the frame to move said barrier between the opening configuration and the encumbrance configuration;

wherein said system further comprises:

- a people detection device structured to detect each crossing of the portal by incoming and outcoming users;
- a measuring device structured to measure a body temperature of each user before a crossing of said portal to access said place;
- a command and control unit operatively connected to said people detection device and to said measuring device and programmed and configured for:
  - calculating in real time a total number of users inside said place as a function of a detection signal sent by said people detection device;
  - comparing said total number of users with a predetermined maximum number of users;
  - comparing said body temperature with a reference value representative of a pyrexia condition;
  - commanding said movement system to arrange said barrier in said opening configuration only on condition that said total number of users is lower than said predetermined maximum number of users and that said body temperature is lower than said reference value.

[0008] According to an aspect, the invention relates to a method for control of the accesses to a delimited public place, the method comprising:

- arranging a portal in proximity of an access door for accessing said place, said access door defining an access direction to said place, said access direction being horizontal, and said portal being arranged along said access direction to be crossed by each user, in time sequence with a crossing of said access door, to access said place, wherein said portal comprises:
  - a frame defining a passage area having devel-

opment on a plane perpendicular to said access direction;

- a barrier mounted on the frame and structured to assume an opening configuration in which it leaves said passage area clear to allow the crossing of the passage area by the user, and an encumbrance configuration, in which it encumbers a portion of said passage area;
- a movement system mounted on the frame to move said barrier between the opening configuration and the encumbrance configuration;

wherein the method further comprises:

- detecting (preferably by a people detection device) each crossing of the portal by incoming and outcoming users;
- measuring (preferably by a measuring device) a body temperature of each user before a crossing of said portal to access said place;
- calculating in real time (preferably by a command and control unit, operatively connected to said people detection device and to said measuring device) a total number of users inside said place as a function of said detecting each crossing of the portal;
- comparing said total number of users with a predetermined maximum number of users;
- comparing said body temperature with a reference value representative of a pyrexia condition;
- arranging said barrier (preferably by said movement system commanded by said command and control unit) in said opening configuration only on condition that said total number of users is lower than said predetermined maximum number of users and said body temperature is lower than said reference value.

[0009] By the expression "delimited public place" it is meant a space with a closed perimeter (e.g. by walls, barriers, fences, etc.) with a predetermined number of accesses, such as an inner room of a building for service for public users (e.g. bank, post office, clinic, commercial operation, etc.) and typically provided with employees, but also an open space such as a stadium or a delimited field used for concerts. This delimited public place, through the access door, can communicate directly with the outside or with a further respective inner area (e.g. an ATM area, an anteroom, a waiting room, etc.), in turn accessible from the outside.

[0010] The terms "vertical", "horizontal" refer respectively to a direction perpendicular, and a direction parallel, to a walking surface on which the access control system is installed in normal operating conditions.

[0011] According to the Applicant, the arrangement of the portal close to the access door and along the access direction to ensure that the user is forced to cross both of them in time sequence to access the public place, allows to create in a simple and practical way a system capable of dissuading, thanks to the movable barrier, a user from entering the public place if the public place is crowded (beyond a predetermined threshold) and/or if the user has a fever.

[0012] The Applicant has realized that the use of a portal in combination with an access door (e.g. of common type) allows to convert in a simple way a pre-existing free access to the delimited public place to a controlled type access, joining together two systems (i.e. portal and access door) typically used separately from each other and without the need to modify the pre-existing access door and/or its operating logic.

[0013] The real-time calculation of the total number of users inside the place and the comparison with the predetermined maximum number of users make it possible to establish whether or not the turnout inside the delimited public place has reached the maximum capacity. If the total number of users is less than the predetermined maximum number, then the user who is about to enter is enabled to access.

[0014] At the same time, the comparison of the user's body temperature with the reference value representative of a pyrexia condition (i.e. 37°C) allows to discriminate users with fever from those who do not show this clinical sign. If the user's body temperature is lower than the aforementioned reference value, then the user is enabled to access. The present invention in one or more of the above aspects may have one or more of the following preferred features.

[0015] Preferably said portal is arranged upstream of said access door with respect to said access direction (i.e. the user crosses the portal before being able to cross the access door). In this way, the control effectiveness of the system is further improved as the control of the conditions is carried out when the user is still outside the place.

[0016] In one alternative embodiment, said portal can be arranged downstream of said access door with respect to said access direction (i.e. the user crosses the portal after having crossed the access door). This embodiment can be suitable for example when the access door separates the delimited public place directly from the external environment (e.g. street, sidewalk), where it is not possible to install the portal, or from an additional inner area in the presence of space constraints.

[0017] Preferably said access door is one of the following: automatic sliding door (e.g. along a plane perpendicular to the access direction), swing door (with push or automatic opening), turnstile (with push or automatic opening). In fact, the present invention contemplates the use of any type of access door to a place. Preferably said access door is an automatic door. Said access door can preferably have free access, i.e. with unconditional opening (automatic or pushed), or it can have access subject to one or more conditions (valid entrance ticket, identity, etc.).

[0018] In one embodiment, said command and control unit is further programmed and configured for calculating in real time said total number of users inside said place

as a function also of one or more further detection signals coming from one or more further detection devices, each further detection device being arranged at a respective further access door to said place (intended also in the case in which the door is dedicated only to the exit from the place). In this way, the calculation of the total number of users inside the place also takes into account possible entrances and/or exits (more preferably only exits) at other doors of the place, even if not equipped with the portal. Preferably the detection device can use an infrared technology, thermal images technology, wi-fi trackers technology, video images technology.

[0019] Preferably the detection device is structured to send said detection signal to said command and control unit which is programmed for calculating in real time the total number of people inside the place as a function of this detection signal (for example by means of a machine learning technology).

[0020] In one embodiment said people detection device comprises a stereoscopic binocular optical camera (which is an inexpensive and easily usable technology for detecting stereoscopic, i.e. three-dimensional, images).

[0021] Preferably said stereoscopic binocular optical camera is arranged at a respective vertical height (with respect to a walking surface on which the system is installed) greater than or equal to 2 m, more preferably greater than or equal to 2,5 m. In this way obstructions of the camera's field of view, for example by the users, are reduced. In one embodiment said people detection device uses a time-of-flight technology and comprises a source, suitable for pulse emitting a plurality of electromagnetic radiation beams (e.g. with wavelength in the infrared field), and an optical receiver, suitable for receiving a reflected component of each electromagnetic radiation beam. This device makes it possible to perform a three-dimensional scan of the area in the respective field of view by calculating the distance of each point of the scanned area with respect to the device itself by measuring the time of flight taken by each emitted beam of electromagnetic radiation to go from the device to a respective point of the scanned area, be reflected from said respective point and return to the device (i.e. to the optical receiver of the device).

[0022] In one embodiment said measuring device comprises a thermal camera and a respective optical camera suitably calibrated for each one to capture a respective digital image of a same spatial region. Preferably said spatial region comprises a face of said user.

[0023] Preferably said measuring device comprises a processing unit programmed and configured for associating with each other said respective digital images captured by said thermal camera and by the optical camera of the measuring device, to obtain a respective total digital image representative of a face of said user and of a heat map of said face. In this way the measurement of the user's body temperature is accurate. Preferably said measuring device comprises a monitor structured to show to the user a value of said body temperature. In this way the user can know his own measured temperature.

[0024] Preferably said measuring device is arranged at a respective height along a vertical direction greater than or equal to 1,2 m, and/or less than or equal to 1,8 m, more preferably equal to about 1,5 m. In this way, it is convenient for the user to arrange himself with his face facing the thermal and optical cameras of the measuring device and read the measured temperature value from the monitor. In one embodiment, a width of said passage area along a transverse direction arranged horizontally and perpendicular to said access direction is greater than or equal to 55 cm, more preferably greater than or equal to 60 cm, and less than or equal to 75 cm, more preferably less than or equal to 70 cm. These dimensions conform to the typical standard dimensions of the portals of the systems for control of the accesses.

[0025] In one alternative embodiment said width is equal to about 90 cm (e.g. 80-100 cm). In this way the passage for disabled users is facilitated.

[0026] Preferably said frame comprises a first and a second upright having development along a vertical direction and arranged at a mutual distance along said transverse direction. In this way, the passage area is easily delimited.

[0027] Preferably said frame comprises a pair of bulkheads which extend respectively from said first and second upright to a support of said access door (e.g. a wall in which the access door is installed). In this way the user is prevented from bypassing the portal for entering the place (and/or the frame is structurally stabilized).

[0028] In one embodiment said frame further comprises a crossbar with development along said transverse direction and arranged at a respective top of said first and second upright to join together said first and second upright. In this way the frame is solid and sturdy.

[0029] Preferably said people detection device is installed on said crossbar of said frame. Preferably said measuring device is installed on said first upright of the frame. In this way they are arranged in an optimal position to perform their respective functions.

[0030] In one embodiment the measuring device, more preferably said optical and thermal camera of the measuring device, can be installed on said crossbar.

[0031] Optionally (only) the monitor of the measuring device can be installed on the first upright to be easily visible.

[0032] In one embodiment, said frame is devoid of said crossbar.

[0033] In one embodiment said people detection device (and/or said measuring device) can be installed on a support on which said access door is mounted, preferably above said access door.

[0034] In one embodiment (preferably when said width of the passage area is about 90 cm) said movement system comprises a first and a second portion mounted respectively on said first and second upright of the frame.

[0035] Preferably said barrier comprises a first and a second bar associated respectively to said first and second portion of the movement system to be moved by said first and second portion, each bar having a respective main development direction. Preferably said first and second portion are mutually specular with respect to a vertical middle plane parallel to the access direction (also as regards the functionality). In one embodiment (preferably when said width of the passage area is greater than or equal to 55 cm and less than or equal to 75 cm) the movement system consists of a single portion mounted on one among said first and second upright of the frame and the barrier consists of a single bar associated to the single portion of the movement system.

[0036] Preferably each portion of the movement system is structured to rotate the respective bar about a respective axis of rotation between an opening position (corresponding to said opening configuration), in which it leaves the passage area clear, and an encumbrance position (corresponding to said encumbrance configuration), in which a protruding portion of the bar encumbers said passage area, preferably with said main development direction arranged (substantially) parallel to said transverse direction. In this way the opening and encumbrance configurations of the barrier are realized. Preferably said respective axis of rotation of each bar is horizontal and parallel to the access direction. In this way the bar rotates on a vertical plane perpendicular to the access direction. In this way, since the system can be crossed by users even when leaving the public place, the bars never move towards the users, eliminating the risk of collision.

[0037] Preferably each bar in said opening position has said respective main development direction arranged vertically. In this way, the encumbrance of the bars is minimized and their path is limited.

[0038] Preferably in said opening position, a direction along the respective main development direction of each bar which goes from the respective axis of rotation to a respective free end, faces downwards. In other words, the bars rotate downwards on the vertical plane going from the encumbrance position to the opening position. In this way, moving bodies that fall from above are avoided and the safety of the system is improved. Preferably each portion of the movement system comprises a rotation pin having development along the respective axis of rotation and associable with the respective bar to rotate said respective bar.

[0039] Preferably each portion of the movement system comprises an electric motor having a motor shaft associated with said rotation pin for rotating said rotation pin. In this way each bar is automatically rotated.

[0040] Preferably each portion of the movement system is structured (e.g. thanks to the clutch referred to below) to also allow a manual rotation of the respective bar about the respective axis of rotation. In this way, the bars can also be manually forced by the user.

[0041] Preferably said motor shaft has a development perpendicular to said rotation pin and each portion of the movement system comprises a gearmotor interposed between said motor shaft and said pin, to transmit the rotation from the motor shaft to the pin by rotating the axis of rotation thereof to arrange said axis of rotation along said access direction. In this way the overall dimensions of the movement system are reduced. Preferably each gearmotor comprises a gear coupling of the endless screw-toothed wheel type proceeding from said electric motor towards said rotation pin.

[0042] Preferably each portion of the movement system comprises a clutch interposed between said rotation pin and said motor shaft, more preferably between said rotation pin and said gearmotor, even more preferably at the toothed wheel of the gearmotor to allow a free rotation of the rotation pin with respect to the toothed wheel for moment forces applied to said bar higher than a threshold value. For example, said clutch can be a clutch with spring system that can be calibrated as a function of the desired threshold value. In this way, any excessive moment forces impressed on the bar about its axis of rotation are not transmitted, beyond a given predetermined threshold, to the gearmotor to avoid damage of the gearmotor.

[0043] Preferably each portion of the movement system comprises a box-like body mounted on the respective upright and to which the respective bar is rotationally fixed. Preferably said box-like body rigidly houses said electric motor and said gearmotor, and preferably said clutch, wherein said rotation pin protrudes through a hole of the box-like body to engage the respective bar.

[0044] Preferably each portion of said movement system is structured to allow the rotation of the respective bar about a respective further axis of rotation (substantially) vertical (i.e. perpendicular to said respective axis of rotation), preferably by manual push onto said bar. In this way the bars can be forced into rotation along a horizontal plane to assume a safety position different from the opening position. This feature allows the user, in the event of emergency or need, to pass (e.g. by manually pushing the bars to rotate them about the further axis of rotation) entering or exiting along the access direction even if the barrier is in the encumbrance configuration. In this sense, the system does not implement a categorical impediment to the access (nor does it have an anti-robbery function), but it acts as a deterrent.

[0045] Preferably said box-like body is structured to rotate about said respective further axis of rotation with respect to the respective upright. In this way, the rotation of the whole portion of the movement system and of the whole respective bar is carried out in a structurally simple way.

[0046] Preferably each portion of the movement system comprises an elastic system operatively interposed between the box-like body and the respective upright and structured to oppose an increasing elastic reaction force to an increasing rotation of said box-like body about said further axis of rotation with respect to the respective up-

right from a first position, in which the respective bar, when in the encumbrance position, is arranged along said transverse direction, to a safety position, in which the respective bar is arranged along said access direction. In this way the elastic system tends to bring the box-like body back to the first position in which it normally operates. Preferably said elastic system comprises a plurality of tension springs (for example at least four springs), each spring being arranged (substantially) parallel to said further axis of rotation and having a first end integral with said box-like body to rotate together with said body box-like about said further axis of rotation, and a second end integral with said respective upright (i.e. fixed). In this way, during the rotation of the box-like body, the springs undergo an elongation that allows the elastic reaction force to be exerted on the box-like body to bring the box-like body back to the first position. Preferably said system for control is structured to allow a crossing of each user along direction opposite to said access direction to exit from said place. In this way it is not necessary to have two doors to enter and exit the place.

[0047] Preferably said command and control unit is further programmed and configured for receiving an opening signal and for commanding, as a function of said opening signal, said movement system to arrange said barrier in said opening configuration. In this way it is possible to clear the passage area to allow the passage of users in particular situations (exit from the place, emergency, etc.).

[0048] In one embodiment said opening signal is voluntarily generated by an operator (e.g. by suitable command).

[0049] In one embodiment said system for control comprises first movement detection devices (e.g. infrared photocells) arranged downstream of said portal along the access direction and structured to generate said opening signal on condition of a detection of a movement of said user towards said portal along direction opposite to said access direction. In this way, users can easily and automatically leave the public place. Preferably said command and control unit is further programmed and configured for receiving a closing signal and for commanding, as a function of said closing signal, said movement system to arrange said barrier in said encumbrance configuration immediately after a crossing of the portal by the user (e.g. entering and/or exiting the place). In this way the system for control is ready for the next user.

[0050] In one embodiment said system for control comprises second movement detection devices preferably installed on said frame, more preferably at said barrier, and structured to generate said closing signal at the end of said crossing of said user (e.g. at the end of the interruption by the user of the infrared beam of the photocell).

[0051] In one embodiment said people detection device is structured to generate said closing signal on condition of a detection of a departure of said user from said portal after said crossing of the portal (entering and/or exiting).

[0052] In one embodiment said system for control comprises timed automatic devices (e.g. time switch) structured for generating said closing signal after a given time interval starting from an instant in which said barrier assumes said opening configuration. According to an aspect, the invention relates to a delimited public place comprising (at least one) system for control of the accesses according to the present invention.

Brief description of the drawings

[0053] The features and the advantages of the present invention will be further clarified by the following detailed description of some embodiments, presented by way of non-limiting example of the present invention, with reference to the attached figures, in which:

- figure 1 shows a schematic and plan view of a delimited public place comprising the system for control according to a first embodiment of the present invention;
- figure 2 shows a schematic and plan view of a portion of a delimited public place comprising the system for control according to a second embodiment of the present invention;
- figure 3 shows a perspective view of the system for control of the accesses of figure 1;
- figure 4 shows a perspective view of a third embodiment of the system for control of the accesses according to the present invention.

Detailed description of some embodiments of the invention

[0054] In the figures with the number 99 it is exemplarily indicated a system for control of the access to a delimited public place 300.

[0055] Exemplarily the system 99 comprises an access door 1 for accessing the place 300 which defines an access direction 100 to the place, the access direction 100 being horizontal. The door 1 can divide the place 300 directly from the external environment or, as shown in figure 1, from a further delimited place 301, for example an ATM room or a waiting room.

[0056] In the embodiments shown in figures 1, 3 and 4 the access door is an automatic door with sliding wings, comprising a respective presence detection device 90 (e.g. radar) known per se and structured to control the automatic opening of the door in case of detection of a body in the respective field of view. Exemplarily the presence detection device 90 is arranged above the door 1.

[0057] In the embodiment of figure 2, the door is a swing door with push opening (whose opening encumbrance is marked by the arc in dashed line).

[0058] Exemplarily the system 99 comprises a portal 2 arranged in proximity of the access door 1 along the access direction 100 to be crossed by each user (not shown), in time sequence with a crossing of the access

door, to access the place 300.

[0059] Exemplarily the portal 2 comprises a frame 3 defining a passage area 500 having development on a plane perpendicular to the access direction 100.

[0060] In the embodiments of figures 1, 3 and 4 the portal 2 is arranged upstream of the access door 1 with respect to the access direction 100 to ensure that the user crosses the portal before crossing the access door. Alternatively (fig. 1 in dashed line) the portal can be arranged downstream of the access door.

[0061] In the embodiment of figure 2, the portal 2 is arranged downstream of the access door with respect to the access direction taking into account the opening encumbrance of the door. Alternatively, it can be arranged upstream of the door (fig. 2 in dashed line). Exemplarily a width L of the passage area 500 along a transverse direction 101 arranged horizontally and perpendicular to the access direction 100 is approximately 90 cm.

[0062] Exemplarily the frame 3 comprises a first 4 and a second upright 5 extending along a vertical direction 102 and arranged at a mutual distance along the transverse direction. Exemplarily the frame comprises a pair of bulkheads 6 (each bulkhead is exemplarily constituted of a pair of arms 6') which develop respectively from the first 4 and the second upright 5 up to a wall 7 in which the access door is mounted. In the embodiments of figures 1, 2 and 3, the frame further comprises a crossbar 8 extending along the transverse direction 101 and arranged at a respective top of the first and second upright to join them together.

[0063] Exemplarily the portal comprises a barrier 9 mounted on the frame 3 and structured to assume an opening configuration (not shown) in which it leaves the passage area 500 clear to allow the user to cross the passage area, and an encumbrance configuration (figures 3 and 4), in which it encumbers a portion of the passage area.

[0064] Exemplarily the portal 2 comprises a movement system 10 mounted on the frame 3 to move the barrier between the opening configuration and the encumbrance configuration.

[0065] Exemplarily (figures 3 and 4) the movement system 10 comprises a first 11 and a second portion 12 mounted respectively on the first 4 and second upright 5 of the frame and specular to each other with respect to a vertical middle plane (not shown) parallel to the access direction (i.e. a plane defined by the access direction 100 and the vertical direction 102).

[0066] Exemplarily (figures 3 and 4) the barrier 9 comprises a first 13 and a second bar 14 associated respectively to the first and second portion of the movement system 10 to be moved by the first and second portion, each bar having a respective main development direction (i.e. the longitudinal direction of the bar).

[0067] In one embodiment (not shown, in which for example the width L of the passage area is equal to 60-70 cm) the movement system consists of a single portion mounted on only one between the first and the second upright of the frame and the barrier consists of a single bar associated with the single portion of the movement system. Exemplarily each portion 11, 12 of the movement system 10 is structured to rotate the respective bar 13, 14 about a respective axis of rotation 104, 104' (as indicated by the double arrow in figures 3 and 4) between an opening position (corresponding to said opening configuration, not shown), in which it leaves the passage area 500 clear, and an encumbrance position (corresponding to said encumbrance configuration shown in figures 3 and 4), in which a protruding portion of the bar encumbers the passage area, with the main development direction arranged parallel to the transverse direction 101. Exemplarily the respective axis of rotation 104, 104' of each bar 13, 14 is horizontal and parallel to the access direction.

[0068] Exemplarily (not shown) each bar 13, 14 in the respective opening position has the respective main development direction arranged vertically and a direction along the respective main development direction of each bar, which goes from the respective axis of rotation 104, 104' to a respective free end, faces downwards (as indicated by the double arrow in figures 3 and 4).

[0069] Exemplarily each portion 11, 12 of the movement system 10 comprises a box-like body 15 mounted on the respective upright 4, 5 and in which the electric motor, the gearmotor and the clutch are rigidly housed, wherein the rotation pin protrudes through a hole (not shown) of the box-like body 15 to engage the respective bar 13, 14. Exemplarily each portion 11, 12 of the movement system 10 is structured to allow the rotation of the respective bar 13, 14 about a respective further vertical axis of rotation 105, 105' (i.e. respectively perpendicular to the axis of rotation 104, 104'), in both directions of rotation, one of which is shown by the arrows 71 in figure 3, by manual push on the bar.

[0070] Exemplarily the whole box-like body 15 is structured to rotate about the further axis of rotation 105 with respect to the respective upright 4, 5 to achieve in a structurally simple way the rotation of the whole portion of the movement system and of the whole respective bar.

[0071] Exemplarily (not shown) each portion 11, 12 of the movement system 10 comprises a respective elastic system operatively interposed between the box-like body 15 and the respective upright 4, 5 and structured to oppose an increasing elastic reaction force to an increasing rotation of the body box-like about the respective further axis of rotation with respect to the respective upright from a first position (shown in figures 3 and 4), in which the respective bar in the encumbrance position is arranged along the transverse direction 101, to a safety position (not shown), in which the respective bar in the encumbrance position is arranged along the access direction 100.

[0072] Exemplarily (not shown) each elastic system comprises a plurality of traction springs (for example at least four springs), each spring being arranged parallelly to the respective further axis of rotation 105, 105' and

having a first end integral with the box-like body 15 to rotate together with the box-like body about the respective further axis of rotation, and a second end integral with the respective upright (i.e. fixed). Exemplarily the system for control 99 further comprises a people detection device 16 (only schematically shown in figures 3 and 4) structured to detect each crossing of the portal 2 by incoming and outcoming users.

[0073] Exemplarily (not shown) the people detection device comprises a stereoscopic binocular optical camera (for stereoscopic images), which is arranged at a respective vertical height equal to about 2.5 m. For example, the people detection device 16 is of the commercially available type.

[0074] In one not shown embodiment, the people detection device is structured to capture two-dimensional images.

[0075] Exemplarily the system for control 99 comprises a measuring device 17 (only schematically shown in figures 3 and 4) structured to measure a body temperature of each user before crossing the portal to access the place 300.

[0076] Exemplarily (not shown) the measuring device 17 comprises a thermal camera and a respective optical camera suitably calibrated for each one to capture a respective digital image of the same spatial region, the spatial region comprising a face of the user. Exemplarily (not shown) the measuring device 17 comprises a processing unit programmed and configured for associating with each other the respective digital images captured by the thermal camera and by the optical camera of the measuring device, to obtain a respective total digital image representative of the face of the user and of a heat map of the face. For example, the measuring device 17 is of the commercially available type. Exemplarily (not shown) the measuring device 17 comprises a monitor structured to show the user the measured body temperature value.

[0077] Exemplarily, in the embodiments shown in figures 3 and 4, the measuring device 17 is installed on the first upright 4 at a respective height of about 1.5 m along the vertical direction 102.

[0078] In the embodiments of figures 1, 2 and 3 the people detection device 16 is installed on the crossbar 8 of the frame (shown in figure 3).

[0079] In the embodiment of figure 4, in which the frame is devoid of the crossbar, the people detection device is exemplarily installed on the wall 7 in which the access door is mounted, above the access door (next to the presence detection device 90). Exemplarily the system for control 99 comprises a command and control unit 18 (only schematically shown) operatively connected to the people detection device 16 and to the measuring device 17.

[0080] Exemplarily the portal 2 comprises a respective optical signalling device 70 (e.g. traffic light with green and red lights) arranged at each portion 11, 12 of the movement system 10 and structured for optically signalling (e.g. by means of the aforementioned lights) the arrangement of the respective bar in the opening position (green light) and in the closing position (red light). Optionally, the portal can also include an acoustic signalling system for signalling the configurations assumed by the barrier (e.g. different sounds for the opening and closing configurations).

[0081] Exemplarily each optical signalling device 70 (and possibly also the acoustic signalling system) is structured and programmed for also signalling (e.g. red light and possibly acoustic signal) the arrangement of the respective box-like body in the safety position following a manual push on the respective bar along the access direction. In this way, a forced access to the place by the user is signalled.

[0082] In use, the system for control 99 allows to carry out a method for control of the access to the delimited public place 300.

[0083] Exemplarily it is provided detecting, by the people detection device 16, each crossing of the portal 2 by incoming and outcoming users of the place 300, and measuring, by the measuring device 17, a body temperature of each user before a crossing of portal 2 to access the place.

[0084] Exemplarily it is provided calculating in real time, by the command and control unit 18 and as a function of a detection signal sent by the people detection device 16, a total number of users inside the place 300 and comparing the total number of users with a predetermined maximum number of users.

[0085] Exemplarily it is provided comparing, by the command and control unit 18, the body temperature with a reference value representative of a pyrexia condition. Exemplarily it is provided arranging the barrier 9, by the movement system 10 commanded by the command and control unit 18, in the opening configuration only on condition that the total number of users is less than the predetermined maximum number users and the body temperature is less than the reference value. In this way, the user is enabled to access the place only if the predetermined maximum capacity of the place has not been reached yet, and the user does not have a fever when accessing the place.

[0086] The system for control 99, given the possibility of the bars 13 and 14 to be able to rotate also about the respective further axis of rotation 105, 105' (together with the respective box-like body 15) does not strictly prevent the user from accessing the place 300 if the aforementioned access conditions are not verified (thus ensuring the safety of the system in every situation, both when accessing and leaving the place), but it is instead aimed at dissuading the user from continuing further and accessing if the barrier assumes the encumbrance configuration. In one alternative embodiment (not shown), in which the rotation of the bars about the further vertical axes of rotation 105, 105' is not allowed, the system for control 99 can instead effectively prevent the user from accessing the delimited public place.

[0087] In one embodiment (not shown) the command and control unit 18 is further programmed and configured

for calculating in real time the total number of users inside the place also as a function of one or more further detection signals coming from respective further detection devices (distinct from the device 16), each further detection device being arranged at a respective further access door to said place (for example in the case in which the place provides multiple accesses/exits not necessarily provided with the system for control 99, or it provides for a single access at which the system for control 99 is installed and one or more doors, devoid of the system for control 99, and used only for the exit of users).

[0088] In one embodiment (not shown) the place 300 can comprise several accesses, each access comprising a respective system for control according to the present invention. Exemplarily the system for control 99 is suitable for further allowing a crossing of each user along direction opposite to the access direction 100 to exit the place 300. Exemplarily the command and control unit 18 is further programmed and configured for receiving an opening signal (e.g. voluntarily generated by an employee through a specific command, for example a button or a command on a touch screen device and/or by the aforementioned movement detection devices) and for commanding, as a function of the opening signal, the movement system 10 to arrange the barrier in the opening configuration (bars 13 and 14 in the opening positions).

[0089] Exemplarily the command and control unit 18 is further programmed and configured for receiving a closing signal and for commanding, as a function of the closing signal, the movement system 10 to arrange the barrier 9 in the encumbrance configuration (bars 13 and 14 in the encumbrance position) immediately after the user has crossed the portal (e.g. entering and/or exiting), as described above.

Claims

1. System for control (99) of the accesses to a delimited public place (300), the system (99) comprising:

    - an access door (1) for accessing said place (300), said access door defining an access direction (100) to said place, said access direction (100) being horizontal;
    - a portal (2) arranged in proximity of said access door (1) along said access direction (100) to be crossed by each user, in time sequence with a crossing of said access door (1), to access said place (300), said portal (2) comprising:

        - a frame (3) defining a passage area (500) having development on a plane perpendicular to said access direction (100);
        - a barrier (9) mounted on the frame (3) and structured to assume an opening configuration in which it leaves said passage area (500) clear to allow the crossing of the passage area (500) by the user, and an encumbrance configuration, in which it encumbers a portion of said passage area (500);
        - a movement system (10) mounted on the frame (3) to move said barrier (9) between the opening configuration and the encumbrance configuration;

    wherein said system (99) further comprises:

        - a people detection device (16) structured to detect each crossing of the portal (2) by incoming and outcoming users;
        - a measuring device (17) structured to measure a body temperature of each user before a crossing of said portal (2) to access said place (300);
        - a command and control unit (18) operatively connected to said people detection device (16) and to said measuring device (17) and programmed and configured for:

            - calculating in real time a total number of users inside said place (300), as a function of a detection signal sent by said people detection device (16);
            - comparing said total number of users with a predetermined maximum number of users;
            - comparing said body temperature with a reference value representative of a pyrexia condition;
            - commanding said movement system (10) to arrange said barrier (9) in said opening configuration only on condition that said total number of users is lower than said predetermined maximum number of users and that said body temperature is lower than said reference value.

2. System for control (99) according to claim 1, wherein said portal (2) is arranged upstream of said access door (1) with respect to said access direction (100), wherein said access door (1) is one of the following: automatic sliding door(s), swing door with push opening, and wherein said people detection device (16) comprises a stereoscopic binocular optical camera arranged at a respective vertical height greater than or equal to 2 m, or uses a time-of-flight technology and comprises a source, suitable for pulse emitting a plurality of electromagnetic radiation beams, and an optical receiver, suitable for receiving a reflected component of each electromagnetic radiation beam.

3. System for control (99) according to any one of the preceding claims, wherein said people detection device (16) is structured to send said detection signal to said command and control unit (18), wherein said

command and control unit is further programmed and configured for calculating in real time said total number of users inside said place (300) as a function also of one or more further detection signals respectively coming from one or more further detection devices, each further detection device being arranged at a respective further access door to said place.

4. System for control (99) according to any one of the preceding claims, wherein said measuring device (17) comprises a thermal camera and a respective optical camera suitably calibrated for each one to capture a respective digital image of a same spatial region comprising a face of said user, wherein said measuring device (17) comprises a processing unit programmed and configured for associating with each other said respective digital images captured by said thermal camera and by the optical camera of the measuring device, to obtain a respective total digital image representative of a face of said user and of a heat map of said face, and a monitor structured to show to the user a value of said body temperature, and wherein said measuring device (17) is arranged at a respective height along a vertical direction greater than or equal to 1,2 m, and/or less than or equal to 1,8 m.

5. System for control (99) according to any one of the preceding claims, wherein a width (L) of said passage area (500) along a transverse direction (101) arranged horizontally and perpendicular to said access direction (100) is greater or equal to 55 cm and less than or equal to 75 cm, or wherein said width (L) is equal to about 90 cm, wherein said frame (3) comprises a first (4) and a second upright (5), having development along a vertical direction (102) and arranged at a mutual distance along said transverse direction (101), and a pair of bulkheads (6) which extend respectively from said first (4) and second upright (5) to a support (7) of said access door (1), wherein said frame (3) further comprises a crossbar (8) with development along said transverse direction and arranged at a respective top of said first and second upright to join together said first and second upright, wherein said people detection device (16) is installed on said crossbar (8) of said frame, and said measuring device (17) is installed on said first upright (4) of the frame.

6. System for control (99) according to claim 5, wherein said movement system (10) comprises a first (11) and a second portion (12) mounted respectively on said first (4) and second upright (5) of the frame, wherein said barrier (9) comprises a first (13) and a second bar (14) associated respectively to said first (11) and second portion (12) of the movement system to be moved by said first and second portion, each bar having a respective main development direction, wherein said first (11) and second portion (12) are specular with respect to a vertical middle plane parallel to the access direction (100), or wherein the movement system consists of a single portion (11) mounted on one among said first and second upright of the frame and the barrier consists of a single bar (13) associated to the single portion of the movement system.

7. System for control (99) according to claim 6, wherein each portion (11, 12) of the movement system (10) is structured to rotate the respective bar (13, 14) about a respective axis of rotation (104, 104') between an opening position corresponding to said opening configuration, in which it leaves the passage area (500) clear, and an encumbrance position corresponding to said encumbrance configuration, in which a protruding portion of the bar encumbers said passage area, wherein said respective axis of rotation (104, 104') of each bar is horizontal and parallel to the access direction, wherein each bar in said opening position has said respective main development direction arranged vertically, and wherein, in said opening position, a direction along the respective main development direction of each bar (13, 14), which goes from the respective axis of rotation to a respective free end, faces downwards.

8. System for control (99) according to claim 7, wherein each portion (11, 12) of said movement system (10) is structured to allow the rotation of the respective bar (13, 14) about a respective further axis of rotation (105, 105') substantially vertical by manual push onto said bar, wherein each portion (11, 12) of the movement system (10) comprises a box-like body (15) mounted on the respective upright and to which the respective bar is rotationally fixed, wherein said box-like body is structured to rotate about said respective further axis of rotation with respect to the respective upright, wherein each portion (11, 12) of the movement system (10) comprises an elastic system operatively interposed between the box-like body (15) and the respective upright and structured to oppose an increasing elastic reaction force to an increasing rotation of said box-like body about said further axis of rotation with respect to the respective upright from a first position, in which the respective bar, when in the encumbrance position, is arranged along said transverse direction, to a safety position, in which the respective bar is arranged along said access direction, and wherein said elastic system comprises a plurality of tension springs, each spring being arranged substantially parallel to said further axis of rotation (105, 105') and having a first end integral with said box-like body (15) to rotate together with said body box-like about said further axis of rotation, and a second end integral with said respective upright (3, 4).

9. System for control (99) according to any one of the preceding claims, wherein said system (99) is structured to allow a crossing of each user along direction opposite to said access direction (100) to exit from said place, wherein said command and control unit (18) is further programmed and configured for receiving an opening signal and for commanding, as a function of said opening signal, said movement system (10) to arrange said barrier (9) in said opening configuration, wherein said opening signal is voluntarily generated by an operator and/or wherein said control system (99) comprises first movement detection devices arranged downstream of said portal (2) along the access direction (100) and structured to generate said opening signal on condition of a detection of a movement of said user towards said portal along direction opposite to said access direction, wherein said command and control unit (18) is further programmed and configured for receiving a closing signal and for commanding, as a function of said closing signal, said movement system (10) to arrange said barrier (9) in said encumbrance configuration immediately after a crossing of the portal by the user, wherein said control system comprises second movement detection devices installed on said frame, preferably at said barrier, and structured to generate said closing signal at the end of said crossing of said user, and/or wherein said people detection device (16) is structured to generate said closing signal on condition of detection of a departure of said user from said portal after said crossing of the portal, and/or wherein said control system comprises timed automatic means structured for generating said closing signal after a given time interval starting from an instant in which said barrier (9) assumes said opening configuration.

10. Method for control of the accesses to a delimited public place (300), the method comprising:

- arranging a portal (2) in proximity of an access door (1) for accessing said place (300), said access door defining an access direction (100) to said place, said access direction being horizontal, and said portal (2) being arranged along said access direction (100) to be crossed by each user, in time sequence with a crossing of said access door, to access said place, wherein said portal comprises:
  - a frame (3) defining a passage area (500) having development on a plane perpendicular to said access direction (100);
  - a barrier (9) mounted on the frame (3) and structured to assume an opening configuration in which it leaves said passage area (500) clear to allow the crossing of the passage area (500) by the user, and an encumbrance configuration, in which it encumbers a portion of said passage area (500);
  - a movement system (10) mounted on the frame (3) to move said barrier (9) between the opening configuration and the encumbrance configuration;

wherein the method further comprises:

- detecting each crossing of the portal by incoming and outcoming users;
- measuring a body temperature of each user before a crossing of said portal to access said place;
- calculating in real time a total number of users inside said place (300) as a function of said detecting each crossing of the portal;
- comparing said total number of users with a predetermined maximum number of users;
- comparing said body temperature with a reference value representative of a pyrexia condition;
- arranging said barrier (9) in said opening configuration only on condition that said total number of users is lower than said predetermined maximum number of users and said body temperature is lower than said reference value.

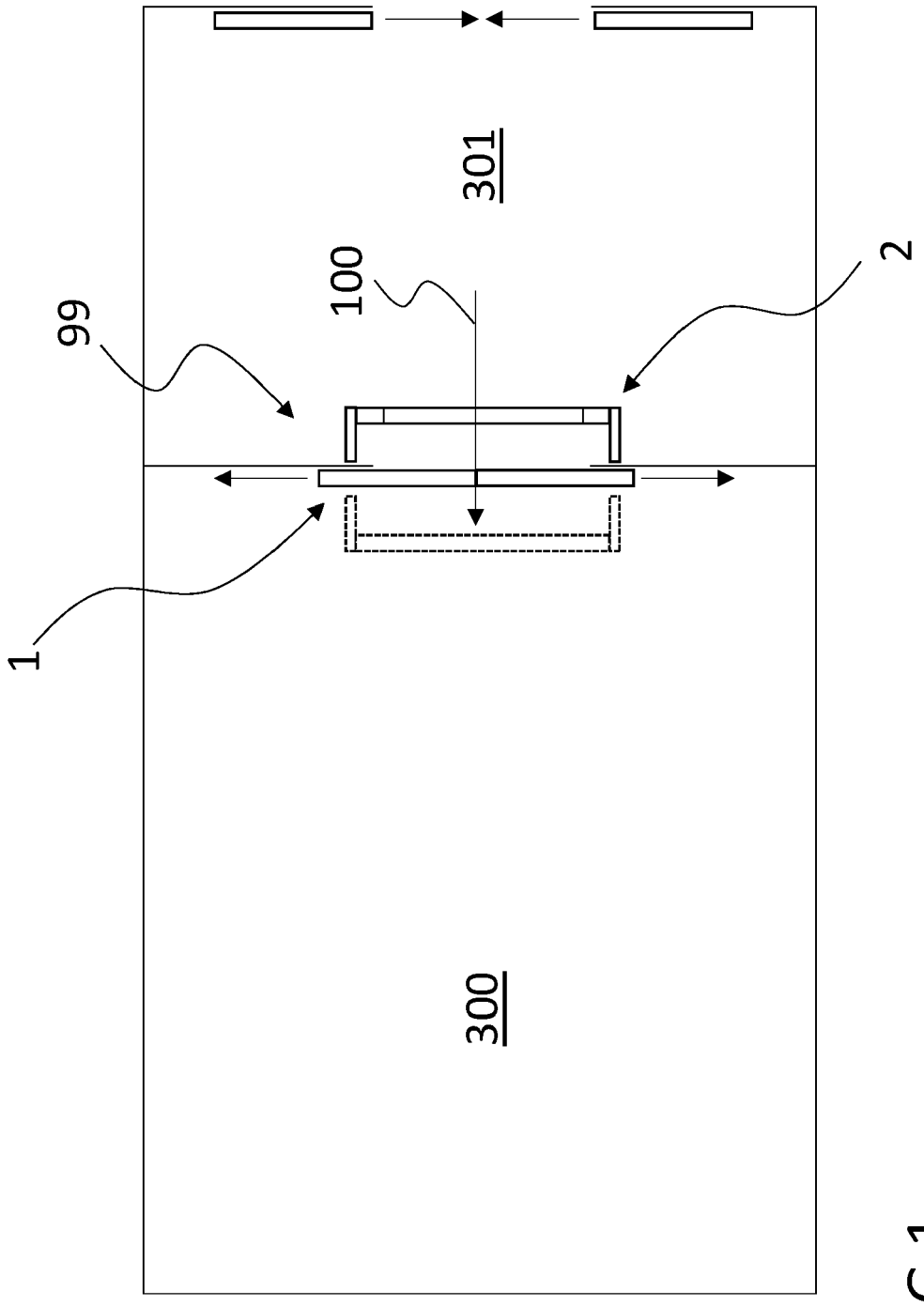
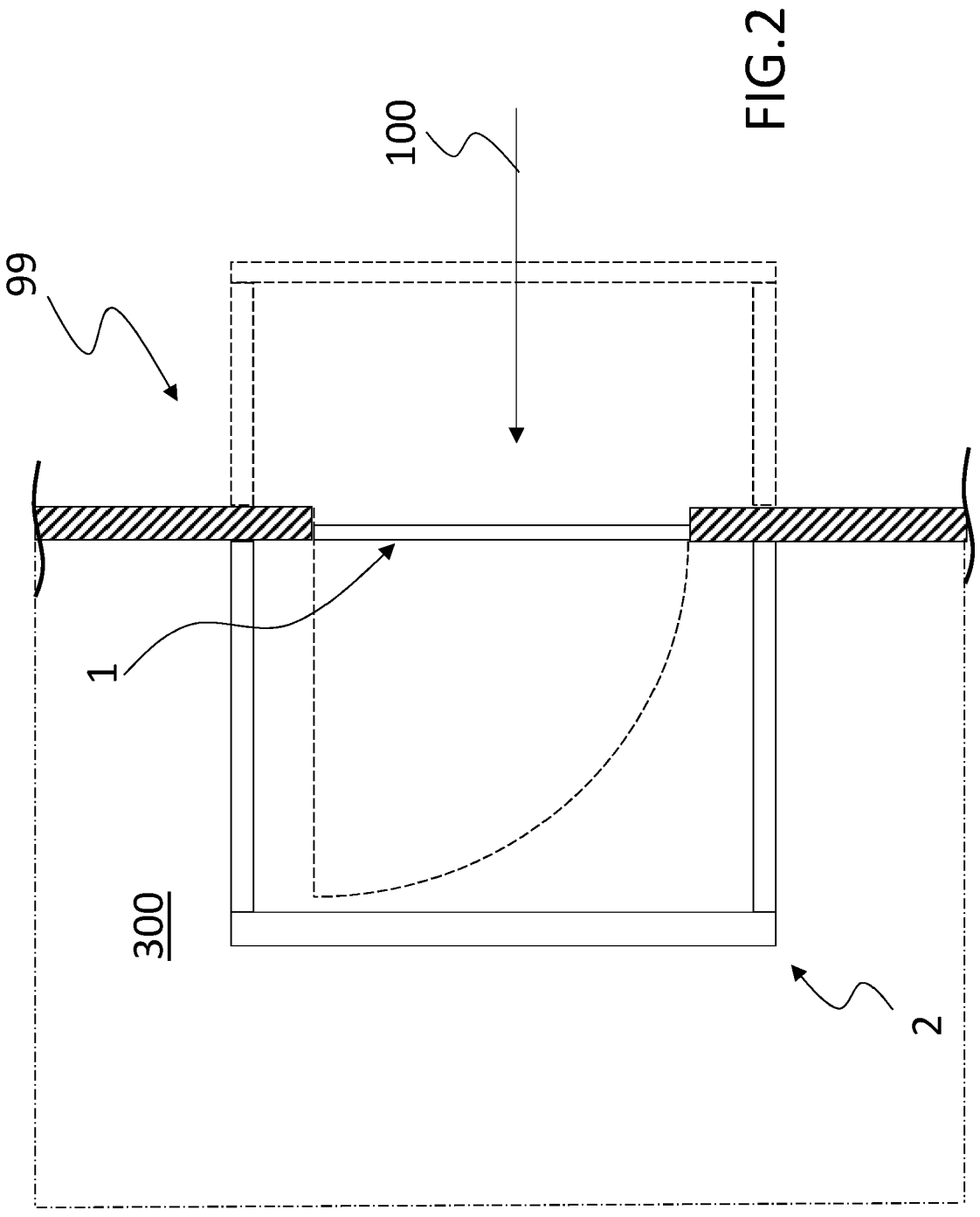


FIG.1

FIG.2



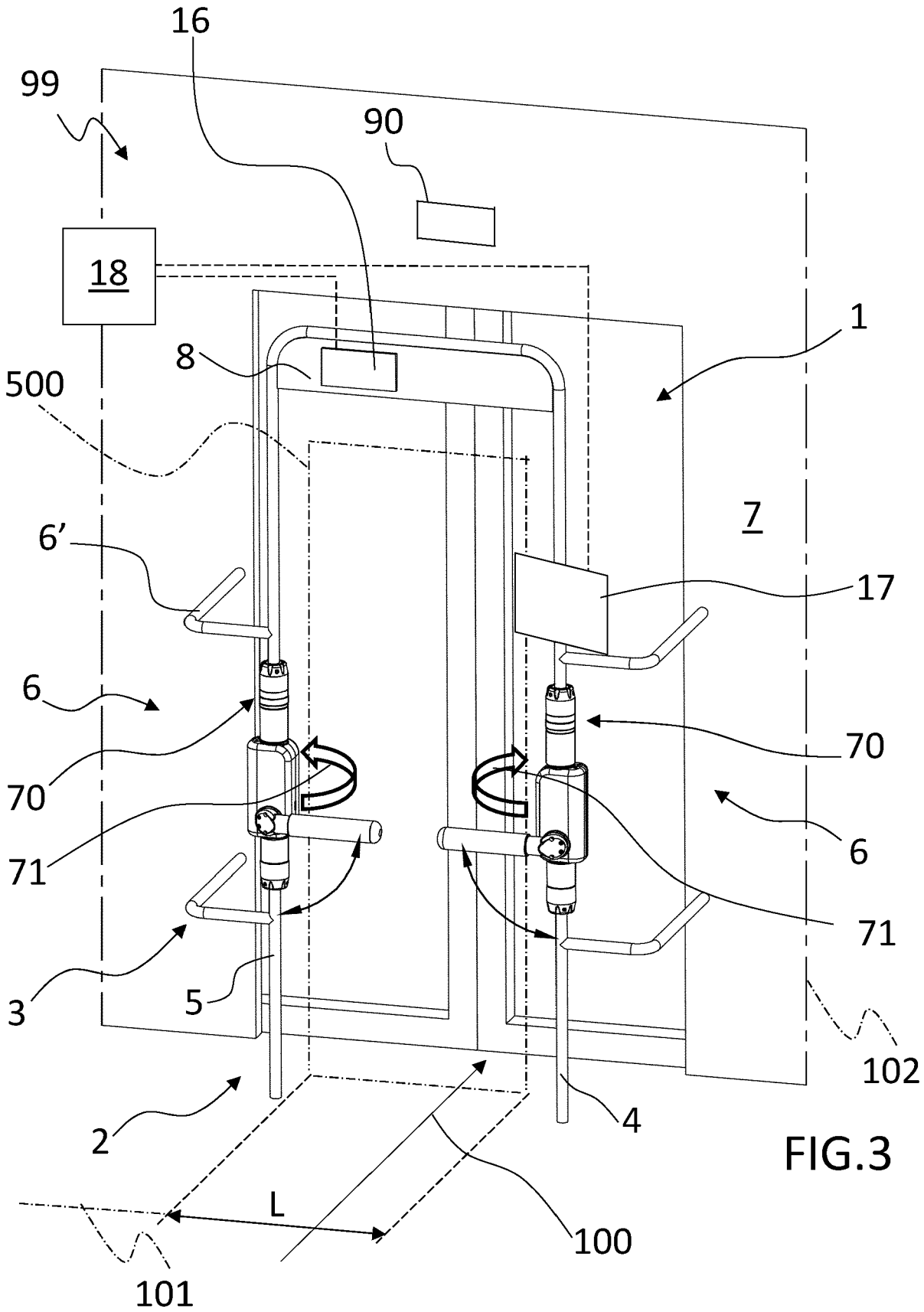


FIG.3

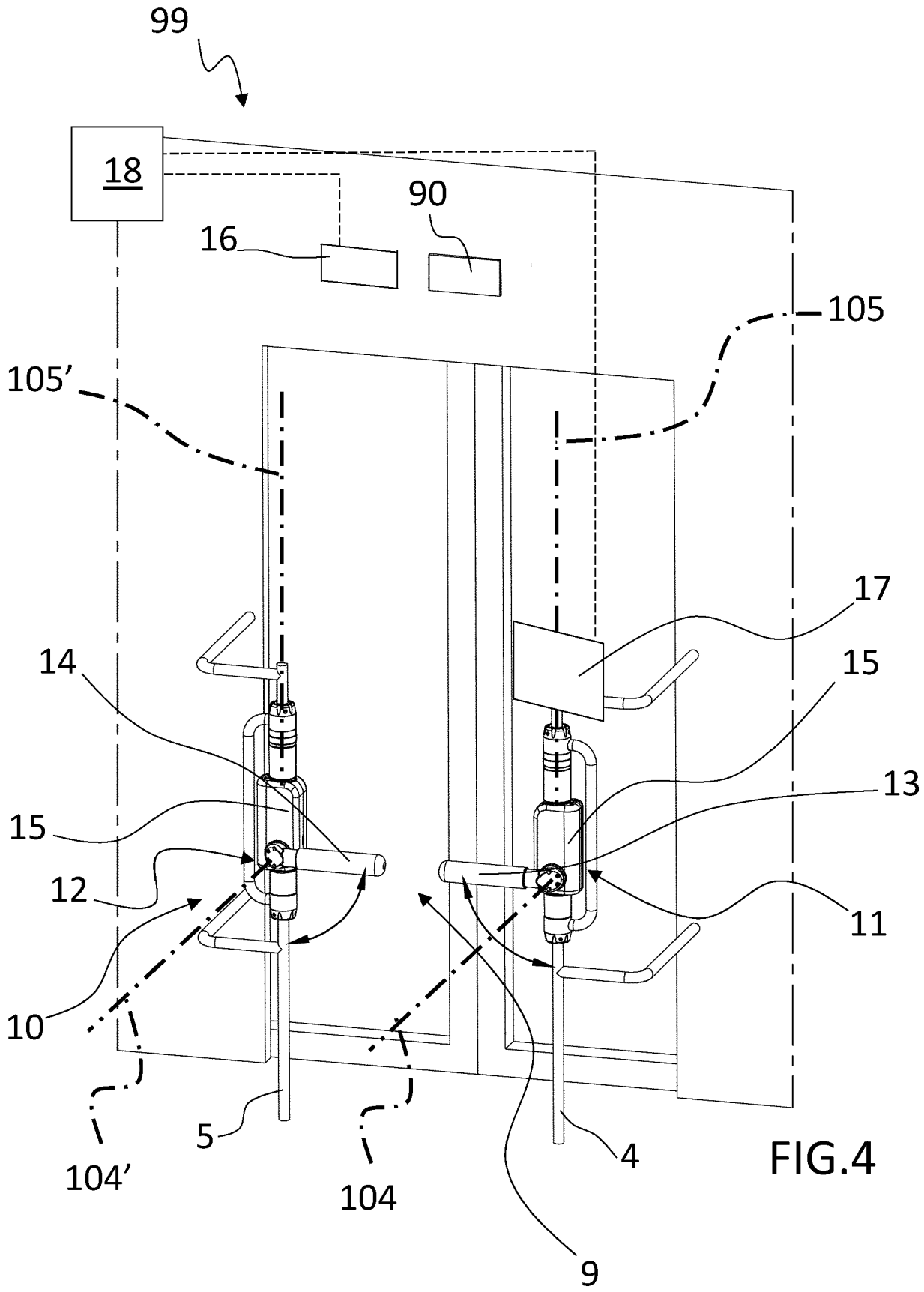


FIG.4

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EUROPEAN SEARCH REPORT

Application Number
EP 21 16 8195

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	CN 206 726 313 U (HANGZHOU MINGJING TECH CO LTD) 8 December 2017 (2017-12-08) * paragraphs [0004], [0008], [0020] - [0028]; figure 1 *	1-10	INV. E06B11/08 G07C9/10 G07C9/00
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TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 August 2021	Gallego, Adoración

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