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(54) **Automatic door**

Automatische Tür

Porte automatique

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(56) References cited:
**EP-A1- 0 799 962 EP-A1- 1 491 709
EP-A1- 1 619 342 EP-A2- 1 681 426**

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Description

[0001] The present invention relates to automatic doors, particularly to doors of a sliding type comprising at least a leaf or two coplanar leaves that move symmetrically to open and close with respect to the central axis of the opening constituting the door.

[0002] The means for opening and closing of the door comprise an electric motor a rotor of which is mechanically connected to a drive pulley of a pair of pulleys between which a loop-closed belt, a strap or another flexible means is stretched.

[0003] A leaf of the door is connected to each of the branches of the flexible means, in such a way that when the flexible means is actuated in a direction the leaves near one another symmetrically, and vice versa.

[0004] The invention relates more particularly to automatic opening doors, which are activated by an electric motor having a stator winding, the output of which is commanded by a first sensor, called a "motion" sensor and located on each side of the door, which indicates when a user is about to pass through the door, and is moving in the area monitored by the sensor.

[0005] For security reasons, a second sensor is located on the same side of the door, called the "presence sensor", which signals when a person is present, even without moving, in the area proximal to the door leaves.

[0006] Obviously, the area monitored by the second sensor is closely adjacent to the doors, while the area monitored by the first sensor is adjacent to the first but more distant from the doors.

[0007] If the area to be monitored located in front of the door is very large, a plurality of motion sensors can be provided, which monitor adjacent strips parallel to the door, thus covering the whole width of the door. EP 1 619 342 A1 discloses such an arrangement.

[0008] Since automatic doors are generally located at the entrance of areas destined to contain a large number of people, for safety reasons they are very wide in order to ensure a rapid evacuation of the area should it be necessary.

[0009] The operating cycle of automatic doors, according to the prior art, is as follows:

- 1) the person about to cross the door activates the motion sensor;
- 2) the door opens completely;
- 3) the door remains open for a predetermined pause time;
- 4) when the person has left the area covered by the sensor, the door closes.

[0010] The opening and closing of the door are commanded only by the "motion sensor", which can be realized using different technologies (active infrared, passive infrared, microwave, ultrasound, etc..) and which in each case communicates with the means for moving the door by means of an output contact.

[0011] The second "presence" sensor has only safety functions, and is placed in series with the first sensor, the two contacts being in serial communication, and only the state of the contacts of the two sensors is transmitted to the activating means of the door, which are activated when the person enters the area of the first sensor and when the person is present in the area involved in the movement of the doors.

[0012] With this system, the person who enters any point of the area monitored by the motion sensor triggers the output contact of the motion sensor which commands the opening of the door.

[0013] When the person leaves the area monitored by the motion sensor, the motion sensor commands the closing of the door which, however, is prevented until the presence sensor is activated.

[0014] The command of the motion sensor always causes the complete opening of the door, whatever the number or position of the persons who are about to cross it.

[0015] A large opening makes it quick and easy to gain access to the building, as well as making it safe to escape through in an emergency, but with the traditional automatic opening thereof, there is considerable heat loss at each opening.

[0016] Remedies to this, in the prior art, involve reducing the width of the opening, but also reducing the safety; thus the prior art does not offer appreciable results in terms of heat savings, since when the door is crossed by a large group of people, the time for which it remains open increases, effectively nullifying the advantage of having a small passage space.

[0017] The aim of the present patent is to obviate the above-mentioned drawbacks with a solution that is simple and relatively economical.

[0018] The above aim is attained by a method and a device having the characteristics recited in the independent claims.

[0019] The dependent claims relate to characteristics able to lend to the invention further advantages.

[0020] According to the invention the door area is closed by two doors that move independently of one another.

[0021] The area in front of the door is sub-divided into a presence area adjacent to the door, and into a movement area adjacent to the presence area.

[0022] Each of the areas is sub-divided into adjacent zones each of which is monitored by a specific sensor, which signals the presence of a person in the area assigned to it.

[0023] The adjacent areas in their entirety cover the entire width of the door.

[0024] The specific motion sensors are connected in parallel and send their signals to a logic circuit which commands activation and deactivation of the activating means of the door.

[0025] In response to the signal of each specific sensor, the logic circuit commands the activation of the open-

ing means of the leaf facing the area monitored by the specific sensor, and commands the deactivation of the opening means when the door opens the position facing the area monitored by the specific sensor.

[0026] In this way the opening of the door is limited to the space necessary to allow passage of the person or persons who are about to cross it, and if they are close to one side of the area, the door that opens affects only this one side. The automated door according to the invention is a double-leaf door with the leaves independent of one another, each associated to an activating motor therefor which is controlled by a logic circuit according to the position of the person who is about to pass through the door.

[0027] The advantages and the constructional and functional characteristics of the invention will emerge from the detailed description that follows, with reference to the accompanying drawings, which illustrate a particular preferred embodiment thereof given by way of non-limiting example.

Figure 1 schematically illustrates a front view of an automatic door with an opening device thereof.

Figure 2 shows the partial section II-II of figure 1 with an detail in larger scale.

Figure 3 illustrates the invention seen in plan view with the sensor assembly schematically represented.

Figure 4 illustrates the invention in schematic section.

Figures 5 and 6 schematically illustrate the invention in two different operating conditions.

Figures 6 and 7 illustrate the invention of figures 1 and 2 in a different configuration.

[0028] The figures show the opening of a door area 1, where the door has two sliding leaves 21, 22 sliding on suitable guides (not shown).

[0029] Each of the two leaves is connected by means of a cogged belt, respectively 23 and 24, moved by a pulley, respectively 25 and 26, activated by an electric gear reducer 27 and 28 having two rotation directions.

[0030] The two electric motors are powered via two logic circuits respectively 3 and 4 that receive the signals of two series of sensors, respectively, the motion sensors A_x and the presence sensors B_x (schematically figures 5 and 6). The tread surface in front of the area is sub-divided into two areas M and P, respectively a movement area and a presence area (figure 3).

[0031] Each of these areas is sub-divided into ten adjacent zones, respectively, M_1 and $M_{10} \dots P_1 \dots P_{10}$.

[0032] Each zone $M_1 \dots M_{10}$ is monitored by a specific motion sensor $A_1 \dots A_{10}$, and each zone $P_1 \dots P_{10}$ is monitored by a specific presence sensor $B_1 \dots B_{10}$ (figure 6).

[0033] The sensors $A_1 \dots A_{10}$ and $B_1 \dots B_{10}$ send their signals to the logic circuits 3 and 4.

[0034] The logic circuits 3 and 4 are not described in detail since they can be easily realized by a person skilled

in the sector.

[0035] The logic circuits 3 and 4 are configured such that on receiving the signal of a sensor $A_1 \dots A_{10}$ they power the motor of the leaf relating to the area in front of the sensor, moving it in the opening direction, and the power supply is interrupted when the door has opened the leaf area serving the area in front of the zone $M_1 \dots M_{10}$ of the respective sensor.

[0036] After a predetermined time, the motor is set in motion in the opposite direction unless one of the safety sensors $B_1 \dots B_{10}$ has been activated, which causes the motor to stop in the closing direction of the respective leaf. Sensors A_3 and A_4 are active in the configuration of figure 5, while all the other sensors are inactive.

[0037] In the configuration of figure 6 sensors A_3 A_5 A_6 A_7 B_4 and B_8 are active, while all the others are inactive.

[0038] Figures 7 and 8 illustrate the invention in a different configuration and, more precisely, the two leaves are drawn by a single cogged belt 23 moved by means of a pulley 25 and powered by an electric gear reducer 27 in two rotation directions.

[0039] The operating principle remains the same with the only difference that the partial opening of the two panels is symmetrical, being controlled by a single motor.

[0040] It is understood that the invention is not limited to the examples described above, and that variants and improvements can be made thereto without forsaking the scope of the appended claims.

Claims

1. A method for opening an automatic two-leaf door comprising a movement area interesting all of a width of a door area, and a presence area which interests all of a width of the door area and is located between the door and the movement area, which comprises following activities:

- monitoring a presence of persons or things in the areas by means of respective motion and presence sensors;
- collecting a signal from the sensors in order to command opening and closing of the door;
- sub-dividing the movement area into a series of adjacent movement zones ($M_1 \dots M_x$), distributed regularly in a transversal direction to the door area such as to cover all the width of the area;
- sub-dividing the presence area into a series of adjacent presence zones ($P_1 \dots P_x$), distributed regularly in a transversal direction to the door area such as to cover all the width of the area;
- independently monitoring each of the adjacent movement zones ($M_1 \dots M_x$) by means of a specific motion sensor ($A_1 \dots A_x$) exclusively dedicated to monitoring movement of persons or

things in the respective zone;

- independently monitoring each of the adjacent presence zones ($P_1 \dots P_x$) by means of a specific presence sensor ($B_1 \dots B_x$) exclusively dedicated to monitoring a presence of persons or things in the respective zone;

the method being **characterised by**:

- sending the signals of the specific motion sensors (A_1, A_x) to a logic circuit (3, 4) commanding activation of the movement means (23, 24, 25, 26) of at least a leaf of the door such as to cause opening thereof up to involving a whole width occupied by the specific motion sensors ($A_1 \dots A_x$) that have been activated;

- sending the signals of the specific presence sensors (B_1, B_x) to a logic circuit (3, 4) commanding activation of the movement means (23, 24, 25, 26) of at least a leaf of the door such as to inhibit closure thereof.

2. A device for opening, according to the method of claim 1, an automatic two-leaf door, the device comprising at least an electric motor having at least a stator winding, means (23, 24, 25, 26) for transmitting motion from the motor to the leaves of the automatic door, and means for commanding power supply to the stator winding, the device further comprising a first series of motion sensors ($A_1 \dots A_x$) distributed over a whole width of each leaf and a second series of presence sensors ($B_1 \dots B_x$) located between the motion sensors and the respective leaf, the device being **characterised by** a logic circuit (3, 4) receiving the signals of the motion sensors ($A_1 \dots A_x$) such as to command activation of the movement means (23, 24, 25, 26) of at least a leaf of the door such as to cause opening thereof up to involving a whole width occupied by the motion sensors ($A_1 \dots A_x$) that have been activated, the logic circuit (3, 4) further receiving the signals of the presence sensors ($B_1 \dots B_x$) such as to command activation of the movement means (23, 24, 25, 26) of at least a leaf of the door such as to inhibit closure thereof.
3. The device for opening an automatic door as in claim 2, **characterised in that** it comprises an independent activating motor for each leaf.

Patentansprüche

1. Verfahren zum Öffnen einer automatischen Tür mit zwei Türblättern, umfassend einen Bewegungsbereich, der eine gesamte Breite eines Türbereichs einnimmt, und einen Präsenzbereich, der eine gesamte Breite des Türbereichs einnimmt und sich zwischen der Tür und dem Bewegungsbereich befindet, die

folgenden Aktivitäten umfassend:

- Überwachen einer Präsenz von Personen oder Gegenständen in den Bereichen mittels Bewegungs- beziehungsweise Präsenzsensoren,

- Erfassen eines Signals von den Sensoren, um das Öffnen und Schließen der Tür anzuweisen,

- Unterteilen des Bewegungsbereichs in eine Folge benachbarter Bewegungszonen ($M_1 \dots M_x$), die gleichmäßig in einer Querrichtung über den Türbereich verteilt sind, so dass die gesamte Breite des Bereichs abgedeckt wird;

- Unterteilen des Präsenzbereichs in eine Folge benachbarter Präsenzzonen ($P_1 \dots P_x$), die gleichmäßig in einer Querrichtung über den Türbereich verteilt sind, so dass die gesamte Breite des Bereichs abgedeckt wird,

- unabhängiges Überwachen jeder der benachbarten Bewegungszonen ($M_1 \dots M_x$) mittels eines speziellen Bewegungssensors ($A_1 \dots A_x$), der ausschließlich der Überwachung von Bewegungen von Personen oder Gegenständen in der jeweiligen Zone dient,

- unabhängiges Überwachen jeder der benachbarten Präsenzzonen ($P_1 \dots P_x$) mittels eines speziellen Präsenzsensors ($B_1 \dots B_x$), der ausschließlich der Überwachung einer Präsenz von Personen oder Gegenständen in der jeweiligen Zone dient,

wobei das Verfahren **gekennzeichnet ist durch**:

- Senden der Signale der speziellen Bewegungssensoren ($A_1 \dots A_x$) an eine Logikschaltung (3, 4), die die Aktivierung der Bewegungsmittel (23, 24, 25, 26) mindestens eines Blattes der Tür anweist, so dass eine Öffnung bis zu einer gesamten Breite bewirkt wird, die von den speziellen Bewegungssensoren ($A_1 \dots A_x$), die aktiviert wurden, eingenommen wird,

- Senden der Signale der speziellen Präsenzsensoren ($B_1 \dots B_x$) an eine Logikschaltung (3, 4), die die Aktivierung der Bewegungsmittel (23, 24, 25, 26) mindestens eines Blattes der Tür anweist, so dass deren Schließen verhindert wird.

2. Vorrichtung zum Öffnen einer automatischen Tür mit zwei Türblättern gemäß dem Verfahren nach Anspruch 1, wobei die Vorrichtung mindestens einen Elektromotor mit mindestens einer Statorwicklung, Mittel (23, 24, 25, 26) zum Übertragen von Bewegung von dem Motor auf die Blätter der automatischen Tür und Mittel zum Anweisen der Versorgung der Statorwicklung mit Energie umfasst, wobei die Vorrichtung ferner eine erste Folge von Bewegungssensoren ($A_1 \dots A_x$), die über eine gesamte Breite jedes Türblatts verteilt sind, und eine zweite Folge von Präsenzsensoren ($B_1 \dots B_x$), die sich zwischen den

Bewegungssensoren befinden und dem jeweiligen Türblatt befinden, umfasst, wobei die Vorrichtung durch eine Logikschaltung (3, 4) gekennzeichnet ist, die die Signale der Bewegungssensoren ($A_1...A_X$) empfängt, um die Aktivierung der Bewegungsmittel (23, 24, 25, 26) mindestens eines Blattes der Tür anzuweisen, um dessen Öffnen bis zu einer gesamten Breite zu bewirken, die von den Bewegungssensoren ($A_1...A_X$), die aktiviert wurden, eingenommen wird, wobei die Logikschaltung (3, 4) ferner die Signale der Präsenzsensoren ($B_1...B_X$) empfängt, um die Aktivierung der Bewegungsmittel (23, 24, 25, 26) mindestens eines Blattes der Tür derart anzuweisen, dass ein Schließen desselben verhindert wird.

3. Vorrichtung zum Öffnen einer automatischen Tür nach Anspruch 2, **dadurch gekennzeichnet, dass** sie einen unabhängigen Aktivierungsmotor für jedes Türblatt umfasst.

Revendications

1. Méthode d'ouverture d'une porte automatique à deux battants comprenant une zone de mouvement concernant la totalité d'une largeur d'une zone de porte et une zone de présence qui concerne la totalité d'une largeur de la zone de porte et qui est située entre la zone de mouvement et la zone de porte, qui comprend les activités suivantes :

- la surveillance d'une présence de personnes ou d'éléments dans les zones au moyen de capteurs de mouvement et de présence respectifs ;
- la réception d'un signal envoyé par les capteurs afin de commander l'ouverture et la fermeture de la porte ;
- la subdivision de la zone de mouvement en une série de zones de mouvement adjacentes ($M_1... M_X$), réparties régulièrement dans une direction transversale vers la zone de porte afin de couvrir toute la largeur de la zone ;
- la subdivision de la zone de présence en une série de zones de présence adjacentes ($P_1... P_X$), réparties régulièrement dans une direction transversale vers la zone de porte afin de couvrir toute la largeur de la zone ;
- la surveillance indépendante de chacune des zones de mouvement adjacentes ($M_1... M_X$) au moyen d'un capteur de mouvement spécifique ($A_1... A_X$) exclusivement dédié à la surveillance de mouvement de personnes ou d'éléments dans la zone respective ;
- la surveillance indépendante de chacune des zones de présence adjacentes ($P_1... P_X$) au moyen d'un capteur de présence spécifique ($B_1... B_X$) exclusivement dédié à la surveillance d'une présence de personnes ou d'éléments

dans la zone respective ;

la méthode étant **caractérisée par** :

- l'envoi des signaux des capteurs de mouvement spécifiques (A_1, A_X) à un circuit logique (3, 4) commandant l'activation des moyens de mouvement (23, 24, 25, 26) d'au moins un battant de la porte de façon à ouvrir ce dernier sur toute une largeur occupée par les capteurs de mouvement spécifiques ($A_1... A_X$) qui ont été activés ;
- l'envoi des signaux des capteurs de présence spécifiques (B_1, B_X) à un circuit logique (3, 4) commandant l'activation des moyens de mouvement (23, 24, 25, 26) d'au moins un battant de la porte de façon à empêcher la fermeture de ce dernier ;

2. Dispositif pour l'ouverture, selon la méthode de la revendication 1, d'une porte automatique à deux battants, le dispositif comprenant au moins un moteur électrique possédant au moins un enroulement statorique, des moyens (23, 24, 25, 26) pour la transmission du mouvement du moteur jusqu'aux battants de la porte automatique et des moyens pour commander l'alimentation de l'enroulement statorique, le dispositif comprenant également une première série de capteurs de mouvement ($A_1... A_X$) répartie sur toute une largeur de chaque battant et une seconde série de capteurs de présence ($B_1... B_X$) située entre les capteurs de mouvement et le battant respectif, le dispositif étant **caractérisé par** un circuit logique (3, 4) recevant les signaux des capteurs de mouvement ($A_1... A_X$) afin de commander l'activation des moyens de mouvement (23, 24, 25, 26) d'au moins un battant de la porte automatique afin de provoquer l'ouverture de ce dernier sur toute une largeur occupée par les capteurs de mouvement spécifiques ($A_1... A_X$) qui ont été activés, le circuit logique (3, 4) recevant également les signaux des capteurs de présence ($B_1... B_X$) afin de commander l'activation des moyens de mouvement (23, 24, 25, 26) d'au moins un battant de la porte de façon à empêcher la fermeture de ce dernier.
3. Dispositif pour l'ouverture d'une porte automatique selon la revendication 2, **caractérisé en ce qu'il** comprend un moteur d'activation indépendant pour chaque battant.

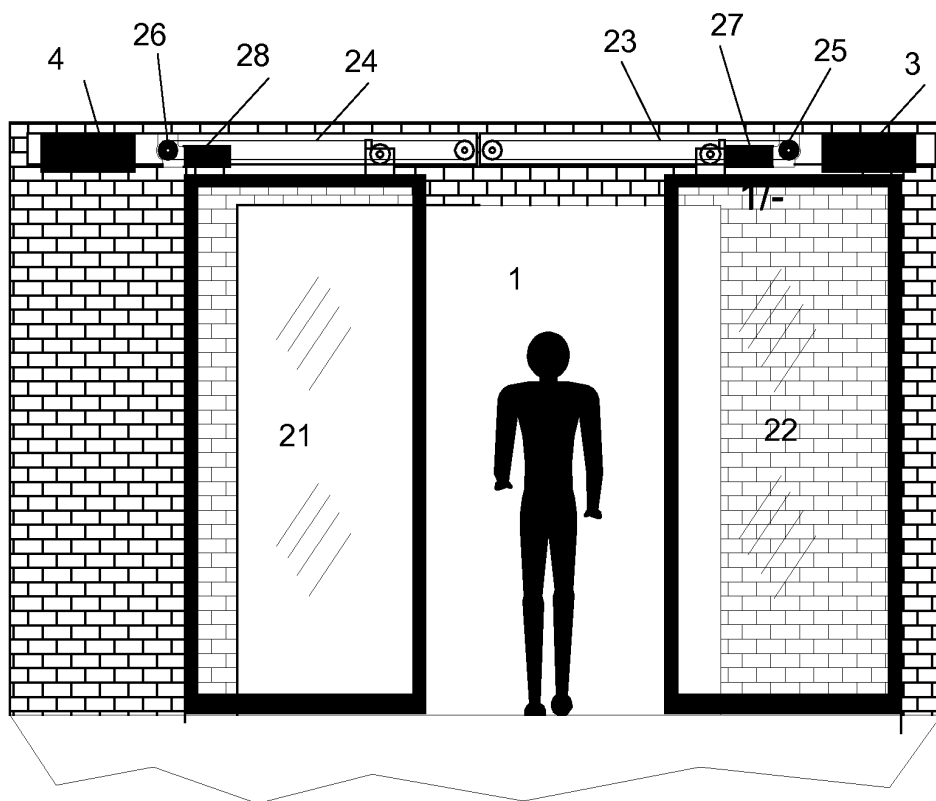


Fig.1

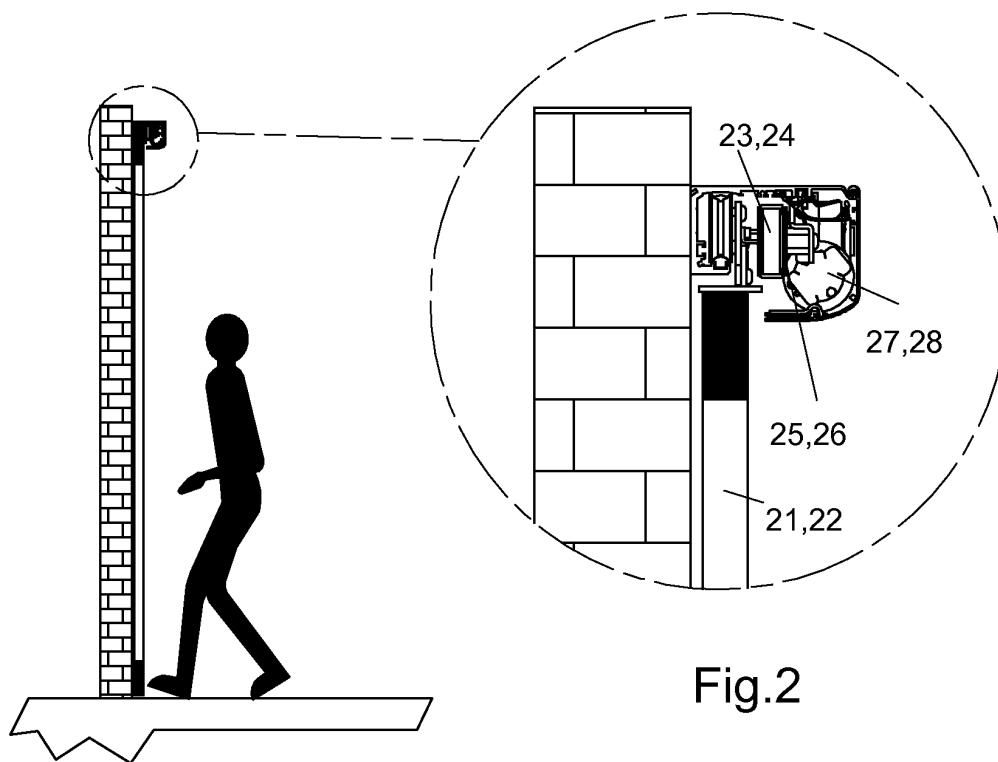


Fig.2

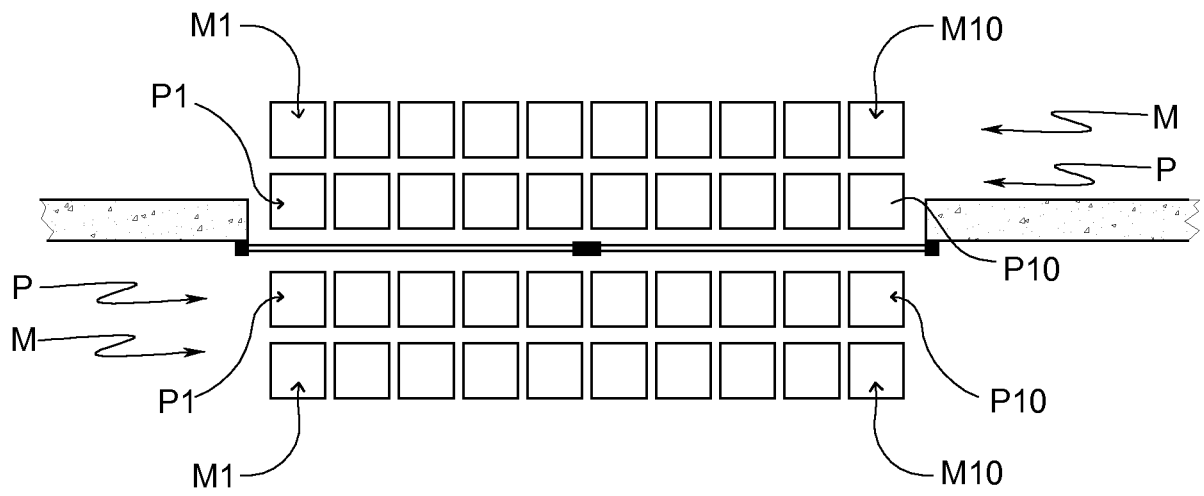


Fig.3

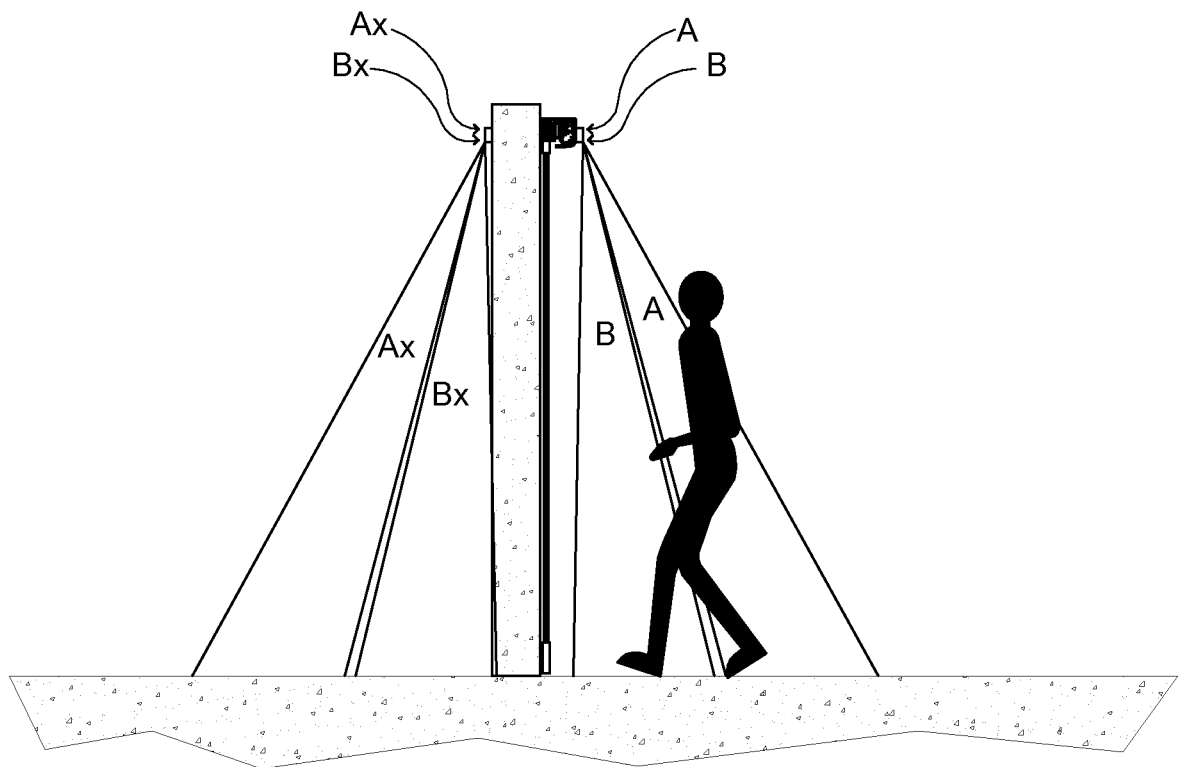
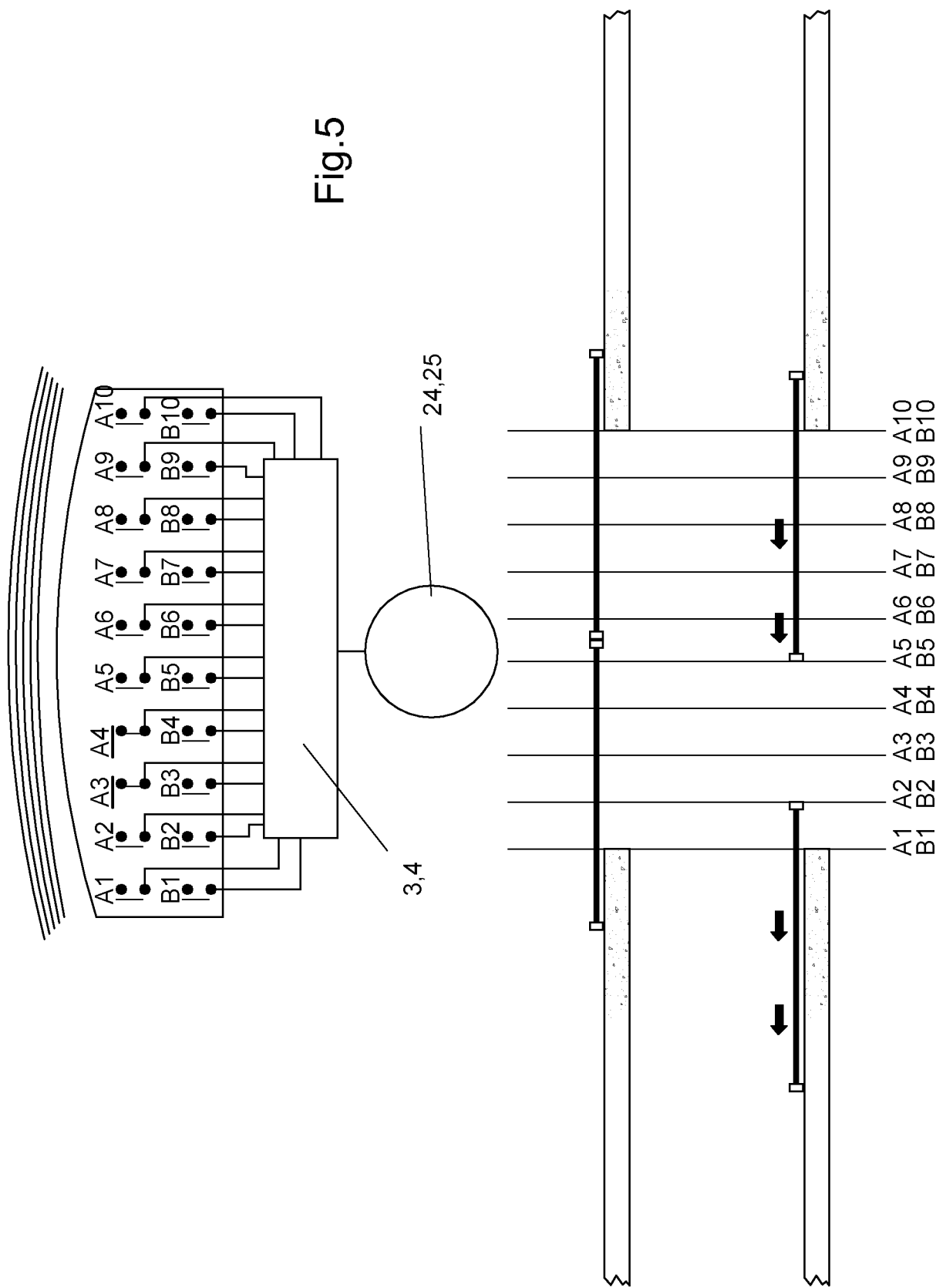
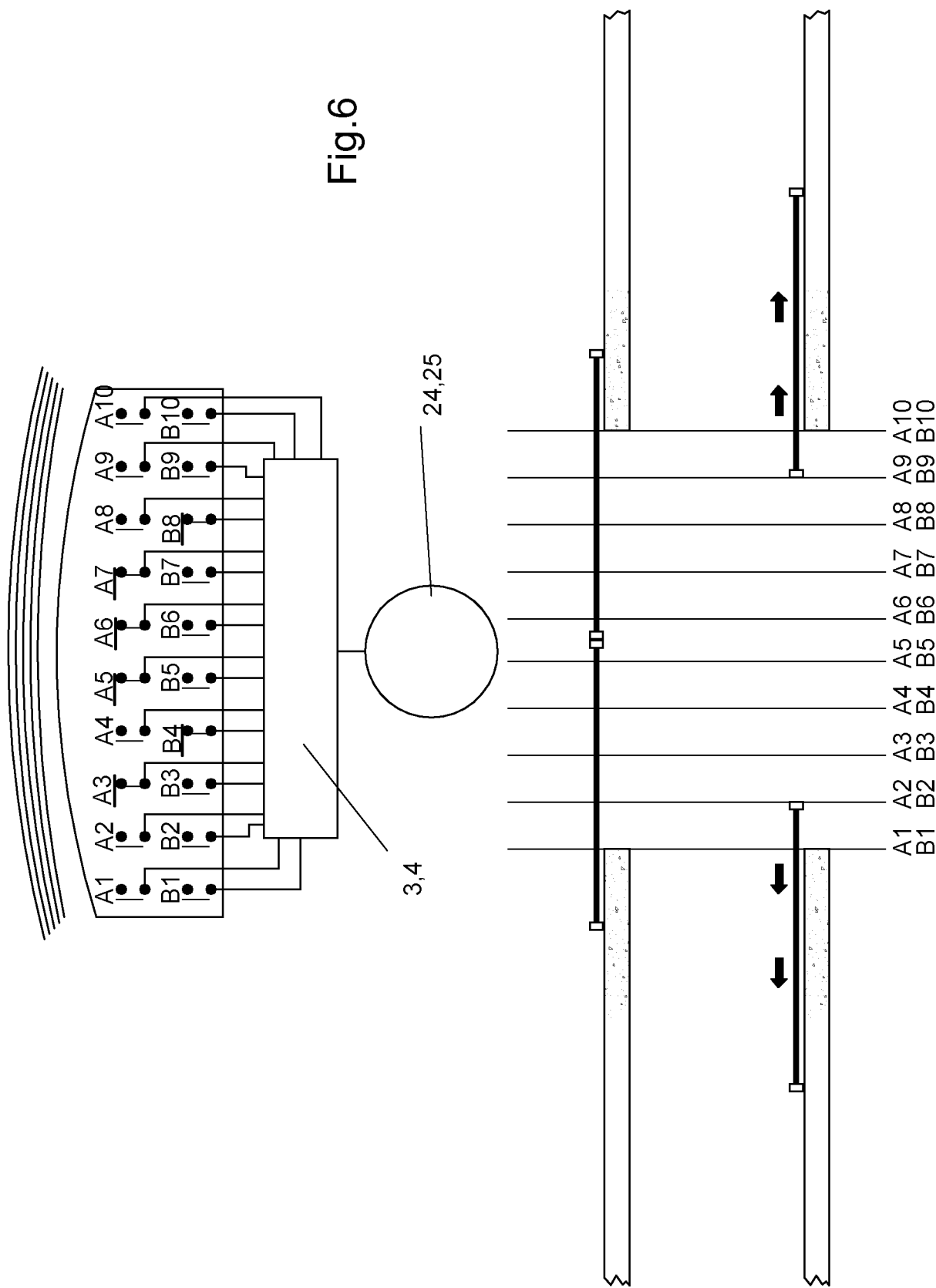


Fig.4





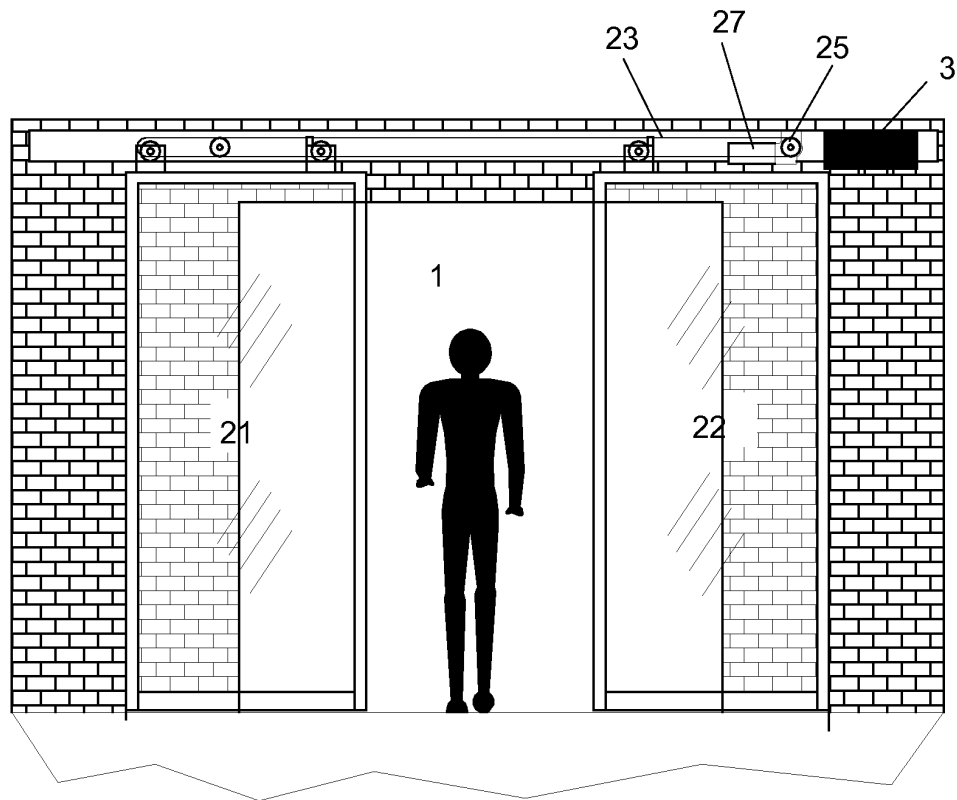


Fig.7

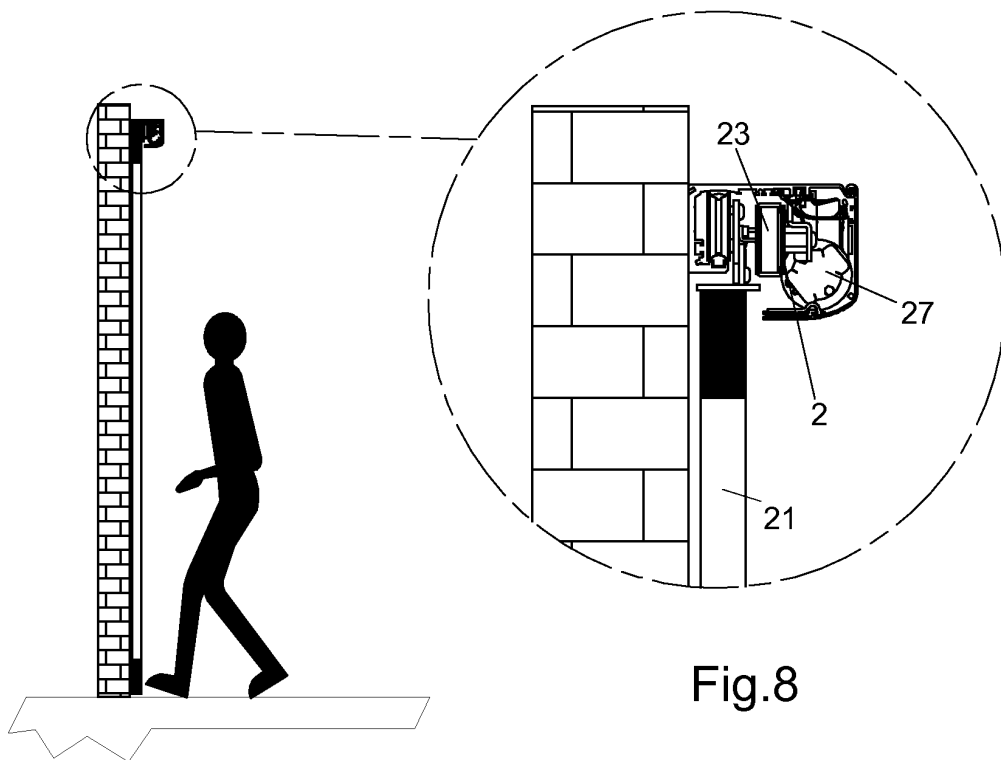


Fig.8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1619342 A1 [0007]