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(54) **Door for accesses of elevator apparatuses, elevator apparatus and method for operating said door**

(57) The invention relates to a door for accesses of elevator apparatuses, elevator apparatus and method for operating said door, which allows improving the efficiency of the space occupied by the elevator apparatus, improving its ergonomics and safety, comprising at least two leaves (1, 1') configured to move between a closed position, in which said leaves (1, 1') close an access (2, 3) of the elevator apparatus, said leaves (1, 1') being opposed at their side edges (4) and said side edges (4)

being flush with one another, and an open position, in which said access (2, 3) is open, said leaves (1, 1') being opposed at their faces (5). The method for operating said door between the closed position and the open position comprises a first phase in which the leaves (1, 1') move without relative movement and being laterally connected to one another; and a second phase in which the leaves (1, 1') move with relative movement and being laterally disconnected from one another.

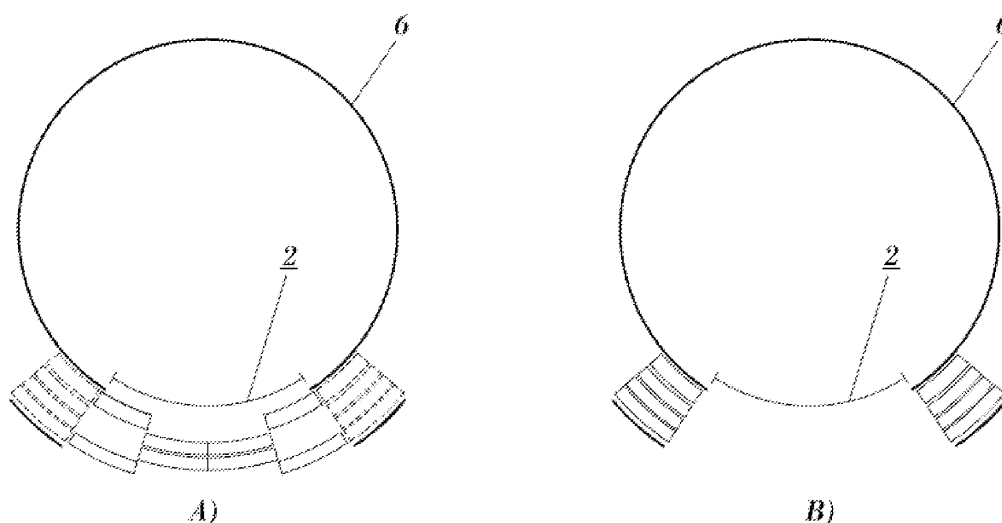


FIG. 2

Description

Technical Field of the Invention

[0001] The present invention has an application in the industry of elevator apparatuses, and more specifically in the field of access systems for accessing cars of elevator apparatuses, allowing increasing the efficiency of the space occupied by the elevator apparatus, particularly allowing increasing the free surface of the floor of a car of the elevator apparatus, allowing the use of said free surface for the occupation and transport of the users and/or loads, likewise allowing improving the safety and ergonomics of the users of the elevator apparatus.

Background of the Invention

[0002] The access system for accessing a car of an elevator apparatus comprises at least one car door, each one being arranged for each access or entrance which said car has, and at least two floor doors, at least one floor door being arranged for each story, floor or landing of the building.

[0003] There are currently various types of doors, each of which has its own features. Two types of doors can essentially be distinguished, which are car doors and floor, story or landing doors. Currently, depending on their mode of operation, manual, semiautomatic and automatic doors are distinguished, semiautomatic door being understood as that in which the car door is automatic and the floor door is manual.

[0004] Usually, in automatic operation doors, the door opening and closing operation system is located in the car door, such that said car door is what acts on the floor door by means of a coupling mechanism, when both the floor and car doors are leveled.

[0005] Said automatic operation system, causing the automatic opening and closing of the doors, comprises mechanisms coupled to an electric motor which is connected to a maneuver control module of the elevator apparatus. When the car stops and is leveled in a certain floor, the maneuver control module operates the electric motor causing the opening of the car doors and the corresponding floor doors, likewise causing the closing thereof before the car resumes its movement.

[0006] The currently most used doors are automatic doors with horizontal sliding, also called sliding doors, which are usually formed as telescopic doors comprising a plurality of leaves, usually two leaves per door, which move in one and the same vertical plane, being opposed and stacked, at least partially overlapped, in parallel vertical planes when they are in the open position, as depicted in view B of Figure 1, the closed position having been depicted in view A. Figure 2 shows a currently existing telescopic door comprising leaves with a cylindrical configuration, the closed position having been depicted in view A and the open position in view B.

[0007] One of the drawbacks of these doors, as can

be graphically seen in said Figures 1 and 2 is that a certain space between the floor door and the car door is not wasted when the leaves are in the extended position, i.e., in the closed position.

[0008] A second drawback is that the leaves of each door have one or several successive steps, which do not form a single plane, which is inconvenient for the users when occupying the inner space of the car, reduces the space available for the users, decreases the ergonomics thereof and affects the aesthetics of both the elevator and of the floors of the building.

[0009] A third drawback, arising from the previous one, i.e., it occurs as a result of said steps, is that it negatively affects the safety of the users, since during the trajectory of the leaves of each door during the door closing and opening maneuvers, there is the risk of a user being trapped since the introduction of, for example, the fingers of the hands of the users between the small free gaps remaining between the leaves of each door, at the height of the steps, is possible. The safety regulations in force for the construction and installation of elevators UNE-EN 81-1 establishes maximum operative clearances between said small gaps or grooves of the leaves of the doors.

[0010] All of this negatively affects the concept of the efficiency of the space of the elevator apparatus, since a certain space of the floor of the car and of the building is required for the arrangement of the doors, which limits the space available for the occupation and the transport of users and objects.

[0011] A partial solution for minimizing the problem set forth above is described in European patent application number EP-1449802-A1, which describes an access system by means of telescopic doors, in which the number of leaves comprised in the car door is different from the number of leaves comprised by the floor door, all of this for the purpose of making flexible and optimizing the floor space of the elevator shaft occupied by the different components of the elevator, such as the car, the counterweight, the car door and the floor doors.

[0012] Likewise, in international application number WO-2004108580-A1 it can be seen how this problem also affects a telescopic arrangement in which the trajectory of the leaves is curvilinear, for cases of doors with cylindrical leaves, instead of planar leaves, having the same drawbacks as in the case of planar leaves, as they have been set forth above.

Description of the Invention

[0013] A first aspect of the present invention relates to a door for accesses of elevator apparatuses, which allows increasing the efficiency of the space occupied by the elevator apparatus, specifically allowing increasing the surface of the floor of a car of the elevator apparatus which is freed up for being occupied, housing and transporting users and/or loads, likewise allowing improving the ergonomics and the safety conditions of said users.

[0014] The door for accesses of elevator apparatuses proposed by the invention comprises at least two leaves which are configured to move between a closed position, in which said leaves close an access, either to a car or to a floor, of the elevator apparatus, and an open position, in which said access is at least partially open.

[0015] According to the invention, in the closed position the leaves are opposed at their side edges, said side edges being leveled, i.e., flush with one another, such that their faces are extended according to a straight line or a line of constant curvature, being at the same height or level and without there being a step between both leaves. On the other hand, according to the invention, in the open position said leaves are opposed and at least partially overlapped at their faces, without having to be in contact at said faces.

[0016] Likewise, the invention allows a decrease in the risk of a user experiencing injuries, especially in his or her fingers, given that the door lacks a step between leaves when it is in the closed position and during part of the trajectory of the leaves during the opening and the closing thereof.

[0017] The door of the invention is extremely versatile, allowing its incorporation in any type of elevator apparatus, in addition to improving the aesthetics and ergonomics thereof due to the absence of a step between the leaves of the doors when they are in the closed position and during most of the movement of the leaves in the opening and closing operations, with the gain of space that this entails.

[0018] The possibility is contemplated, according to an embodiment of the door of the invention, that the leaves are substantially planar surfaces and that in the closed position said leaves are substantially located in one and the same plane, i.e., they are coplanar, whereas in the open position said leaves are located in different planes. It is likewise contemplated that in the open position the leaves are located in at least two parallel planes.

[0019] On the other hand, according to an embodiment variant of the invention, it is contemplated that the leaves are substantially cylindrical surfaces and that in the closed position the leaves are substantially located in a cylindrical surface, whereas in the open position said leaves are located in different cylindrical surfaces, such that their horizontal edges are extended according to a line of constant curvature. It is likewise contemplated that in the open position said leaves are located in at least two substantially equidistant cylindrical surfaces.

[0020] The possibility is contemplated that the leaves are configured to move without relative movement and being laterally connected to one another during a first section of the path between the closed and open positions, said leaves being configured to move with relative movement and being laterally connected to one another during a second section of said path.

[0021] On the other hand, it is also contemplated that the leaves are configured to move without relative movement and being laterally connected to one another during

an intermediate section located between the first and the second section of said path.

[0022] Likewise, the possibility is contemplated that the door of the invention comprises guiding means configured to guide the movement of the leaves indistinctly between the closed position and the open position, said guiding means comprising at least one rail comprising a straight section and a non-straight section.

[0023] A second aspect of the invention relates to an elevator apparatus comprising at least one car comprising at least one car access, said at least one car being arranged to move through an elevator shaft comprising at least two floor accesses located at a different level, such that said elevator apparatus comprises at least one door such as the one described above.

[0024] Finally, a third aspect of the invention relates to a method for operating a door such as the one described above, between a closed position, in which at least two leaves close an access of the elevator apparatus, and an open position, in which said access is at least partially open.

[0025] According to the invention, the method comprises the following phases:

- a first phase in which said at least two leaves move without relative movement and being laterally connected to one another; and
- a second phase in which said at least two leaves move with relative movement and being laterally disconnected from one another.

Description of the Drawings

[0026] To complement the description which is being made and for the purpose of aiding to better understand the features of the invention according to a preferred practical embodiment thereof, a set of drawings is attached as an integral part of said description, in which the following has been depicted with an illustrative and non-limiting character:

Figure 1 shows two schematic views of an elevator apparatus of the state of the art, being able to see its access system comprising telescopic car and floor doors, said doors having been depicted in a closed position in a view A, whereas said doors have been depicted in an open position in view B.

Figure 2 shows two schematic views of an elevator apparatus of the state of the art, like that of the previous figure, being able to see its access system comprising telescopic car and floor doors with a cylindrical configuration, said doors having been likewise depicted in a closed position in a view A, whereas said doors have been depicted in an open position in view B.

Figure 3 shows a schematic plan view in which an embodiment of the door for accesses of elevator apparatuses proposed by the invention can be seen,

having been depicted in a closed position.

Figure 4 shows a schematic plan view of the door depicted in Figure 3 in any one position during the first phase between the closed position and an open position, in which the leaves move without relative movement and being laterally connected to one another.

Figure 5 shows a schematic plan view of the door depicted in Figure 3 in any one position during the second phase between the closed position and the open position, in which the leaves move with relative movement and being laterally disconnected from one another.

Figure 6 shows a schematic plan view of the door depicted in Figure 3, having been depicted in the open position.

Figure 7 shows a schematic plan view, like that of Figure 3, of an embodiment variant of the door of invention comprising cylindrical leaves, having been depicted in the closed position.

Figure 8 shows a schematic plan view of the door depicted in Figure 7, having been depicted in the open position.

Preferred Embodiment of the Invention

[0027] In view of the indicated figures, it can be observed how in one of the possible embodiments of the invention the door for accesses of elevator apparatuses proposed by the invention comprises a car door comprising two leaves (1, 1') configured to move between a closed position, depicted in Figures 3 and 7, in which the leaves (1, 1') close a car access (2) of the elevator apparatus, and an open position, depicted in Figures 6 and 8, in which said car access (2) is open.

[0028] On the other hand, the access of the elevator apparatus comprises a floor door comprising two leaves (1, 1') configured to move between a closed position, in which the leaves (1, 1') close a floor access (3) of the elevator apparatus, and an open position, in which said floor access (3) is open.

[0029] As can be seen in the figures, in the closed position the leaves (1, 1') corresponding to each door are opposed at their side edges (4), said side edges (4) being flush with one another, whereas in the open position said leaves (1, 1') of one and the same door are opposed and overlapped at their faces (5).

[0030] Figures 3 to 6 show an embodiment of the door of the invention, in which the leaves (1, 1') are planar surfaces which in the closed position are located in one and the same plane, whereas in the open position said leaves (1, 1') are located in two parallel planes.

[0031] On the other hand, Figures 7 and 8 show an embodiment variant of the door of the invention, in which the leaves (1, 1') are cylindrical surfaces which in the closed position are located in a cylindrical surface, whereas in the open position said leaves (1, 1') are located in two equidistant cylindrical surfaces, such that

their horizontal edges are extended according to a line of constant curvature.

[0032] It is contemplated that the leaves (1, 1') of the doors can adopt any other configuration with a shape different from those described above, i.e., planar and cylindrical, within the object of the invention.

[0033] As has been schematically depicted in the sequence corresponding to Figures 3 and 4, the leaves (1, 1') of a door are configured to move without relative movement and being laterally connected to one another during a first section of the path between the close and open positions, said leaves (1, 1') being configured to move with relative movement and being laterally disconnected from one another during a second section of said path.

[0034] On the other hand, the leaves (1, 1') are configured to move without relative movement and being laterally connected to one another during an intermediate section located between the first and second section of said path.

[0035] According to a preferred embodiment of the invention, depicted in Figures 3 to 6, the door comprises guiding means, not shown, configured to guide the movement of the leaves (1, 1') indistinctly between the closed position and the open position, said guiding means comprising at least one rail comprising a straight section and a non-straight section, such that the first section of the path of the leaves (1, 1') between the closed position and the open position is comprised in the straight section of the guiding means, whereas the intermediate section of said path corresponds to the non-linear section of said guiding means.

[0036] On the other hand, according to the embodiment depicted in Figures 7 and 8, it is contemplated that the guiding means comprise at least one rail comprising at least two sections with different curvature.

[0037] Additionally, for any of the previously described embodiments, it is contemplated that the guiding system comprises independent rails for each leaf of one and the same door, the trajectory of each leaf being determined by said rail. It is also contemplated that a part of a rail is common for at least two leaves.

[0038] Likewise, each door comprises a driving leaf (1) and a driven leaf (1') configured to be moved by the driving leaf (1) when they are connected, such that the car door is operated jointly in collaboration with the corresponding floor door by means of conventional couplings for elevator doors, said driven leaf (1') being a slave of the driving leaf (1) and being guided in folded profiles of the guiding system, such that upon reaching the end of its path towards the open position, the driven leaf (1') moves away from the trajectory of the driving leaf (1) and both leaves (1, 1') are stacked at their faces (5).

[0039] The connection between the leaves (1, 1') of a door is carried out by means of conventional attachment means available in the state of the art, not shown, configured to laterally connect said leaves (1, 1') to one another during said first section of the path and laterally

disconnect said leaves (1, 1') from one another during the second section of the path. For example, a leaf (1, 1') is joined to the other leaf (1, 1') by means of a mechanical mechanism which can consist of a rotating part serving to be able to guide and at the same time attach the driven leaf (1') with respect to the driving leaf (1) in a position whereas once rotated by an operation which releases and disconnects the driven leaf (1') once the first section of the path has ended. However, the attachment means can consist of electromechanical or electromagnetic elements, for example electromagnets which connect and disconnect the leaves (1, 1') controlled by a control unit.

[0040] A second aspect of the invention relates to an elevator apparatus comprising a car (6) comprising a car access (2), said car (6) being arranged to move through an elevator shaft (7) comprising at least two floor accesses (3) located at a different level, such that said elevator apparatus comprises a door such as the one described above which is located in said car access (2) and floor accesses (3).

[0041] In view of this description and set of drawings, the person skilled in the art will understand that the embodiments of the invention which have been described can be combined in multiple ways within the object of the invention. The invention has been described according to several preferred embodiments thereof, but it will be evident for the person skilled in the art that multiple variations can be introduced in said preferred embodiments without exceeding the object of the claimed invention.

Claims

1. Door for accesses of elevator apparatuses, comprising at least two leaves (1, 1') configured to move between a closed position, in which said leaves (1, 1') close an access (2, 3) of the elevator apparatus, and an open position, in which said access (2, 3) is at least partially open, **characterized in that** in the closed position the leaves (1, 1') are opposed at their side edges (4), said side edges (4) being flush with one another, whereas in the open position said leaves (1, 1') are opposed and at least partially overlapped at their faces (5).
2. Door for accesses of elevator apparatuses according to claim 1, **characterized in that** the leaves (1, 1') are substantially planar surfaces and in the closed position said leaves (1, 1') are substantially located in one and the same plane, whereas in the open position said leaves (1, 1') are located in different planes.
3. Door for accesses of elevator apparatuses according to claim 2, **characterized in that** in the open position said leaves (1, 1') are located in at least two parallel planes.
4. Door for accesses of elevator apparatuses according to claim 1, **characterized in that** the leaves (1, 1') are substantially cylindrical surfaces and in the closed position the leaves (1, 1') are substantially located in a cylindrical surface, whereas in the open position said leaves (1, 1') are located in different cylindrical surfaces.
5. Door for accesses of elevator apparatuses according to claim 4, **characterized in that** in the open position said leaves (1, 1') are located in at least two substantially equidistant cylindrical surfaces.
6. Door for accesses of elevator apparatuses according to any of the previous claims, **characterized in that** the leaves (1, 1') are configured to move without relative movement and being laterally connected to one another during a first section of the path between the closed and open positions, said leaves (1, 1') being configured to move with relative movement and being laterally disconnected from one another during a second section of said path.
7. Door for accesses of elevator apparatuses according to claim 6, **characterized in that** the leaves (1, 1') are configured to move without relative movement and being laterally connected to one another during an intermediate section located between the first and second section of said path.
8. Door for accesses of elevator apparatuses according to any of claims 1 to 3, **characterized in that** it comprises guiding means configured to guide the movement of the leaves (1, 1') indistinctly between the closed position and the open position, said guiding means comprising at least one rail comprising a straight section and a non-straight section.
9. Door for accesses of elevator apparatuses according to any of the previous claims, **characterized in that** it comprises at least one driving leaf (1) and at least one driven leaf (1') configured to be moved by said at least one driving leaf (1) when they are connected.
10. Door for accesses of elevator apparatuses according to any of claims 6 to 9, **characterized in that** the connection between said at least two leaves (1, 1') is carried out by means of attachment means configured to laterally connect said leaves (1, 1') to one another during said first section of the path and laterally disconnected said leaves (1, 1') from one another during the second section of the path.
11. Elevator apparatus comprising at least one car (6) comprising at least one car access (2), said at least one car (6) being arranged to move through an elevator shaft (7) comprising at least two floor accesses

(3) located at a different level, **characterized in that** it comprises at least one door according to any of claims 1 to 10.

12. Elevator apparatus according to claim 11, **characterized in that** at least one door is located in said at least one car access (2). 5
13. Elevator apparatus according to any of claims 11 and 12, **characterized in that** at least one door is located in a floor access (3). 10
14. Method for operating a door according to any of claims 1 to 10 between a closed position, in which at least two leaves (1, 1') close an access (2, 3) of the elevator apparatus, and an open position, in which said access (2, 3) is at least partially open, **characterized in that** it comprises the following phases: 15
- 20
- a first phase in which said at least two leaves (1, 1') move without relative movement and being laterally connected to one another; and
 - a second phase in which said at least two leaves (1, 1') move with relative movement and being laterally disconnected from one another. 25

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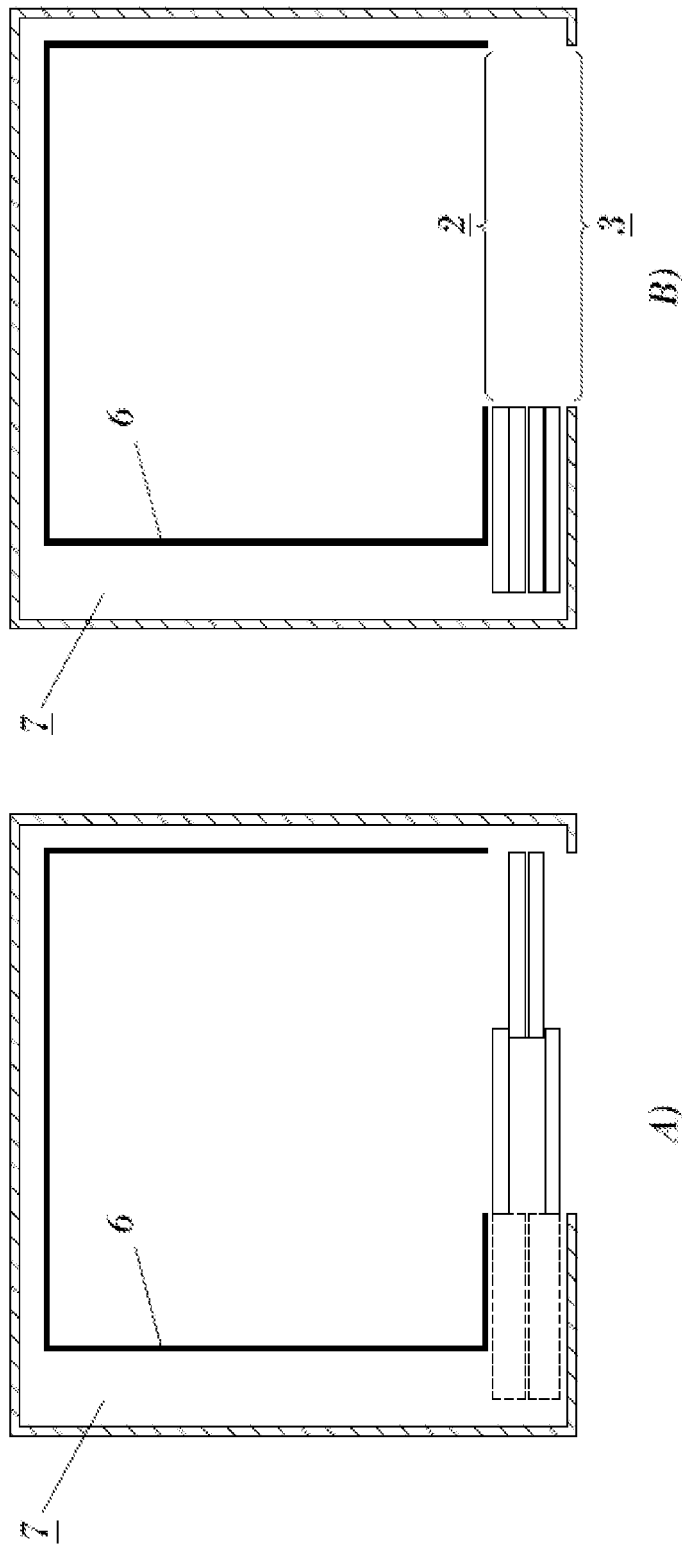


FIG. 1

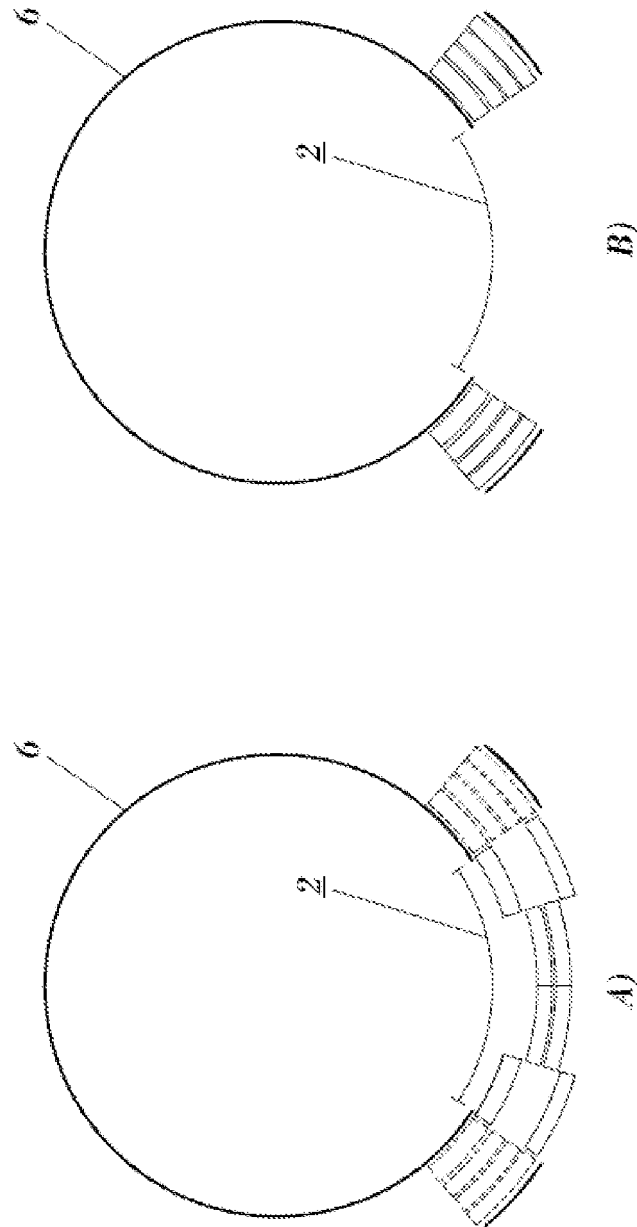


FIG. 2

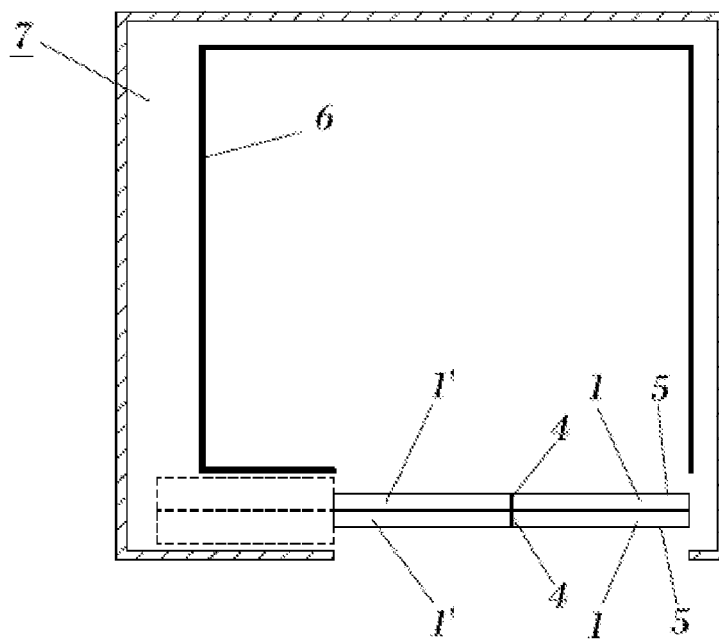


FIG. 3

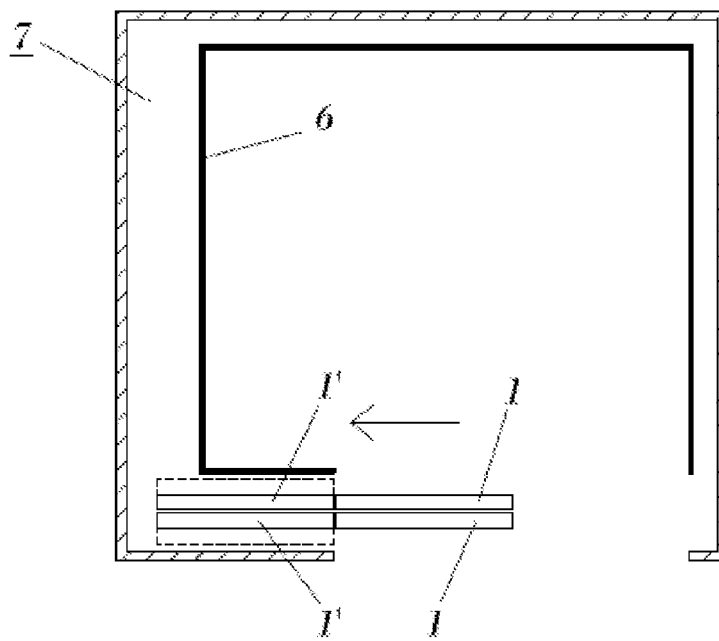


FIG. 4

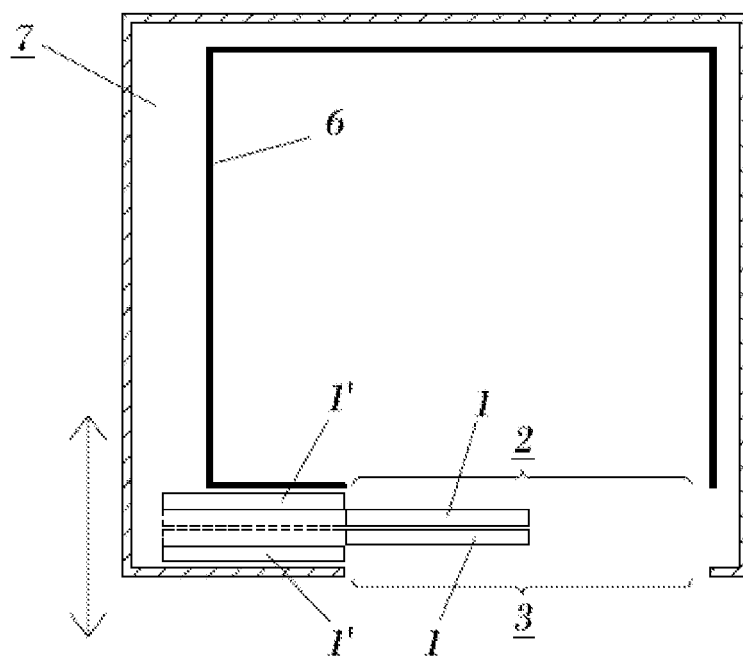


FIG. 5

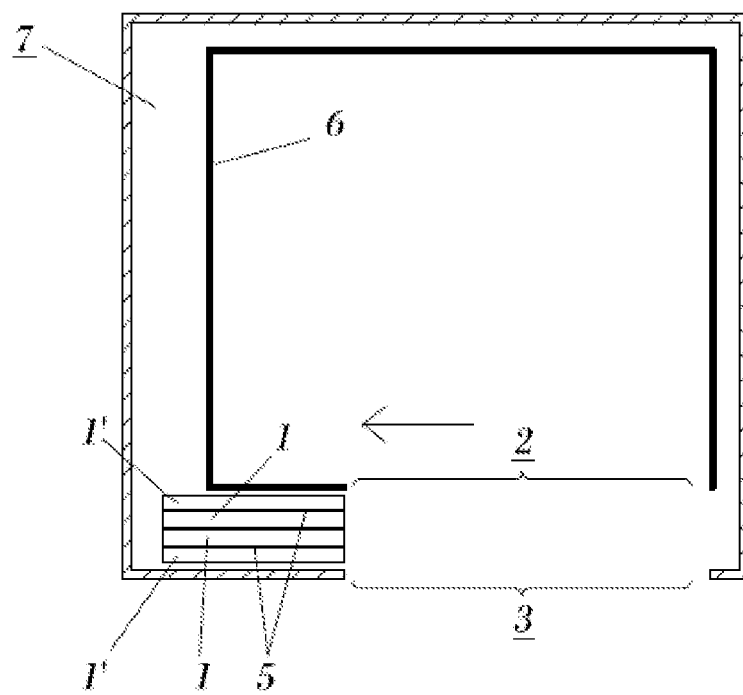


FIG. 6

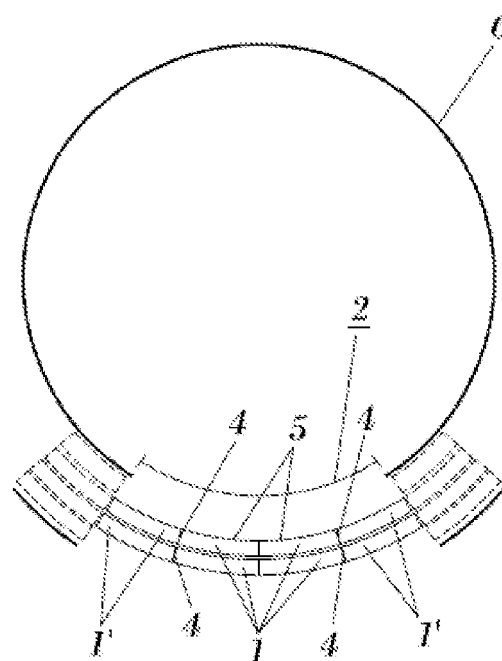


FIG. 7

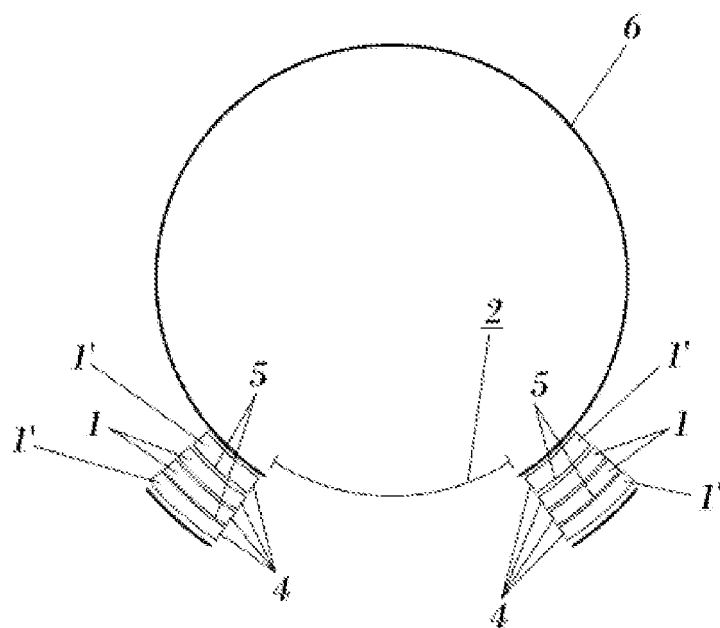


FIG. 8



EUROPEAN SEARCH REPORT

Application Number
EP 09 38 2289

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	* figures 1,2 *	4-8,14	
X	US H 1362 H (HERRMANN WALTER J [US] ET AL) 4 October 1994 (1994-10-04)	1-3, 10-13	
A	* abstract * * column 2, line 32 - column 2, line 44 * * figure 1 *	4-9,14	
A	EP 1 449 802 A1 (INVENTIO AG [CH]) 25 August 2004 (2004-08-25)	1-14	TECHNICAL FIELDS SEARCHED (IPC)
A	* abstract * * figures 1-7 *		
A	WO 2004/108580 A1 (WITTUR S P A [IT]; GIORGIONI PAOLO [IT]) 16 December 2004 (2004-12-16)	1-14	B66B
	* abstract * * figure 1 *		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 March 2010	Examiner Oosterom, Marcel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 38 2289

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The members are as contained in the European Patent Office EDP file on
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18-03-2010

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REFERENCES CITED IN THE DESCRIPTION

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