(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 495 208 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
05.09.2012 Bulletin 2012/36

(51) Int Cl.:
B66B 9/04 *(2006.01)*

(21) Application number: **11156386.2**

(22) Date of filing: **01.03.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(54) Lift system

(57) The invention regards a lift system for elevation of persons or goods, comprising elevation means and a cabin that at least at times can move in a vertical direction and be positioned at different vertical positions, the cabin comprises an outer surface with a bottom defining a footprint for the cabin and an inner compartment with a floor, the footprint comprises an inner area where the footprint and the floor overlaps and an outer area where the footprint and the floor does not overlap, the elevation means comprises at least one lifting column, which is able to move the cabin in the vertical direction wherein the at least one lifting column penetrate the bottom of the outer area.

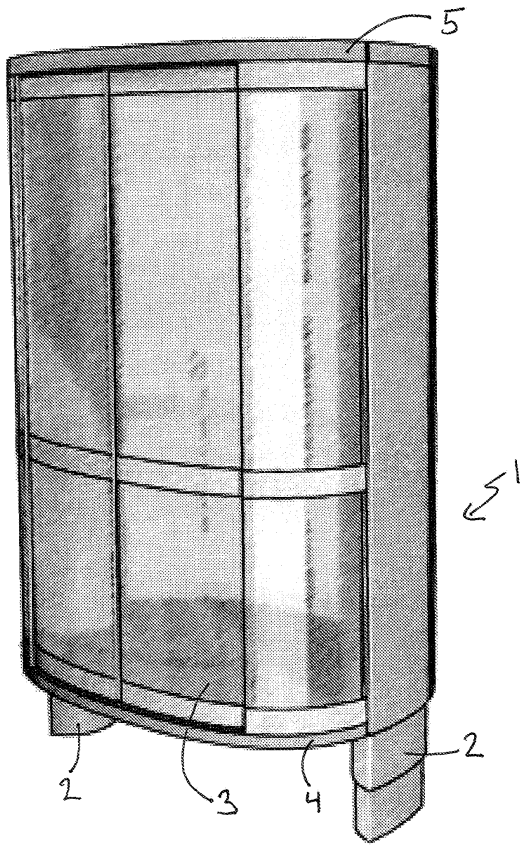

Fig 1

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Description

Field of invention

[0001] The invention relates to a lift system for elevation of persons or goods.

Background of the Invention

[0002] Lift or elevator systems are normally used as a vertical transportation means for moving people and goods, for example between floors in a building. Lifts are conventionally positioned in shafts and are guided by rails that span the entire shaft and powered by a motor that drive a traction cable. These lift systems are required to have some part of the system positioned at the highest point reachable for the lift. That can be the motor itself or a pulley which is used to change the direction of the traction cable that connects the motor and the cabin.

[0003] Lifts used for persons requires measures ensuring the security of the persons. Accordingly, making sure, that in case of a malfunction the lift does not fall to the ground and cause injury. This can be ensured by emergency breaks on the cabin, which breaks against the rails or a break on the traction cable. It is usually preferred that a lift system has means which will enable persons to leave the lift in case of a malfunction.

Summary of the invention

[0004] Considering the prior art described above, it is an object of the present invention to provide a lift system wherein there are no requirements for parts of the system to be positioned at a substantially greater height than the cabin.

[0005] The object can be achieved by means of a lift system for elevation of persons or goods, comprising elevation means and a cabin that at least at times can move in a vertical direction and be positioned at different vertical positions, the cabin comprises an outer surface with a bottom area defining a footprint for the cabin and an inner compartment with a floor, the footprint comprises an inner area where the footprint and the floor overlaps, and an outer area where the footprint and the floor does not overlap, the elevation means comprises at least one lifting column, which is able to move the cabin in the vertical direction wherein the at least one lifting column penetrate the bottom of the outer area.

[0006] Thus, it is possible to have a lift system where there is no need to have a part of the system at an elevated position above the cabin to pull the cabin upwards. Additionally, the lifting column is outside the inner compartment, making sure that the person using the lift system does not get in contact with the moving parts of the lift system. The lift system can, so to speak, be made as a self-contained entity that can easily be installed and if necessary moved. The footprint can, preferably, be square, round, oval or super elliptic

[0007] In an embodiment, the at least one lifting column comprise a telescopic member. The telescopic member can be a telescopic member with multi-stage units of two, three, or more stages. Preferably, the telescopic member comprises at least two metal or plastic profiles which enable the telescopic motion. This expands the movable vertical distance of the cabin.

[0008] Preferably, the telescopic member can at least at time be retracted to be substantially enclosed within the outer surface of the cabin. This makes the system compact and very easy to install as the lift system can be delivered and installed as a single unit requiring little or no extra space to incorporate parts of the system.

[0009] In an embodiment, the telescopic member comprises a wire pulley system that secures the extending of the telescopic member is facilitated. Using multiple linear actuators can be expensive and they can be difficult to calibrate to get a smooth speed of the cabin. If the lift system only uses one or a small number of actuators then the moving parts can be connected by a wire pulling system to lower the costs. This is especially advantageously when using a telescopic member, as it is sufficient to have only one actuator and a number of wires and pulleys, depending on the number of telescopic members and the number of stages in each telescopic member.

[0010] Advantageously, the elevation means comprises linear actuator, preferably a hydraulic actuator. Hydraulic actuators have the benefit of no need for additional security as the cabin will not fall after a hydraulic malfunction. If for example the pump stops working, it will be impossible to ascend the lift, but neither will it descend. By opening a valve and releasing hydraulic fluid (e.g. oil) from the hydraulic system, it is possible to descend the lift in a controlled manner. The valve can be an extra security valve installed for this purpose. If alternatively, a linear actuator with a spindle and nut is used, the lift will simply stop moving during a malfunction.

[0011] In an embodiment, the outer surface of the cabin comprises a top defining a substantially vertical topplane wherein the at least one lifting column does not extend through the top plane. Accordingly, the lifting column does not extend through the roof of the cabin. Constructing the lift system this way, ensures a compact construction and easy installation of the lift system. Further, it is easy to install this lift in buildings not prepared for lifts. This is the case in old buildings where, during construction, no lift was installed. Subsequent installation of the lifts often require extensive modifications of the building, whereas the present invention require very little modifications.

[0012] Preferably, the elevation means comprises two, three or four lifting columns. Using two or more lifting columns secures the stability of the lift system. The Cabin can, so to speak, be situated on at least two feet. The task to be considered when using more than one lifting column is the synchronisation of the columns. The extension needs to be in sync, to ensure that the floor of

the inner chamber keeps a vertical position. This can be done by using only one actuator and connect at least one of the lifting columns to the actuator via a column wire pulley system. In other words, letting the lifting columns be actuated by a shared actuator.

[0013] In an embodiment, the at least one lifting column extends through a plane having a vertical position similar to the floor of the inner compartment. In other words, the lifting columns go further up than the floor of the inner compartment. Using this embodiment ensures the lifting columns can have a larger part inside the cabin, and that the cabin is constructed to provide space for the lifting columns.

[0014] Preferably, the inner compartment comprises at least one wall and a door, wherein the floor of the inner compartment is only limited by the at least one wall and the door of the inner compartment. Accordingly, that the floor is unbroken. For example that it is not possible to circumscribe the lifting columns from within the inner chamber.

Description of the drawings

[0015] The invention will in the following be described in greater detail with reference to the accompanying drawings:

Fig. 1 a schematic view of a lift system according to a first embodiment of the invention.

Fig. 2 a schematic view of a lift system according to a second embodiment of the invention in a first position.

Fig. 3 a schematic view of a lift system according to a second embodiment of the invention in a second position.

Fig. 4 a schematic views of top cross-sectional view of a second embodiment of the invention with the doors open.

Fig. 5 a schematic views of top cross-sectional view of a second embodiment of the invention with the doors closed.

Fig. 6 a schematic view of a lifting column.

Description of a preferred embodiment

[0016] Fig. 1 shows a lift system 1 according to a first embodiment of the invention with a top or roof 5, a floor 4, outer walls 5 and inner doors 3 which define a cabin. The doors 3 are positioned on tracks so that is can slide to the side and not occupy any considerable space neither outside nor inside the cabin. Although the doors can be of any type as long as they provide access to the cabin. The lift system 1 can be of any form such as rectangular or circular, in the present case the lift system 1 has an elliptic shape. Generally it is preferred to have an elliptic or circular shape (see fog. 2 to 5 for a embodiment with circular shape) as that ensures that sliding doors can follow the outer shape of the lift. This provide the benefit that the lift doors can be made relatively large compared to the cabin and at the same time not occupy cabin space or require space outside the cabin. This is especially beneficial, as it makes the installation of the lift easier and the cabin can be relatively small leading to fewer requirements for the surroundings compared to a lift system with rectangular shape.

[0017] The cabin can also have two sets of doors one on each "side". Then the person using the lift does, for example not need to turn around between entering at one level and exiting at another level. This is beneficial for people with reduced mobility such as people in wheel chairs.

[0018] The cabin can have a control panel, wherein the vertical position of the cabin can be controlled. This lift control panel is well known in the art.

[0019] The first embodiment shown in fig. 1 has two lifting columns 2. The lifting columns are positioned within the footprint of the lift system 1. They do in a way limit the space inside the cabin because parts of them are enclosed within the outer shape of the lift 1. The lift columns 2 are telescopic and actuated 8 by a hydraulic actuator as described below. The telescopic lifting column 7 has three telescopic members 12, 13, 14 on each lifting column 2. This enables the cabin to be elevated to a position that is about three times the height of the cabin. The number of telescopic members required, is dictated by the height that the cabin must reach. In principle any height can be reached with the use of telescopic members.

[0020] Fig. 2 and 3 shows a second embodiment of a lifting system 1. In fig. 2 the doors are open and in fig. 3 the doors are closed. The lifting system 1 is similar to the first embodiment, it has a top or roof 5, a floor 4, outer walls 5 and inner doors 3 which define a cabin. The lift system 1 functions the same way as the first embodiment shown in fig. 1. Additionally the ground or the floor 15, where the lift system is positioned and the horizontal division 18 between building levels is schematically shown. The cover 19 of the hole 20 where through the lift moves is also shown.

[0021] Fig. 1 shows the lift in a first position which can be ground level or in any case the lowest level where the lift can be positioned. Fig. 2 shows the lift in a second position where it is at the first floor.

[0022] The second embodiment is installed in a building, where a hole 20 in the horizontal division 18 between the levels is needed. It is constructed in such a way that the hole 20 is closed with a cover 19. At some point, when the cabin is at the lower level (see fig. 2) and when the cabin ascends, it will reach the cover and then the cover can ascend together with the cabin, lying on top of the cabin, as shown in fig 3. In this way, the area occupied

by the lift system on higher levels is kept to a minimum when the lift is in its lower position.

[0023] In some cases, lift systems are, due to safety, required to have dual doors and measures, securing nothing gets under the lift while it is descending. This can be ensured by using an extra wall 16 surrounding the lift system, as shown in the second embodiment. This extra wall 16 should have security doors 17 corresponding to inner doors 3 in the cabin, so that when both doors 3, 17 are open the inner compartment is accessible. The security doors 17 in the extra wall 16 should preferably be sliding doors, as shown in the second embodiment. These sliding security doors 17 use the same principles as the inner doors 3 of the cabin.

[0024] Installation of any one of the embodiments is especially easy, as it can be placed anywhere and lift a person up to the height desired. This is important, especially when the lift is to be installed in a building, which initially was not designed for lifts. The lift can for example be positioned inside a house and provide transportation between floors. It can for example be positioned anywhere on the lowest floor and then a hole in the horizontal division between the levels is the only modification needed in the building. Alternatively, the lift can be installed where there already is access between the levels. This can for example be in a stairway.

[0025] In fig. 4 and 5 the footprint of the cabin, according to the second embodiment, can be seen. The floor 4 is smaller than the footprint of the lift system 1. This is because there is a column space 6 for the lifting column 2 that occupies part of the area of the bottom of the lift 1. When using the word footprint, it should be interpreted as the area taken up by lift system 1. Preferably, lifting columns 2, mechanics and hydraulics are positioned within this area. Although, some of the parts, such as the pump arrangement for the hydraulic, can be positioned outside the footprint, it is preferred to enclose as many of the parts as possible within the column space 6.

[0026] Fig. 4 and 5 show the principle of the sliding doors. In fig. 4 both the inner doors 3 and the security doors are open. Here is can be seen that the doors are sliding in such a way that they follow the shape of the lift and the extra wall 16. The security doors 17 are, in this specific embodiment, stationary in the same way as the security wall 16. In fig. 5 the doors 3,17 are closed.

[0027] Referring to fig. 6, a telescopic lifting column 7 is shown to have three telescopic members 12, 13, 14. It is however clear for the skilled person, that any number of telescopic members can be used when applying these principles. It is also clear, that the telescopic members can be of any form or that the telescopic members 12, 13, 14 can be enclosed in an outer telescopic members for aesthetic and security purposes, as it will secure that nothing will get caught in the lifting columns. The telescopic lifting column 7, comprises a hydraulic actuator 8, a first telescopic member 12, a second telescopic member 13, a third telescopic member 14 and a wire pulley system 9 with a pulley 10 and a wire 11. The telescopic members 12, 13, 14 fit into each other in such a way that they can slide out from each other, a principle well known in the art. The hydraulic actuator 8 is connected in one end to the first telescopic member 12 and in the other end with the second telescopic member 13 in such a way that when the hydraulic actuator 8 is extended and retracted so is the second telescopic member 13 in relation to the first telescopic member 12. The wire 11 is in one end connected to the first telescopic member 12 and in the other end connected to the bottom of the third telescopic member 14, wherein the direction is altered by the pulley 10, which is positioned at the top of the second telescopic member 13. In this way the third telescopic member 14 is raised when the second telescopic member 13 is raised by the hydraulic actuator 8. A wire pulley system 9 as described can be used to add any desired number of additional telescopic members. Among the benefits of the wire pulling system is that it is cheap and easy to implement.

[0028] The principle of the wire pulley system ensures that the third telescopic member 14 extends simultaneously as the second telescopic member 13.

[0029] When two lifting columns 2 are used, it can be beneficial to use only one hydraulic actuator. Then one of the lifting columns can be arranged as shown in fig. 6 and a further wire pulley system is arranged, so that the second lifting columns is actuated. The further wire pulley system is connected in similar fashion, as the wire pulley system 9 on the lifting column with the hydraulic actuator. This is an advantage because if more that one hydraulic actuator is used, one needs to ensure that they are correlated and lift precisely at the same time, where as this problem does not occur when there is only one hydraulic actuator.

[0030] Alternatively to the hydraulic actuator 8 shown in fig. 6, there can be used another actuator for example screw or wheel and axle actuators. If a wheel and axle actuator is used the wire pulley principle shown in fig.6 can be used.

[0031] The hydraulic actuator 8 needs a pump for the hydraulic fluid and control means for the pump (not shown). The principle of a hydraulic actuator is well known in the art. One special benefit, as described above, when using a hydraulic actuator, is that it provides security. The worst case for a hydraulic system is if oil (or another hydraulic fluid) leaks. In that case the lift will descend as the oil leaks and hydraulic pressure decreases. If, for some reason, the control means stop working there can be installed a security valve that can open and release the hydraulic pressure which then lowers the cabin. This security arrangement is very cheap and easy to install and makes it possible for the cabin to securely reach the lowest level in case of a malfunction.

[0032] While specific and preferred embodiments of the invention have been shown and described in detail above to illustrate the inventive principles, it will be understood that variants to these embodiments may be provided without departing from the scope of the invention

as set forth in the accompanying claims.

Reference list:

[0033]

lift system 1
lifting columns 2
inner doors 3
floor 4
top or roof 5
column space 6
telescopic lifting column 7
hydraulic actuator 8
wire pulley system 9
pulley 10
wire 11
first telescopic member 12
second telescopic member 13
third telescopic member 14
floor 15
extra wall 16
security doors 17
horizontal division 18
cover 19
hole 20

Claims

1. Lift system for elevation of persons or goods, comprising elevation means and a cabin that at least at times can move in a vertical direction and be positioned at different vertical positions,

- the cabin comprises an outer surface with a bottom area defining a footprint for the cabin and an inner compartment with a floor,
- the footprint comprises an inner area where the footprint and the floor overlaps, and an outer area where the footprint and the floor and the floor does not overlap,
- the elevation means comprises at least one lifting column, which is able to move the cabin in the vertical direction

wherein the at least one lifting column penetrate the bottom of the outer area.

2. Lift system according to claim 1, wherein the at least one lifting column comprise a telescopic member.

3. Lift system according to claim 1, wherein the telescopic member comprises at least two metal or plastic profiles which enable the telescopic motion.

4. Lift system according to claim 2, wherein the telescopic member at least at time can be retracted to be substantially enclosed within the outer surface of the cabin.

5. Lift system according to any of the preceding claims, wherein the telescopic member comprises a wire pulley system that secures the extending of the telescopic member is facilitated.

6. Lift system according to any of the preceding claims, wherein the elevation means comprises linear actuator, preferably a hydraulic actuator.

7. Lift system according to any of the preceding claims, wherein the outer surface of the cabin, comprises a top defining a substantially vertical top-plane, wherein the at least one lifting column does not extend through the top plane.

8. Lift system according to any of the preceding claims, wherein the elevation means comprises two, three or four lifting columns.

9. Lift system according to claim 8, wherein the lifting columns are actuated by a shared actuator.

10. Lift system according to claim 9, wherein at least one of the lifting columns are connected to the actuator via a column wire pulling system.

11. Lift system according to any of the preceding claims, wherein the at least one lifting column extends through a plane having a vertical position similar to the floor of the inner compartment.

12. Lift system according to any of the preceding claims, wherein the inner compartment comprises at least one wall and a door, wherein the floor of the inner compartment is only limited by the at least one wall and the door of the inner compartment.

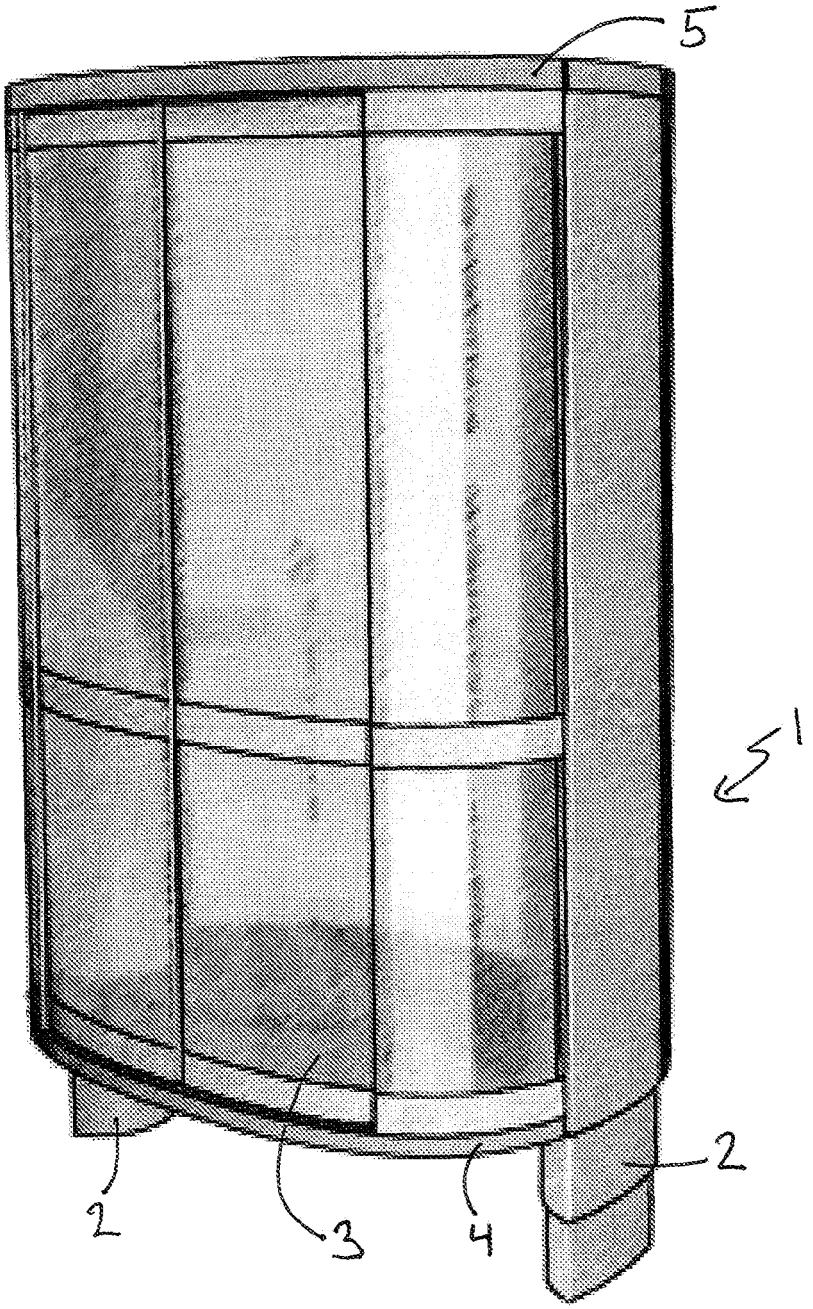

Fig 1

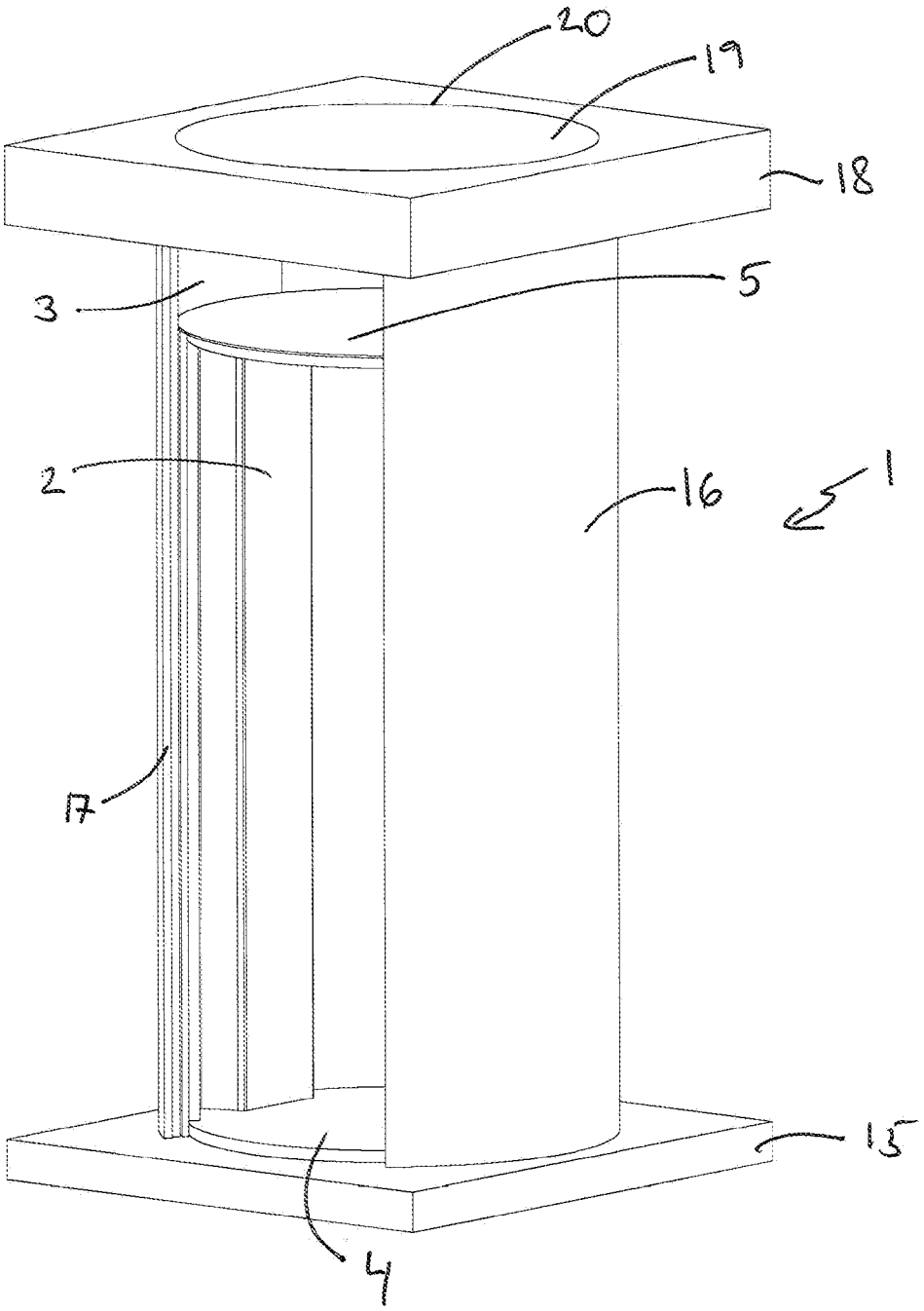

Fig. 2

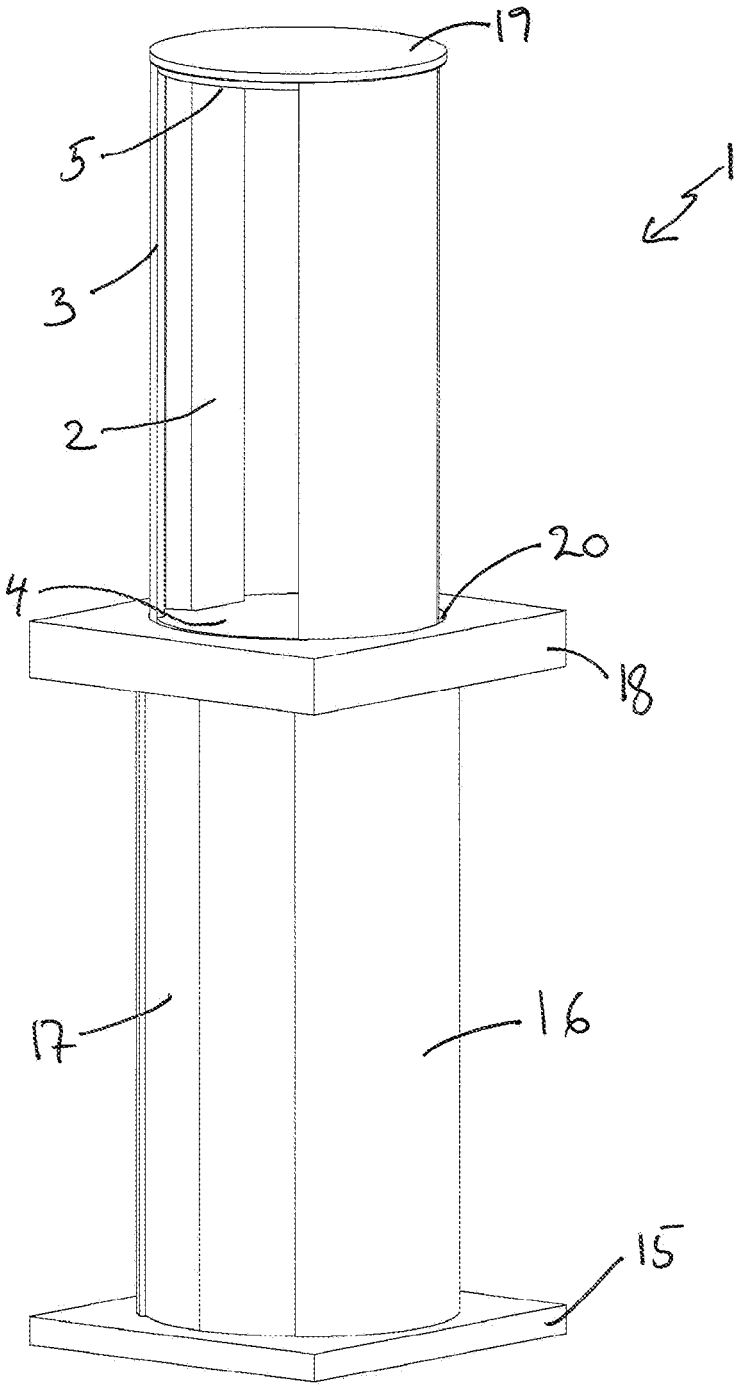

Fig. 3

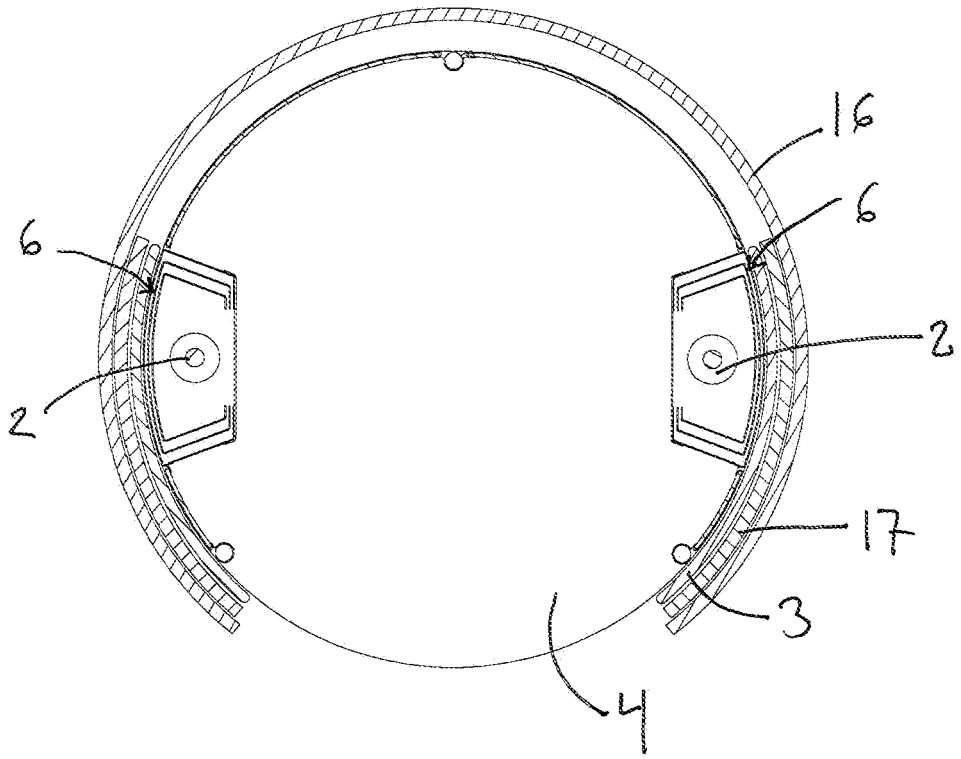

Fig. 4

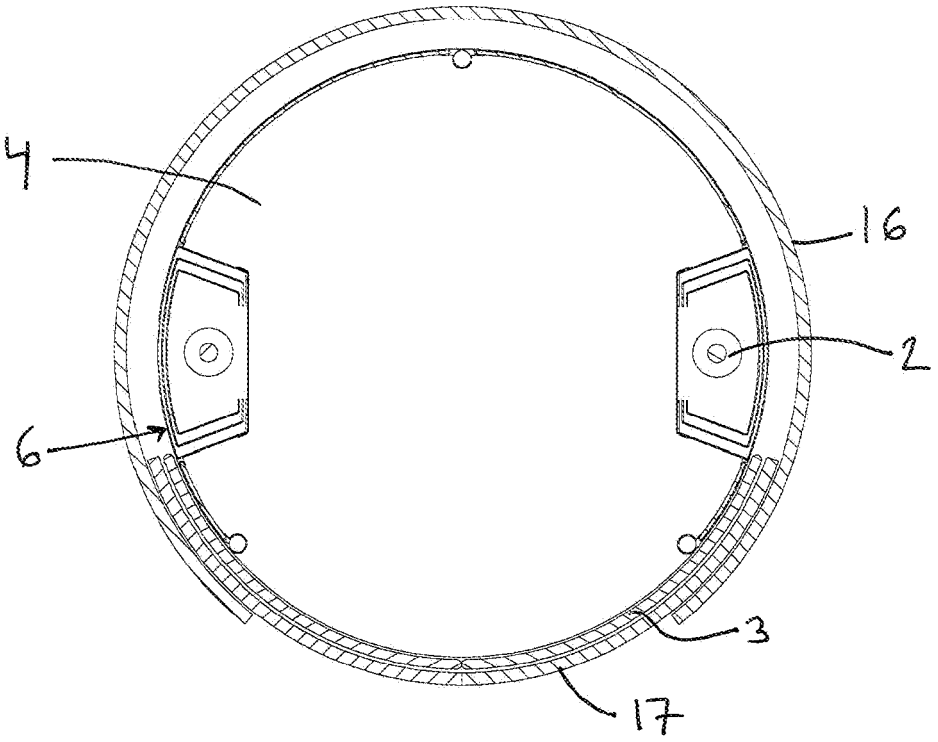

Fig. 5

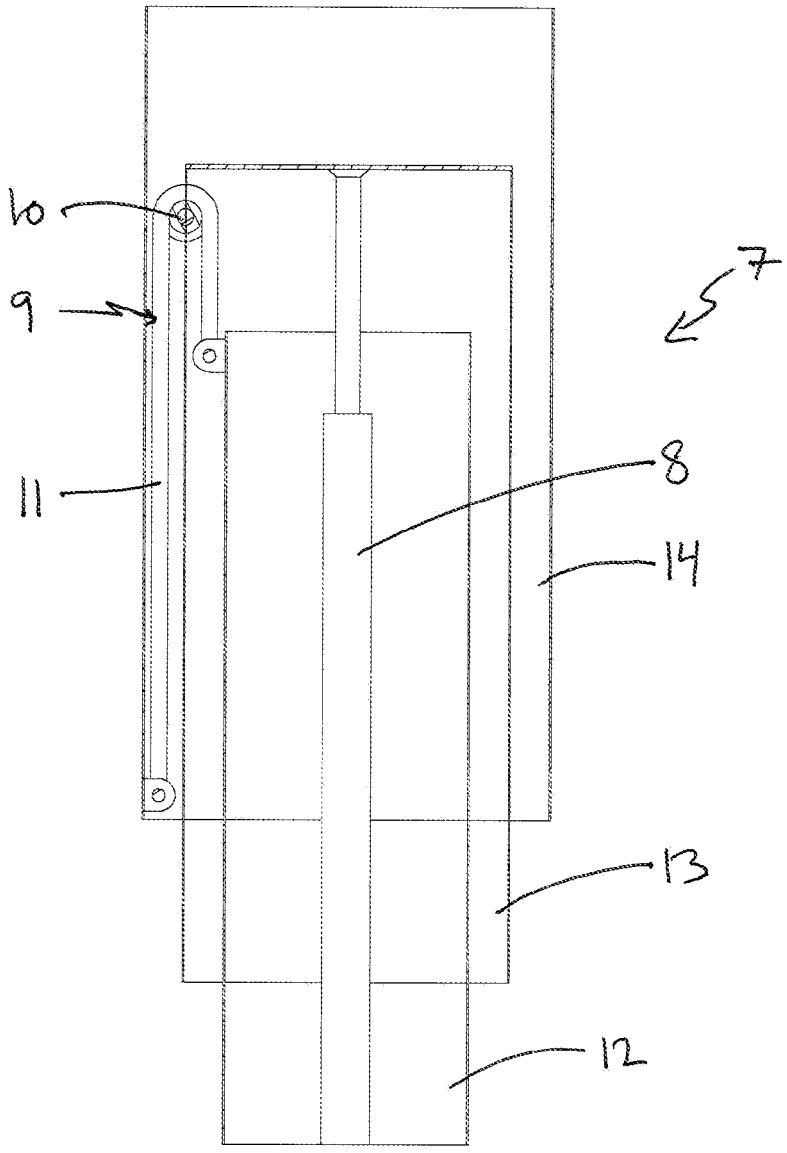

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 11 15 6386

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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TECHNICAL FIELDS SEARCHED (IPC)
B66B B66F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 July 2011	Iuliano, Emanuela

CATEGORY OF CITED DOCUMENTS

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