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(54)

LANDING FLOOR OFFSET WARNING THROUGH LIGHT FROM SILL

(57) Elevator system comprising at least one elevator car (20) moveable within an elevator shaft (10) between a plurality of storeys (40), the elevator car (20) comprising an elevator car door sill (24), and at least one storey (40), the storey being provided with a shaft door sill (44), wherein the elevator car door sill (24) and the shaft door sill (44) each comprise a vertically extending surface, and lighting means (29, 49) provided in or on the vertically extending surface of the elevator car door sill (24) and/or the shaft door sill (44).

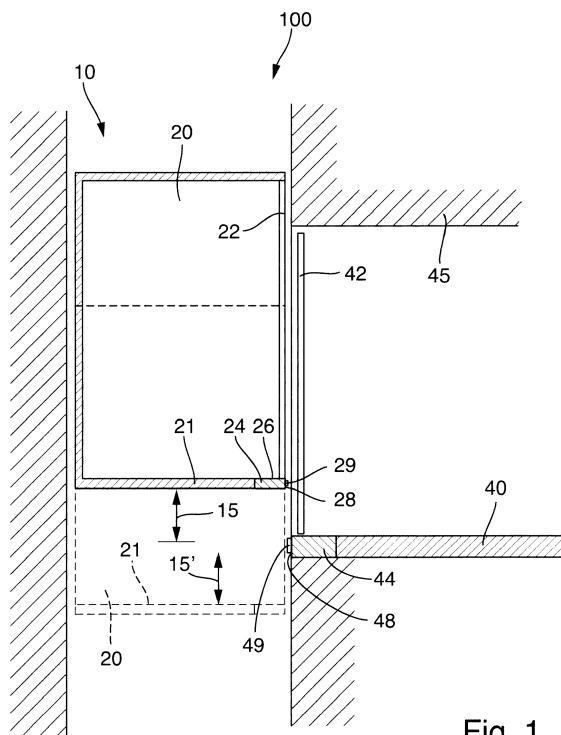


Fig. 1

Description

[0001] The present invention relates to an elevator system comprising at least one elevator car moveable within an elevator shaft.

[0002] An elevator car is provided with an elevator door, which can be opened and closed in a known manner. The edge portion of the elevator car, over which the elevator door moves, is referred to as an elevator car door sill. An elevator car door sill comprises a horizontally extending surface aligned with the elevator car door floor, and a vertically extending surface, defining the horizontal limit of the elevator car on the side of the elevator car door.

[0003] Correspondingly, each storey of the building, in which the elevator is installed, typically comprises a shaft door, which is in its open position only when the elevator car is aligned with this specific storey, and the elevator car door is also open. The shaft door correspondingly moves over a shaft door sill, which is aligned with the floor of the storey at which the elevator car is positioned. The shaft door sill correspondingly is provided with a horizontally extending surface and a vertically extending surface.

[0004] During use of an elevator, it can not always be ensured that an elevator car is in perfect vertical alignment with a floor of the building. Thus, it is possible that a passenger wishing to enter or exit an elevator car will encounter a step, i. e. a vertical offset between the elevator car door sill and the shaft door sill. Obviously, such steps constitute a danger for a passenger when entering or exiting an elevator car.

[0005] DE 10 2007 049 548 discloses an elevator system provided with lighting means in a shaft door sill and/or an elevator car door sill, adapted to warn passengers in case of such a step.

[0006] The provision of such lighting means as described in this document is considered to be somewhat cumbersome, as the lighting means must be exactly fitted into corresponding spacing within the horizontally extending sections or surfaces the sills.

[0007] The present invention seeks to simplify the provision of such lighting means for warning passengers of an elevator of dangers due to steps due to misalignment of an elevator car with a storey of a building.

[0008] This object is achieved by an elevator system comprising the features of claim 1, and also by a method comprising the features of claim 8.

[0009] By providing lighting means in or on the vertically extending surface of an elevator car door sill and/or a shaft door sill, a highly efficient warning means for an elevator passenger is provided. By providing lighting means in or on the vertically extending surfaces of such sills, there is no need to ensure perfect alignment of the lighting means with a surface, as is necessary in case of positioning of such lighting means in or on the horizontally extending surface of a sill. In case such lighting means provided in the horizontally extending surfaces of a sill are not perfectly aligned with other horizontal sill surface

sections, there exists a danger of a passenger tripping over such lighting means.

[0010] Be it noted, that the term "lighting means" shall be understood to comprise active and passive lighting means. Active lighting means especially comprise electrically powered means such as lights, LEDs etc. Passive lighting means especially comprise reflective or fluorescent means.

[0011] The invention also provides a method of retrofitting existing elevator systems with such lighting means. Here again, it requires substantially less or even no alignment work if such retrofitted lighting means are provided in the vertically extending surfaces of sills.

[0012] Advantageous embodiments of the invention are the subject matter of the dependent claims.

[0013] Preferably, the lighting means provided in or on at least one of the vertically extending surfaces of the car door sill or the shaft door sill are provided as LEDs. LEDs require little space, and can be easily fitted or retrofitted to elevator car door or shaft door sills. Also, they can provide light in a multitude of different colours.

[0014] According to an advantageous embodiment, the lighting means are provided as a strip comprising a plurality of LEDs, the strip being adhesively connected to the vertical surfaces of the elevator car door sill and/or the shaft door sill. Such LED-strips can be provided with a first type LED providing a first colour, for example red, and a second type of LED providing a second colour, for example green. Depending on an actual alignment or disalignment position of an elevator car relative to a floor of a building, and provision of corresponding sensor means, one and/or the other of such colours can be generated.

[0015] Advantageously, the lighting means are adapted to provide different and/or changing warning signals in dependence on the alignment of the elevator car door sill and the shaft door sill. For example, a number of alignment thresholds can be predetermined. In dependence on the position of the elevator car relative to such thresholds, the LEDs can be provided to generate a constant blinking or a blinking light.

[0016] According to a preferred embodiment of the invention, in case the lighting means provided in or on one of the vertically extending surfaces of the elevator car door sill and the shaft door sill are provided as LEDs, the lighting means provided in or on the other of the vertically extending surfaces of the elevator car door sill and the shaft door sill are provided as reflecting or fluorescent means. According to this embodiment, it is sufficient to provide LEDs on only one of the elevator car door sill or the shaft door sill, the light generated by these LEDs being reflected or fluorescently transformed by the respective other door sill, so that a sufficient indication or warning can be provided for a passenger. It is especially advantageous to provide the lighting means only on the elevator car door sill. In this case, only one strip of LEDs must be provided. Each shaft door sill can then be equipped with a corresponding reflecting or fluorescent

strip. Be it noted, that a reflective strip can provide a mirror-like or a diffuse reflection.

[0017] Advantageously, there is a sensor system provided for determining the alignment and/or vertical offset of the elevator car door sill and the shaft door sill. Advantageously, such a sensor system can comprise magnets provided in a stationary manner within the shaft, for example on elevator car guide rails, and magnetic sensors such as Hall-sensors provided on the elevator car, i.e. movable relative to such stationary magnets. Such magnetic sensors provide an output voltage in response to the magnetic field of the magnets. This output voltage can be fed to a control unit, which can actuate LEDs in dependence on the output voltage received.

[0018] According to a preferred embodiment of the method of the invention, a plurality of LEDs are adhesively connected to vertically extending surfaces of the elevator car door sill and/or at least one shaft door sill. Preferably, these LEDs are provided on a strip, which is adhesively connected to said vertically extending surfaces. Such an adhesive connection can be easily effected with existing elevators, so that even existing elevators can be provided with an effective warning system, indicating to passengers that an elevator car is not in perfect alignment with a floor.

[0019] Further advantages and embodiments of the invention will become apparent from the description and the appended figures.

[0020] It should be noted that the previously mentioned features and the features to be further described in the following are usable not only in the respectively indicated combination, but also in further combinations or taken alone, without departing from the scope of the present invention.

[0021] In the drawings:

Figure 1 shows a schematically simplified side view of a first embodiment of an elevator system according to the invention, and

Figures 2 to Figure 4 show preferred arrangements of sensor systems for sensing vertical alignment of an elevator car door sill with a shaft door sill.

[0022] An elevator system according to a preferred embodiment of the invention is generally designated 100 in figure 1. It comprises an elevator shaft 10 with an elevator car 20 movable therein. Drive means such as motors, gears or roping, are not shown for the sake of clarity. In figure 1, the elevator car 20 is shown in a position in which the elevator car floor 21 is not in alignment with a storey floor 40 of a building 45 in which the shaft 10 is provided and which the elevator car 20 serves. The portion of the elevator car floor 21, over which the elevator car door 22 moves in order to reach its open or closed position is referred to as elevator car door sill 24. The portion of the storey floor, over which the shaft door 42 moves between its open and closed position, is referred to as shaft door

sill 44.

[0023] Be it assumed that the vertical displacement 15 between elevator car floor 21 and storey floor 40 is such that an elevator car door 22 as well as a corresponding shaft door 42 are openable, so that a passenger can enter or exit the elevator car 20. This is typically the case if a vertical displacement 15 is smaller than a predetermined threshold value, for example 2, 3, 4 or 5 cm.

[0024] Obviously, in this situation, there is a danger of a passenger entering elevator car 20 of tripping due to the upward displacement 15 of the elevator car 20 relative to floor 40.

[0025] The elevator car door sill 24 is provided with a horizontally extending surface 26 and a vertically extending surface 28. The horizontally extending surface is aligned with the elevator car floor 21, the vertically extending surface 28 can especially be in alignment with the vertically extending outside edge of elevator car door 22, or can slightly protrude therefrom.

[0026] The horizontally extending surface of shaft door sill 44 is in alignment with the storey floor 40. The vertical surface of shaft door sill 44 is in alignment with the shaft door 42, or can slightly protrude therefrom.

[0027] In order to provide a passenger, who in the situation shown in figure 1 enters an elevator car, with a warning, the vertically extending surface 28 of elevator car door sill 24 is provided with an LED-strip 29, which is illuminated in the situation shown in figure 1. For example, the LED-strip 29 can extend over the whole or essentially the whole width of elevator car door sill 24.

[0028] A corresponding situation, in which the elevator car 20 is in a position slightly lower than floor 40, is shown in dashed lines in figure 1. Here, elevator car floor 21 of elevator car 20 is displaced a distance 15' below the storey floor 40. Again, it is assumed that displacement 15' is smaller than a predetermined threshold value, so that elevator car door 22 and shaft door 42 can open and close in a normal fashion.

[0029] Obviously, there is no immediate danger in this situation for a passenger entering the elevator car 20'. However, a passenger exiting elevator car 20 may easily trip over a shaft door sill 44 in this situation. Thus, the vertically extending surface 48 of shaft door sill 44 is also provided with an LED-strip 49, which is illuminated if elevator car 20 is in the position shown in dashed lines in figure 1.

[0030] LED-strips 29 and 49 can constitute the vertical surfaces of the respective sills 24, 44. However, using LED-strips, it is easily possible to retrofit existing door sills with LED-strips. In the latter case, LED-strips can be, for example, adhesively attached to existing vertical surfaces of elevator car door sills and shaft door sills.

[0031] Be it noted, that one of the LED-strips 29 or 49 can be substituted by a reflecting or fluorescent strip. Preferably, strip 49 provided on the shaft door sill 44 is provided as a reflective or fluorescent strip. In case an elevator car door sill 24 provided with LED-strip 29 is in the vicinity of such a reflective or fluorescent strip, light

generated by the LED is reflected or fluorescently transformed by strip 49, so that it can serve as a sufficient indication or warning for a passenger.

[0032] Depending on the extent of displacement 15, 15', the LED-strips can be provided to generate light of different colour or frequency. For example, if displacement 15, 15' is small, for example below a first threshold value, the LED-strips 29, 49 can provide a green light, and if this first threshold is exceeded, in case the vertical displacement 15, 15' is under a second larger threshold, the LED-strips can provide a second colour, for example red, or vice versa.

[0033] The LEDs can be provided to emit light constantly, or in a blinking mode.

[0034] Preferred sensor systems for sensing the vertical alignment or displacement of elevator car 20 or elevator car floor 21 relative to storey floor 40 are shown in figures 2 to 4. Here, elevator guide rails 90 are shown, which extend vertically along elevator shaft 10, and along which elevator car 20 travels in a known manner. This guide rail 90 is not shown in figure 1, for sake of clarity.

[0035] In figure 2, elevator rail 90 is provided with a first magnet 92, a second magnet 94 and a third magnet 96. These magnets 92, 94, 96 are adapted to cooperate with sensor 122 and 124, which are mounted on elevator car 20 (not shown in figures 2 to 4) and are thus movable relative to guide rail 90 and magnets 92, 94, 96. In the situation shown in figure 2, the sensors 122, 124 are not in vertical alignment with any of the magnets 92, 94, 96. This means, that the elevator car is in an intermediate position between two floors 40, so that an elevator car door 22 and a shaft door 42 will be in their closed position.

[0036] Be it now assumed that the elevator car 20 moves upwardly along guide rail 90 so that both sensors reach the position of dash-dotted line 99. This position corresponds to a perfect alignment of the elevator car 20 with storey floor 40, i.e. elevator car floor 21 with storey floor 40. In this situation, sensor 124 cooperates with magnet 96, such that a voltage is generated, which is input via wires 128 to a (not shown) control unit as an input signal. In dependence on this signal, the control unit actuates (not shown) LEDs, such that they emit light of a desired colour. For example, if a corresponding signal from sensor 124 is received, the control unit actuates LEDs to emit green light. In this situation, there is no interaction between sensor 122 and any of the magnets 92, 94, 96.

[0037] If, however, the elevator car 20 comes to a halt slightly above or below level position 99, an interaction between sensor 122 and either of magnets 92 or 94 occurs. Hereby, sensor 122 generates a signal such the control unit activates LEDs generating red light. Hereby, an effective warning is provided for a person/passenger entering or exiting elevator car 22.

[0038] In Figure 3, an alternative embodiment of such a sensor system is shown. Here, third magnet 96 is omitted, so that there is no LED activation in case of sensor 122 being positioned in level position 99. Thus, in this

situation, no indicating light is generated. The cooperation between magnets 92, 94 and sensor 122 corresponds to that as described in figure 2.

[0039] A further embodiment is shown in figure 4. Here, there is only one magnet 92 provided, which cooperates with one sensor 122. In this embodiment, sensor 122 generates a signal for the control unit to actuate LEDs to provide light, for example red light or green light, in situations where the elevator car 20 is in perfect alignment with storey floor 40, and also in situations where there is a small disalignment, such that the elevator car door 22 and the shaft door 42 can still be opened and closed. In the embodiment of figure 4, provision of one magnet 92 and sensor 122 is sufficient.

Claims

1. Elevator system comprising
at least one elevator car (20) moveable within an elevator shaft (10) between a plurality of storeys (40), the elevator car (20) comprising an elevator car door sill (24), and at least one storey (40), the storey being provided with a shaft door sill (44), wherein the elevator car door sill (24) and the shaft door sill (44) each comprise a vertically extending surface,
characterized by
lighting means (29, 49) provided in or on the vertically extending surface of the elevator car door sill (24) and/or the shaft door sill (44).
2. Elevator system according to claim 1, wherein the lighting means (29, 49) provided in or on at least one of the vertically extending surfaces of the elevator car door sill (24) or the shaft door sill (44) are provided as LEDs.
3. Elevator system according to any one of the preceding claims, wherein the lighting means (29, 49) are provided as a strip comprising a plurality of LEDs, the strip being adhesively connected to the vertically extending surface of the elevator car door sill (24) and/or the shaft door sill (44).
4. Elevator system according to any one of the preceding claims, wherein the lighting means are adapted to provide warning signals in dependence on the alignment of the elevator car door sill (24) and the shaft door sill (44).
5. Elevator system according to claim 4, wherein the lighting means exhibit a first color in case of sufficient alignment of the elevator car door sill (24) and the shaft door sill (44), and a second color in case a vertical offset between the elevator car door sill (24) and the shaft door sill (44) exceeds a predetermined threshold value.

6. Elevator system according to any one of the preceding claims, wherein in case the lighting means (29, 49) provided in or on one of the vertically extending surfaces of the elevator car door sill and the shaft door sill are provided as LEDs, the lighting means (29, 49) provided in or on the other of the vertically extending surfaces of the elevator car door sill and the shaft door sill are provided as reflecting or fluorescent means.
7. Elevator system according to any one of the preceding claims, wherein a sensor system is provided for determining the alignment or vertical offset of the elevator car door sill (24) and the shaft door sill (44).
8. Method of retrofitting lighting means to an elevator system according to any one of the preceding claims, wherein the lighting means are connected to vertically extending surfaces of an elevator car door sill and/or at least one shaft door sill.
9. Method according to claim 8, wherein a strip comprising a plurality of LEDs is adhesively connected to vertically extending edges of the elevator car door sill (24) and/or at least one shaft door sill (44).

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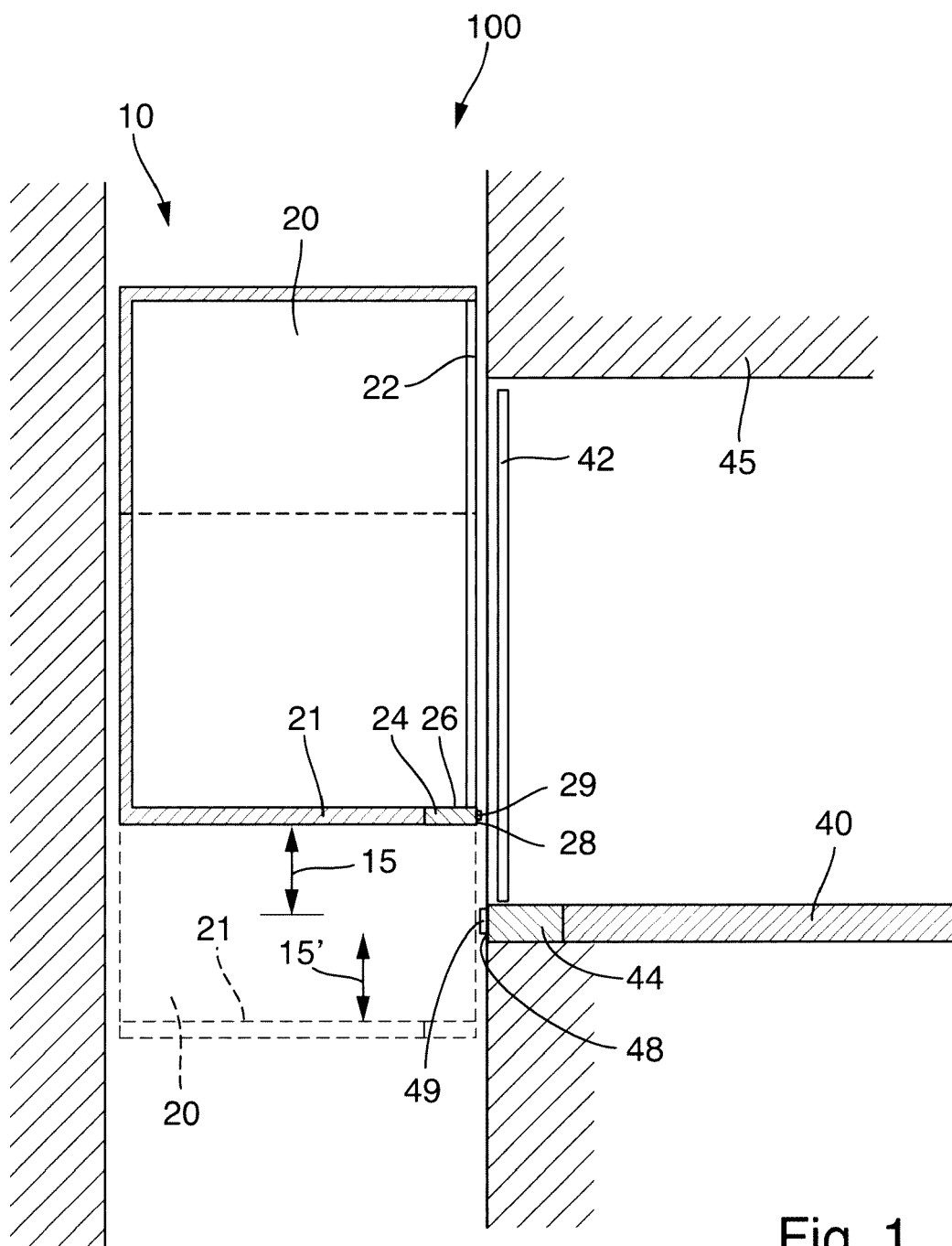
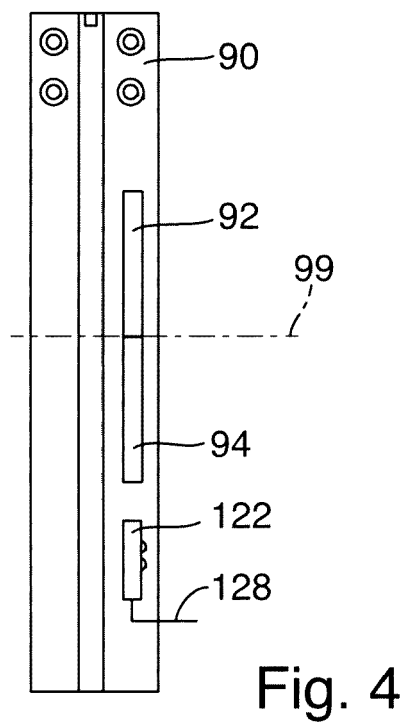
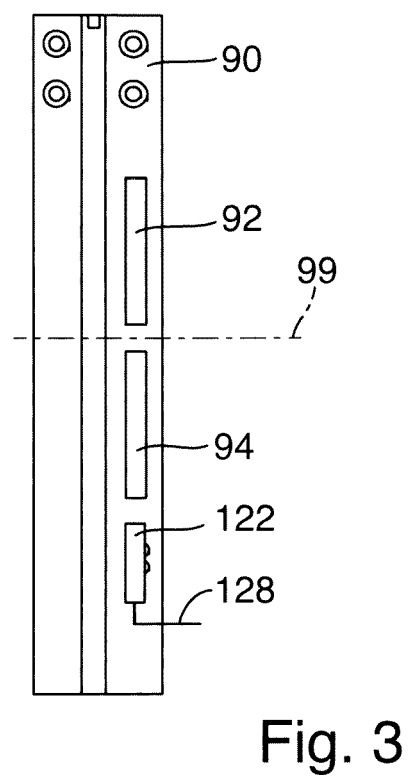
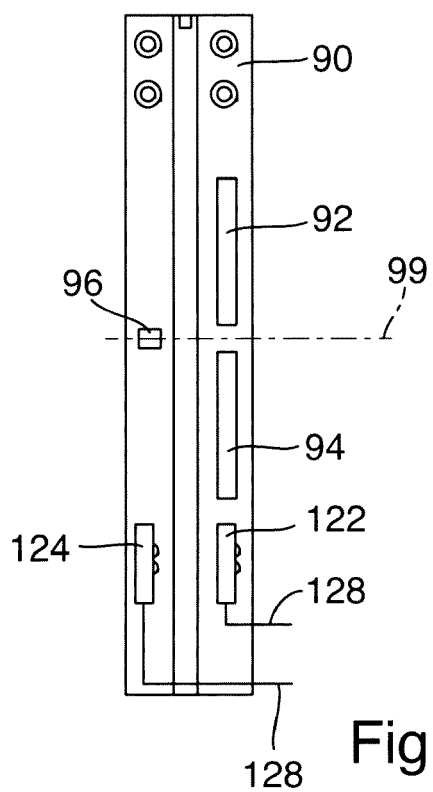


Fig. 1





EUROPEAN SEARCH REPORT

 Application Number
 EP 16 38 0005

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* abstract; figures 1,2 *	3,5,7,9	
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Y	* abstract; figure 2 *	2,3,5,7,9	
Y	EP 2 746 208 A1 (NAULED S R L [IT]) 25 June 2014 (2014-06-25) * paragraphs [0009], [0010], [0018], [0023], [0029], [0041]; figure 2 *	2,3,5,7,9	
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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		6 September 2016	Lenoir, Xavier
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			

EPO FORM 1503 03.82 (P04C01)

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

EP 16 38 0005

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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06-09-2016

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REFERENCES CITED IN THE DESCRIPTION

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