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(54) **A PASSENGER MOVING SYSTEM COMPRISING A STATIC NEUTRALIZING DEVICE**

(57) The present invention refers to a passenger moving system comprising a moving component and a device for neutralizing static charge accumulated on the moving component.

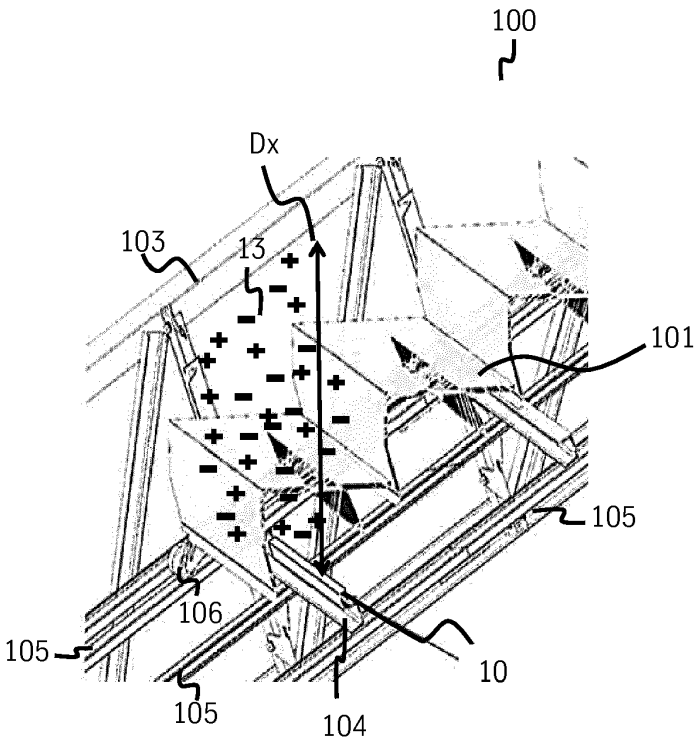

Fig. 6

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Description

[0001] The invention relates to a passenger moving system comprising a static neutralizing device. Passenger moving systems include moving walkways and escalators. In particular, the invention relates to a passenger moving system comprising a static neutralizing device wherein neutralization occurs on a contactable surface of moving walkways and escalators, for example, the handrail, in particular the handrail belt, the moving pallets upon which passengers stand, the moving belt upon which the passengers stand, the balustrade between the handrail and the moving pallets.

[0002] The most common method for removing static electricity in passenger moving systems involves the use of brushes which contact a moving part or parts. The brushes are earthed so to provide a "sink" for any excess ions. In the event the moving part or parts become charged and static electricity is created, the earth connection allows for safe removal of the charge rendering the area on the passenger moving system free from static electricity.

[0003] CN 102849599 teaches an anti-static safety device including a metal support member disposed on the truss of the escalator or moving walkway. The device further comprises a brush assembly disposed on the metal support member. The component parts are electrically connected to the truss and the truss is grounded, i.e., earthed. This solution provides that as the handrail moves over the rail, the brush will always abut against a surface of the handrail and brush against it. Since the component parts are electrically connected, and the truss is grounded, any static electricity generated travels into the grounded truss and is removed.

[0004] WO 0168500 teaches a device for dissipating electrostatic charge involving non-contact mass-connected antistatic elements in the area of movable components of a moving walkway or escalator. The device uses non-contact antistatic brushes consisting of an aluminum body with embedded high-grade steel wire. The brushes are grounded, i.e., earthed and are installed inside the escalator or moving walk scaffold, i.e., balustrade, and are connected thereto via a cable. The earthing location thus acts as a "sink" for static removal.

[0005] CN 207792451 teaches incorporating a carbon fiber into an escalator handrail belt to remove antistatic charge.

[0006] It is an object of the invention, to provide an alternative solution to those presented in the art, in particular, to provide an improved and simplified way in which static electricity on a passenger moving system can be removed.

[0007] The term "passenger moving walking system" refers in particular to moving walkways and escalators.

[0008] The terms "earthed" and "grounded" will be used interchangeably throughout the following disclosure.

[0009] The terms "static" "static electricity" and "static charge" will be used interchangeably throughout the following disclosure.

[0010] This object is solved by passenger moving system according to claim 1, a use according to claim 14 and a method according to claim 15.

[0011] The invention provides an alternative solution to removing static electricity on a passenger moving system. The current solutions require; the presence of brushes or other means, which need to be earthed in order to provide a "sink" for any static electricity; or a specifically modified handrail belt material in order to mitigate static electricity on a passenger moving system. The invention provides a passenger moving system which requires neither brushes nor a modified handrail belt material. It is less complicated in its component parts and is easier to install in a passenger moving system, including new and existing passenger moving systems.

[0012] The invention relates to a passenger moving system according to claim 1. The passenger moving system according to the invention comprises a moving component and a static neutralizing device (hereinafter referred to as "device") for neutralizing static charge accumulated on said moving component, i.e., a charged moving component. The moving component is preferably the moving pallets, of a moving walkway and the mechanism by which they operate; preferably the moving steps of an escalator and the mechanism by which they operate; preferably the moving belt of a moving walkway and the mechanism by which it operates; preferably a handrail and the mechanism by which it operates; preferably a handrail belt or handrail belts on either an escalator or moving walkway, and the mechanism by which it operates. The device provides a means of neutralizing static charge rather than removing it via a brushes and an earth connection. This advantageously simplifies the process of static removal on passenger moving systems.

[0013] In an embodiment of the invention, the device comprised within the passenger moving system preferably comprises a chargeable body. Once connected to an energy supply, the chargeable body is charged with ions and becomes a charged chargeable body. These ions are advantageously immediately dispersed within a particular area of the passenger moving system and neutralize any accumulated static charge in this particular area. Furthermore, the device is contactless i.e. it does not require contact with the moving part of the moving walkway which has a static charge, in order to be effective, nor does it require an earth connection in order to remove the static charge.

[0014] In an embodiment of the invention, the device comprised within the passenger moving system is preferably positioned in the moving system such that it lies below the moving component, more preferably, at a location where charge neutralization is to occur. This allows for the device to operate most advantageously as any ions dispersed for neutralization, are dispersed directly into a space above the device itself. The device is preferably positioned at a location that is non-visible to

a passenger. The device can advantageously be easily introduced to any existing moving walking system It requires no physical modification of component parts, for example a handrail belt, in order to operate.

[0015] In an embodiment of the invention, the device comprised within the passenger moving system is preferably positioned such that a surface of the chargeable body is pointed towards a volume of space, wherein the volume of space is at least partly occupied by the moving component. When the moving component has accumulated a static charge, i.e., is charged, the dispersed ions from the charged chargeable body, also referred to as an ion cloud, interact directly with the charged moving component. This interaction advantageously results in a neutralization of the charged moving component. A further advantage is that there is no need to earth the device itself, in particular the chargeable body, since neutralization occurs in the volume of space above the device.

[0016] In an embodiment of the invention, the device comprised within the passenger moving system can be positioned at any distance below the moving component. Preferably, the device comprised within the passenger moving system is positioned at distance of up to 1000 mm below the moving component, more preferably, the device is positioned at a distance of up to 800 mm below the moving component, most preferably the device is positioned at a distance of up to 500 mm below the moving component. This advantageously allows for the neutralization of static electricity on any charged moving component part which is located within a set distance from the device itself. The distance refers to the distance covered by the ion cloud when measured upwards from the outermost tip of the charged body.

[0017] In an embodiment of the invention, the chargeable body of the device comprised within the passenger moving system comprises a plurality of protrusions, and an energy supply input. The energy supply is required to generate ions within the chargeable body. The plurality of protrusions advantageously help to "launch" the ions generated in the charged body into the volume of space above to create an ion cloud. This is due to their position on top of the chargeable body of the device and to their orientation towards the volume of space above the device. Preferably, the protrusions are rigid. It is also preferred that they are spaced apart along one surface of the chargeable body of the device. An example of a protrusion can be a pin. The outermost tip pf the protrusions are considered as the outermost tip of the charged body.

[0018] The protrusions can be made from any ion transmitting material, preferably a material which is capable of transmitting ions generated in the charged body into the surrounding environment. The charged body and the protrusions can comprise the same material, or different materials. An example of an ion transmitting material is tungsten. It is preferred that the protrusions are coupled with at least one resistor. This advantageously provides for a long service lifetime.

[0019] In an embodiment of the invention, the device comprised within the passenger moving system can comprise a monitoring means, preferably a sensor, for example visual and/or audio sensors. A preferred example of a sensor is an LED. The LED can show one colour, for example green, when the device is operating as it should, and a different colour, for example red, when there is a problem. This advantageously allows for quick and easy monitoring in a passenger moving system.

[0020] In an embodiment of the invention, device comprised within the passenger moving system can be adapted such that the monitoring means also provides for remote monitoring. Since the device requires a connection to an energy supply in order to function, any interruption in this energy supply can be monitored. Remote monitoring can be introduced for example by modifying the software of the control system of the passenger moving system to recognize when any interruption in the energy supply occurs. Having as a monitoring means the combination of a visual and/or audio sensor, for example an LED and a means for remote monitoring, advantageously allows for any problems to be detected without having to actually be on site where the passenger moving system is installed. It also allows for remote access to the passenger moving system so it can be controlled from any location, whilst the sensor e.g. LED communicates to a person in the immediate vicinity of the passenger moving system the operational status.

[0021] Preferably, the moving component of the passenger moving system according to the invention is selected from; the moving pallets; the moving steps; the moving belt; at least one handrail; the moving pallets and at least one handrail; the moving steps and at least one handrail; the moving belt and at least one handrail; or any combination thereof.

[0022] In an embodiment of the invention, the passenger moving system comprises a plurality of a static neutralizing devices for neutralizing static charge accumulated around at least one moving component.

[0023] The invention also relates to the use of a static neutralizing device for neutralizing static charge in a passenger moving system wherein the device comprises a chargeable body. Preferably, the chargeable body further comprises a plurality of protrusions, more preferably, the protrusions are rigid. It is also preferred that the protrusions are in a fixed position and are spaced apart along one surface of the body.

[0024] The invention relates also to the use of a static neutralizing device for neutralizing static charge in a variable speed passenger moving system wherein the device comprises a chargeable body. Preferably, the chargeable body comprises a plurality of protrusions, more preferably, the protrusions are rigid. It is also preferred that the protrusions are in a fixed position and are spaced apart along one surface of the body.

[0025] The invention relates to a method for neutralizing static charge on a moving component of a passenger moving system comprising the steps of:

- providing a static neutralizing device comprising a chargeable body. Preferably the chargeable body comprises a plurality of protrusions wherein the protrusions are rigid. Preferably the chargeable body also comprises an energy supply input;
- positioning the device within a passenger moving system such that it lies below an area on the moving component where charge neutralization is to occur. Preferably the protrusions are directed towards the charged moving component;
- connecting the device, in particular the chargeable body to an energy supply to provide a charged chargeable body.

[0026] The figures describe the invention and preferred embodiments in more detail. Shown in:

Fig. 1 is a schematic representation of a device for neutralizing static charge used in a passenger moving system according to the invention;
Fig. 2 is a schematic representation of a device for neutralizing static charge used in a passenger moving system according to the invention when connected to an electricity supply;
Fig. 3 is a schematic representation of a device for neutralizing static charge used in a passenger moving system according to the invention when connected to an electricity supply and in the presence of a charged component;
Fig. 4 is a schematic representation of a passenger moving system and the preferred location(s) for the introduction of a device for neutralizing static charge;
Fig. 5a is a schematic representation of a passenger moving system and the preferred location(s) for the introduction of a device for neutralizing static charge;
Fig. 5b is a schematic representation of a belt passenger moving system and the preferred location(s) for the introduction of a device for neutralizing static charge;
Fig. 6 is a schematic representation of the introduction a passenger moving system according to the invention;
Fig. 6a is a schematic representation of a handrail of a passenger moving system according to the invention;
Fig. 7b is a schematic representation of a handrail of a passenger moving system according to the invention.

[0027] Fig 1 shows the device for neutralizing static charge 10 used in a passenger moving system (not shown) according an embodiment of the invention. The device 10 is shown as an antistatic bar which comprises a chargeable body 11, a plurality of protrusions 12, an energy supply input 14 and a monitoring means 15. Such an antistatic bar is commercially available. In this embodiment, the monitoring means 15 is a sensor. The protrusions 12 positioned on top of the body 11 are directed to an area within a passenger moving system (not shown) which is both contactable by a passenger and where a build-up of static charge is most likely to occur, for example, a handrail belt (not shown); the moving steps upon which a passenger stands (not shown); the moving pallets upon which a passenger stands (not shown); the moving belt upon which a passenger stands (not shown). Once the bar 10 is positioned within the passenger moving system, for example, under a moving step; and connected to an electricity supply (not shown) at input 14, ions are generated and the chargeable body 11 becomes charged 11c. The protrusions 12 launch the ions into the space above to form an ion cloud 13 (shown in fig. 2).

[0028] An input voltage of 24V DC is sufficient to produce an ion cloud 13 to cover a distance range Dx of up to 500 mm. The bar 10 can also be adapted to suit high working speeds of up to 1000m/min. When at high working speed, the distance range covers between 10 mm and 150 mm, preferably, 20 mm to 120 mm, most preferably, 25 mm to 100 mm, each distance range being measured upwards from the outermost tip of the protrusions 12 When high speed is not required, the distance range of the antistatic bar 10 can cover larger distances, preferably between 50 mm to 700 mm, more preferably between 70 mm to 600 mm, most preferably between 100 to 500 mm when measured upwards from the outermost tip of the pins 12. The sensor 15 is an LED sensor which shows one colour, for example green, when the bar 10 is operating as it should, and a different colour, for example red, when there is a problem.

[0029] Fig. 2 shows the bar 10 of fig. 1 when connected to an electricity supply at input 14. The chargeable body 11c is charged with ions which are launched into the space above by the protrusions 12 to form an ion cloud 13. The ion cloud 13 covers a distance range Dx above the antistatic bar 10. The distance range Dx in this particular example covers up to 500 mm in the vertical direction when measured from the outermost tip of the protrusions 12. The ion cloud 13 comprises an amount of positive and negative ions which are available to interact with a charged entity in the event such an entity enters this volume of space.

[0030] In fig. 3 the antistatic bar 10 of fig. 2 is positioned below a charged component 1 such that the charged component 1 is located within the volume of space occupied by the ion cloud 13. The positive and negative ions of the ion cloud 13 interact with the charged component and charge neutralization, or neutralization occurs. This process mitigates the risks associated with static charge, for example spontaneous air sparks, whilst also avoiding any possible unpleasantness caused to passengers. This allows for a safer passenger moving system and one that is more comfortable for passengers to use.

[0031] Fig.4 shows a passenger moving system 100. The passenger moving system 100 in this embodiment is an escalator. The arrows A and B depict the areas on the escalator 100 where a build up of static charge is

most likely to occur and therefore represent the preferred locations to position a device for neutralizing static charge 10. A device 10 positioned around area A will neutralize static on the moving steps 101 in that area of the escalator 100. A device 10 positioned around area B will neutralize static on the handrail 102 in that area of the escalator 100, likewise, a device 10 positioned around area C will neutralize static on the handrail 103 in that area of the escalator 100. It is also envisaged that a plurality of devices 10 can be located within the escalator, for example, a plurality of devices 10 in the vicinity of the moving steps 101, and/or a plurality of devices 10 within the vicinity of the handrails 102 and 103. The number of devices 10 used will ultimately depend on the dimensions of the escalator and the strength of the ion cloud provided by the device 10. This is dealt with further in figures 7a and 7b.

[0032] Fig.5a shows a passenger moving system 100. The passenger moving system 100 in this embodiment is a pallet moving walkway. The arrows A and B depict the areas on the pallet moving walkway 100 where a build up of static charge is most likely and therefore represent the preferred locations to position a device for neutralizing static charge 10. A device 10 positioned around area A will neutralize static on the moving pallets 111 in that area of the pallet walkway 100. A device 10 positioned around area B will neutralize static on the handrail 112 in that area of the pallet walkway 100, likewise, a device 10 positioned around area C will neutralize static on the handrail 113 in that area of the pallet walkway 100. It is also envisaged that a plurality of devices 10 can be located within the moving pallet walkway 100, for example, a plurality of devices 10 in the vicinity of the moving pallets 111, and/or a plurality of devices 10 within the vicinity of the handrails 112 and 113. The number of devices 10 used will ultimately depend on the dimensions of the moving pallet walkway 100 and the strength of the ion cloud 13 provided by the device. This is dealt with further in figures 7a and 7b.

[0033] Fig.5b shows a passenger moving system 100. The passenger moving system 100 in this embodiment is a belt moving walkway. The arrows A and B depict the areas on the belt moving walkway 100 where a build up of static charge is most likely and therefore represent the preferred locations to position a device for neutralizing static charge 10. A device 10 positioned around area A will neutralize static on the moving belt 120 in that area of the belt walkway 100. A device 10 positioned around area B will neutralize static on the handrail 122 in that area of the belt walkway 100, likewise, a device 10 positioned around area C will neutralize static on the handrail 123 in that area of the belt walkway 100. It is also envisaged that a plurality of devices 10 can be located within the belt moving walkway 100, for example, a plurality of devices 10 in the vicinity of the moving belt 120, and/or a plurality of devices 10 within the vicinity of the handrails 122 and 123. The number of devices 10 used will ultimately depend on the dimensions of the belt moving walkway 100 and the strength of the ion cloud 13 provided by the device. This is dealt with further in figures 7a and 7b.

[0034] Fig 6 shows an example of positioning a device for neutralizing static charge 10 in an area of the moving steps 101 of a passenger moving system 100. In the example shown, the moving system 100 is an escalator and the device 10 is an antistatic bar. The bar 10 is attached via screws (not shown) to a horizontal support beam 104 beneath the moving steps 101 of the escalator 100 and does not move. The moving steps 101 travel along the vertical beams 105 via a rolling mechanism 106. As the moving steps 101 travel over the bar 10, any accumulated static charge is neutralized at this point via the positive and negative ions present in the ion cloud 13. The ion cloud 13 covers a distance range Dx in this particular example of up to 500 mm.

[0035] Figs 7a and 7b show examples of positioning an antistatic bar 10 as shown in figures 1 to 3, in the area of a handrail 102, 103, 112, 113, 122, 123 of a passenger moving system 100. Looking at fig. 7a, the bar 10 is positioned at a newel 107 of each respective handrail 102, 103, 112, 113. The distance covered by the ion cloud 13 is represented as Dx. In this particular example the ion cloud 13 covers a distance Dx of up to 500 mm. When positioned in the newel 107 of the moving walkway 100, the distance Dn covered by the ion cloud 13 is mostly of the balustrade 108 of the passenger moving system 100. Since this part is not likely to be contacted directly by a passenger, it is considered a negative distance range Dn. The surface of the handrail i.e., the handrail belt 102, 103, 112, 113, 122, 123, highlighted in the figure as a dashed line is most likely to be directly contacted by a passenger. The ion cloud covers this distance and is thus considered a positive distance range Dp. Due to the location of the bar 10, the negative distance range Dn is significantly larger than the positive distance range Dp. With such a small positive distance range Dp, it is possible that fewer ions will be present and thus, the ability of the ion cloud 13 to interact with and neutralize any accumulated static charge on the handrail belt 102, 103, 112, 113, 122, 123 may be reduced.

[0036] In fig. 7b, a bar 10 is positioned higher up within a balustrade 108 of a passenger moving system 100 compared to that shown in fig. 7a. The balustrade 108 is different in appearance to the balustrade shown in fig. 7a, however this is for illustration purposes only and is not intended as a limitation in any way. The distance covered by the ion cloud 13 is represented as Dx. As in fig. 7a, this is a distance of up to 500 mm. The distance Dn covered by the ion cloud 13 is also mostly that of the balustrade 108 of the passenger moving system 100. Since this part is not likely to be directly contacted by a passenger, it is considered a negative distance range Dn. The surface of the handrail i.e., the handrail belt 102, 103, 112, 113, 122, 123, highlighted in the figure as a dashed line is most likely to be directly contacted by a passenger. The ion cloud covers this distance and is thus

considered a positive distance range Dp. Due to the location of the bar 10 being higher up within the balustrade 108, the positive distance range Dp is significantly larger than the negative distance range. This provides a larger ion cloud 13 which is available to interact with and neutralize any accumulated static charge on the handrail, in particular the handrail belt 102, 103, 112, 113, 122, 123. This advantageously provides a handrail belt free of static electricity, which is not only safer, for example due to the removal of the risk of air sparks, but it also improves the experience for passengers since the chances of receiving a static shock are negligible.

[0037] In a further embodiment not shown in the figures, the handrail belt 102, 103, 112, 113, 122, 123 covers a larger travelling distance, for example in a variable speed moving walkway. In such larger passenger moving systems, it is possible to use more than one bar 10 in order to neutralize any accumulated static charge. Such cases arise when during a complete rotation of a handrail belt, said belt accumulates so much static electricity that the ion cloud 13 produced by one bar 10 may not be sufficient to neutralize it all. Therefore, a second bar 10 can be introduced to the handrail area. The second bar 10, preferably has the same distance range Dx as the first bar 10. Once positioned beside the first bar 10, the ion cloud 13 covers the same distance but there is now twice as many positive and negative ions occupying the ion cloud 13, i.e., the ion cloud is now twice as strong. Alternatively, the second bar 10 can be positioned at a predetermined distance from the first bar 10 so that the second bar 10 is capable of neutralizing the remaining static charge left over from the first bar 10, as well as neutralizing any static charge that has been newly accumulated during the travelling distance between the first bar 10 and the second bar 10.

[0038] It is envisaged that more than one bar 10 can be positioned at one or more locations e.g., handrail belt (102, 103, 112, 113, 122, 123); moving steps (101); moving belt (120); moving pallets (111), within a passenger moving system 100. For example two bars 10 can be positioned at the same location, or two bars 10 can be positioned at different locations. If more than two bars 10 are required, a first and a second bar 10 can be positioned at a first location to provide an ion cloud 13 which is at least stronger than the ion cloud 13 provided by the first bar 10 or the second bar 10 alone, e.g., it can become twice as strong; and a further bar 10 or further number of bars 10 can be placed at another location. The number of bars 10 used and their location within the passenger moving system is ultimately dependent upon the size of the passenger moving system 100.

[0039] It is to be understood that aspects of various embodiments of the invention described hereinabove may be combined with aspects of other embodiments whilst still falling within the scope of the present disclosure. The foregoing description is intended to be illustrative rather than restrictive.

Reference signs list

[0040]

1	charged component
10	static neutralizing device
11	chargeable body
11c	charged chargeable body
12	protrusion
13	ion cloud
14	energy supply input
15	sensor
100	passenger moving system
101	moving steps
102	handrail belt
103	handrail belt
104	support beam
105	vertical beam
106	rolling mechanism
107	newel
108	balustrade
111	moving pallets
112	handrail belt
113	handrail belt
120	moving belt
122	handrail belt
123	handrail belt
Dx	distance range covered by ion cloud
Dp	positive distance range
Dn	negative distance range

Claims

1. A passenger moving system (100) comprising

- a moving component (101, 111, 120 102, 103, 112, 113, 122, 123) and
- a static neutralizing device (10).

2. The passenger moving system (100) according to claim 1 **characterized in that** the device (10) comprises a chargeable body (11).

3. The passenger moving system (100) according to claim 2, wherein the chargeable body (11) is charged upon connection to an energy supply to provide a charged chargeable body (11c).

4. The passenger moving system (100) according to any of the preceding claims, wherein the device (10) is positioned in the moving system (100) such that it lies below the moving component (101, 111, 120, 102, 103, 112, 113, 122, 123) where charge neutralization is to occur.

5. The passenger moving system (100) according to any of the preceding claims wherein the device (10) is positioned in the moving system (100) such that a surface of the chargeable body (11) is pointed towards a volume of space, wherein the volume of space is at least partly occupied by the moving component (101, 111, 120, 102, 103, 112, 113, 122, 123).

6. The passenger moving system (100) according to any of the preceding claims, wherein the chargeable body (11) comprises a plurality of protrusions (12), and an energy supply input (14).

7. The passenger moving system (100) according to claim 6, wherein the protrusions (12) are rigid.

8. The passenger moving system (100) according to claim 6 or 7 wherein the protrusions (12) are spaced apart along one surface of the body (11) of the device (10).

9. The passenger moving system (100) according to any of claims 6 to 8, wherein the protrusions (12) are adapted to launch the ions of a charged chargeable body (11c) into the volume of space at least partly occupied by the moving component (101, 111, 120 102, 103, 112, 113, 122, 123).

10. The passenger moving system (100) according to any of the preceding claims, wherein the protrusions (12) are made from an ion transmitting material.

11. The passenger moving system (100) according to any of the preceding claims, wherein the device further comprises a monitoring means (15).

12. The passenger moving system (100) according to any of the preceding claims, wherein the moving component is selected from; moving pallets (111); moving steps (101); moving belt (120); at least one handrail (102, 103, 112, 113, 122, 123); or any combination thereof.

13. The passenger moving system (100) according to any of the preceding claims comprising a plurality of devices (10) for neutralizing static charge accumulated around at least one moving component (101, 111, 120, 102, 103, 112, 113, 122, 123).

14. Use of a static neutralizing device (10) for neutralizing static charge in a passenger moving system (100).

15. A method for neutralizing static charge on a moving component (101, 111, 120, 102, 103, 112, 113, 122, 123) of a passenger moving system (100) comprising the steps of:

- providing a static neutralizing device (10) comprising a chargeable body (11);
- positioning the device (10) within a passenger moving system (100) such that it lies below an area on the moving component (101, 111, 120, 102, 103, 112, 113, 122, 123) where charge neutralization is to occur;
- connecting the device (10), in particular the chargeable body (11) to an energy supply to provide a charged chargeable body (11c).

Fig. 1

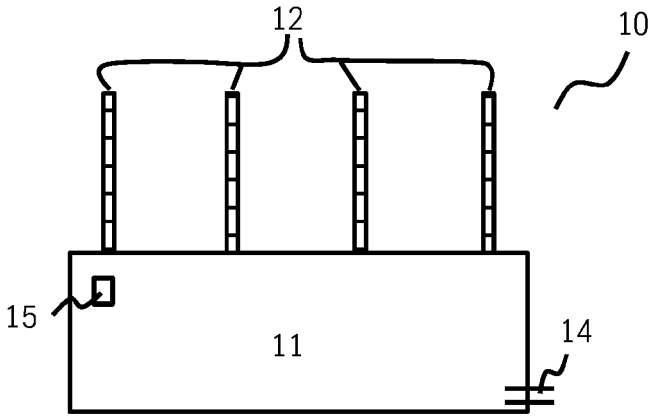


Fig. 2

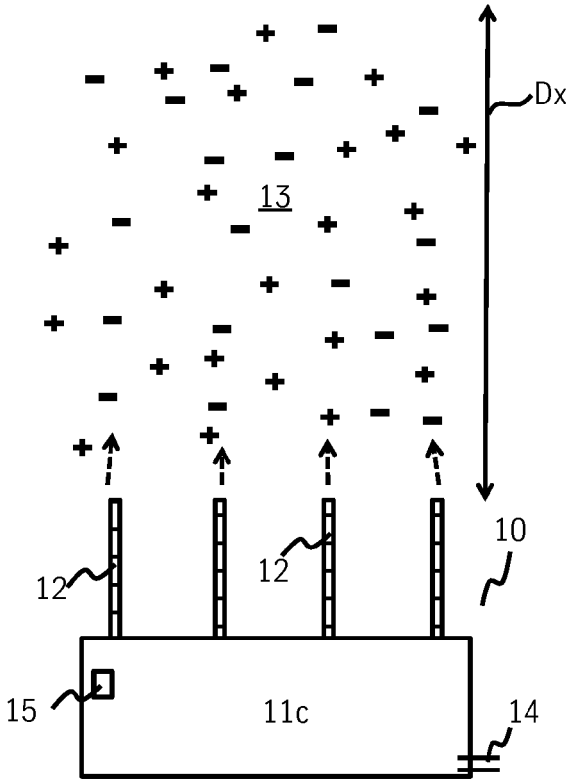
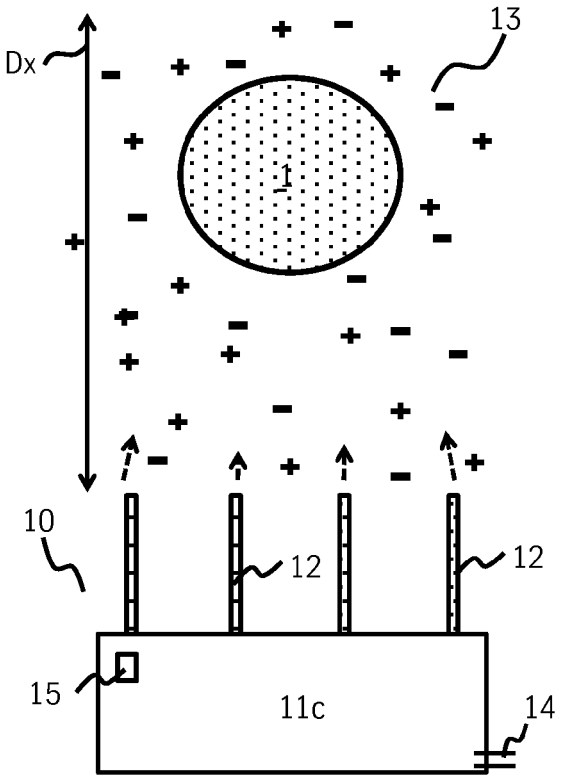


Fig. 3



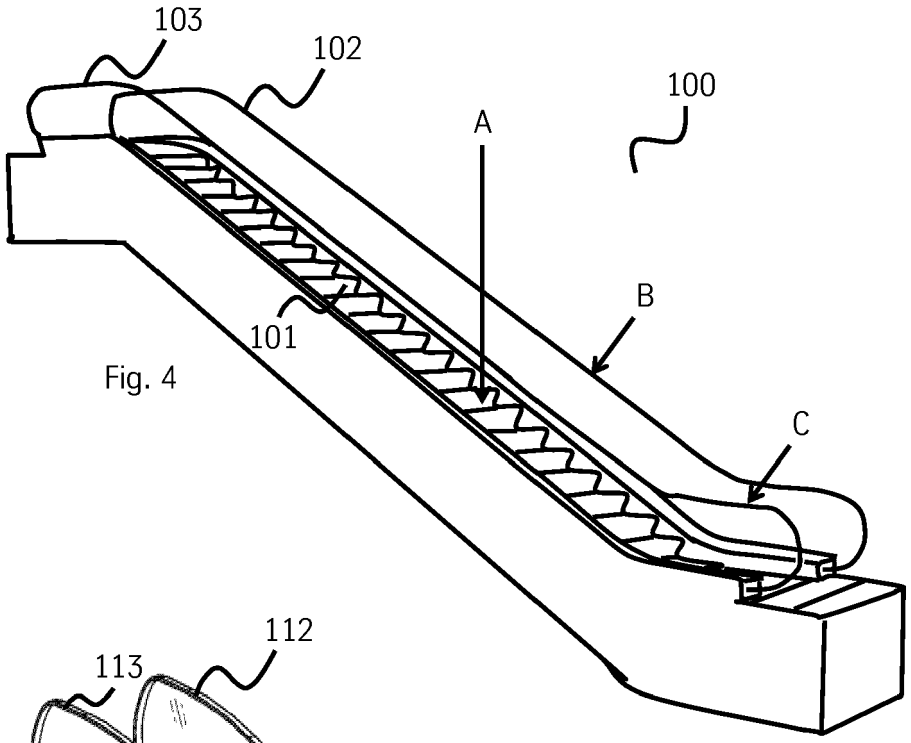


Fig. 4

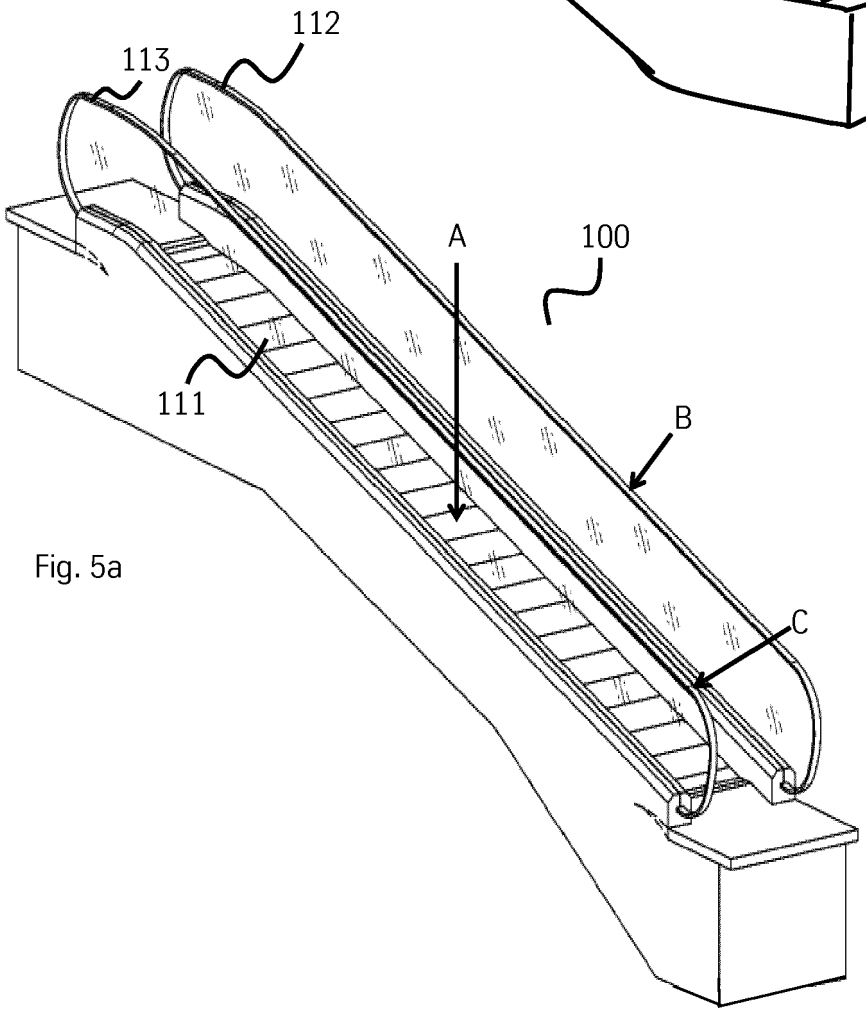


Fig. 5a

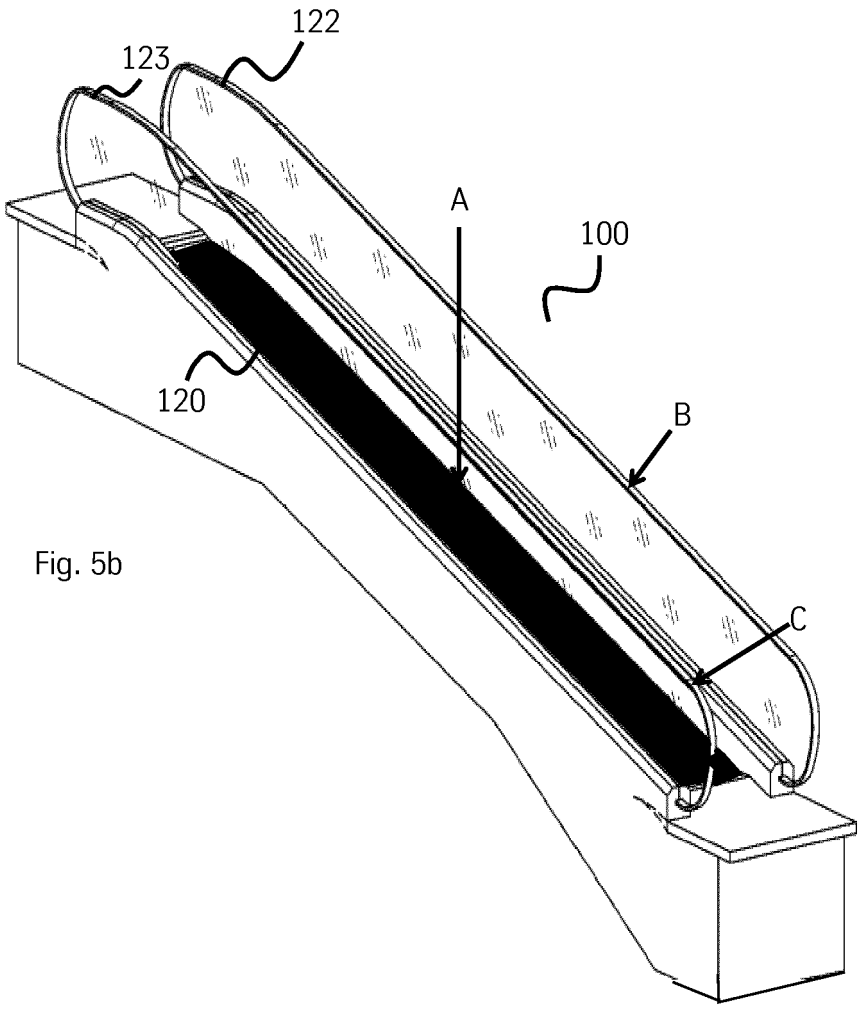


Fig. 5b

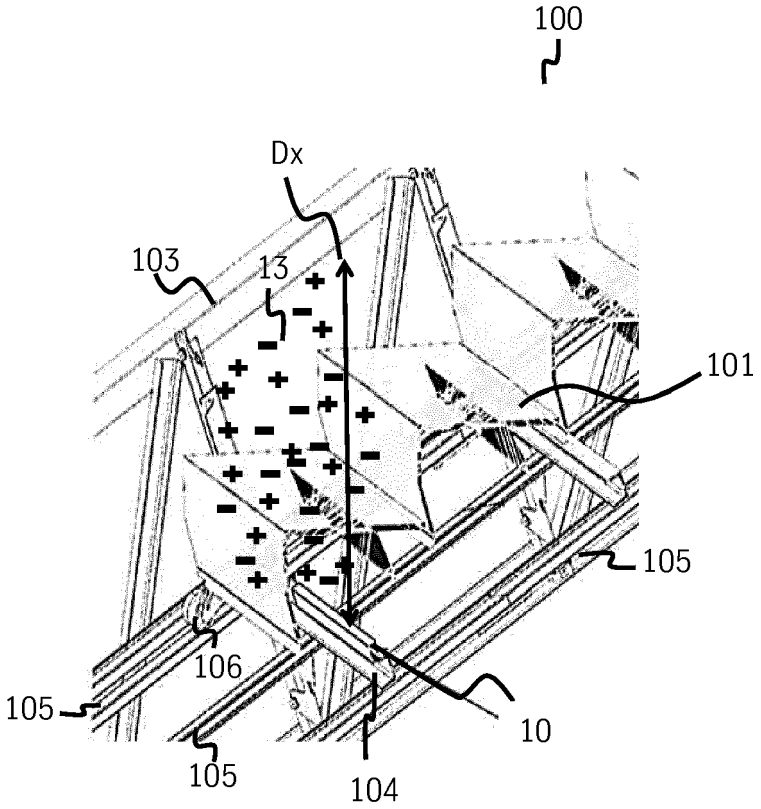


Fig. 6

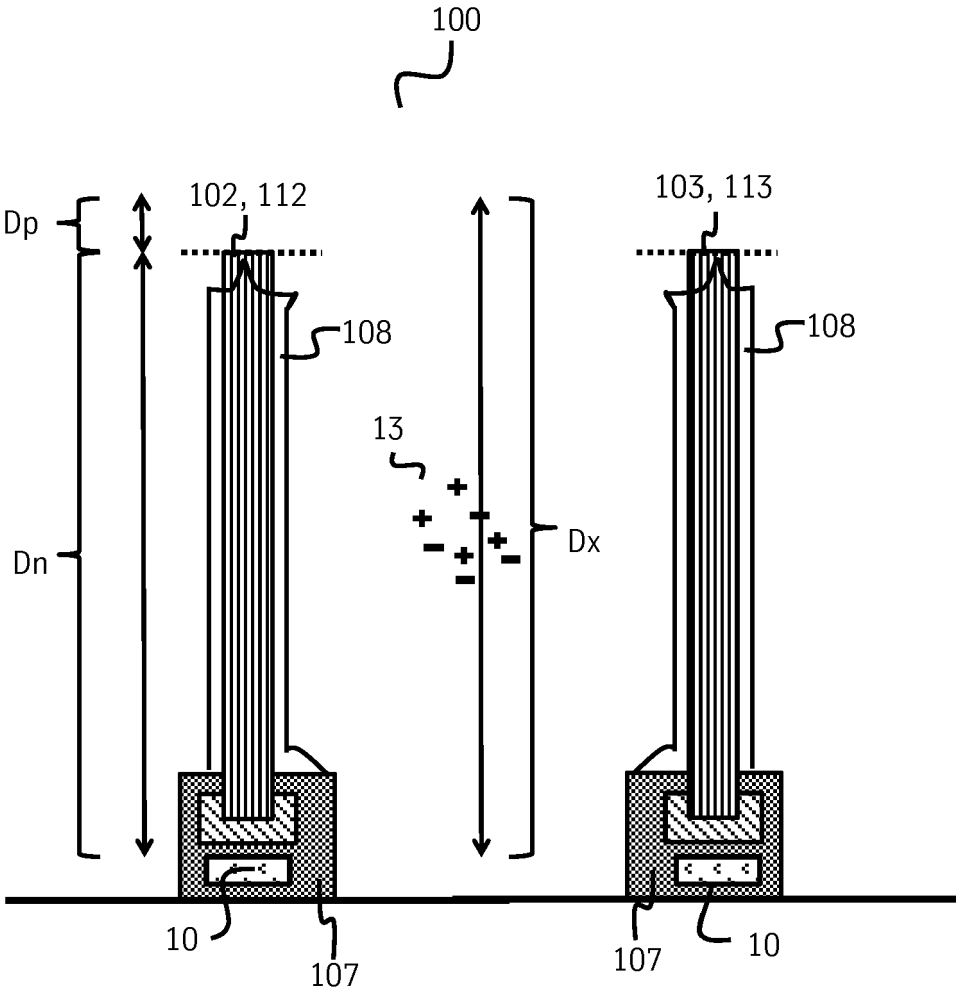


Fig. 7a

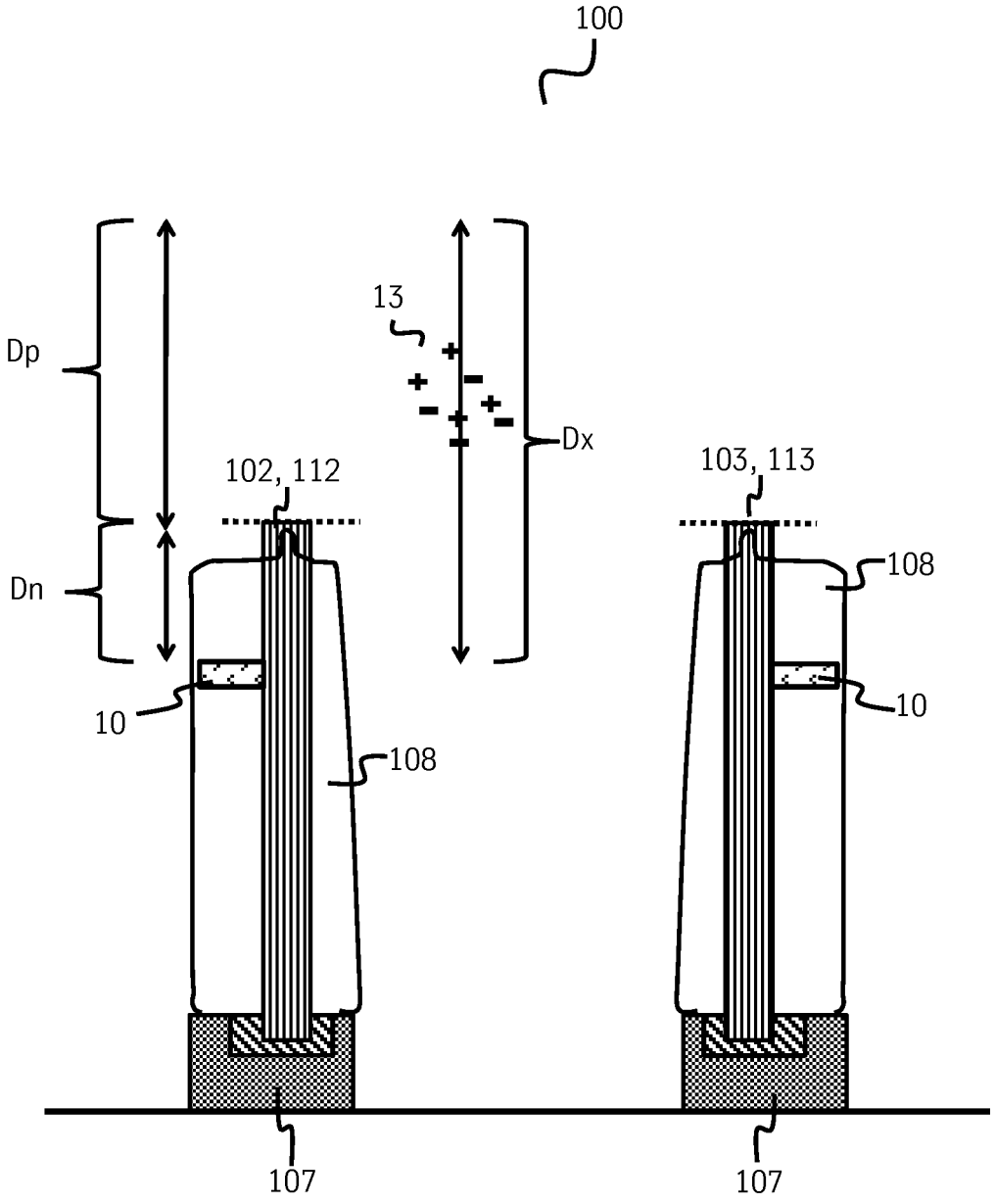


Fig. 7b

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EUROPEAN SEARCH REPORT

Application Number
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Place of search	Date of completion of the search	Examiner
The Hague	22 August 2019	Lenoir, Xavier

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