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(54) **Noise reduction device for appliances, especially household appliances, and appliance using the device**

(57) The present invention relates a noise reduction device (1) for an appliance (50), in particular a household appliance, comprising a base portion (2) for connection to the appliance and comprising two at least partially flexible elements (3, 4) positioned side by side and extending from the base portion (2).

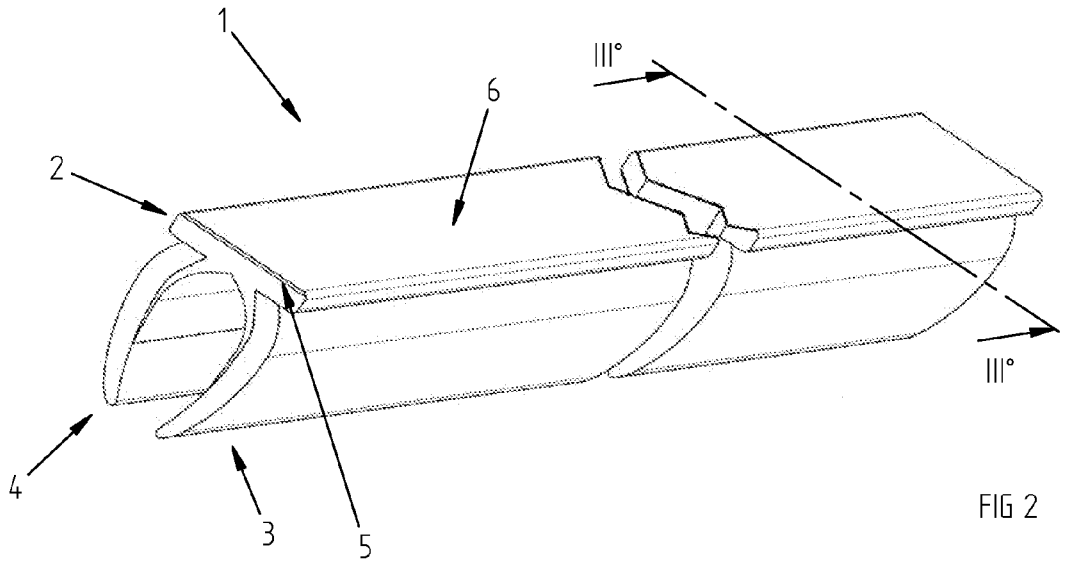

FIG 2

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Description

TECHNICAL FIELD

[0001] The present invention concerns the technical field of systems for the reduction of noise produced by appliances adapted to be installed on a floor, especially household appliances.

[0002] In particular, the present invention refers to a noise reduction device that can be applied to laundry washing machines.

BACKGROUND ART

[0003] The use of various pieces of equipment, in particular household appliances, like for example laundry washing machines, washing-drying machines, laundry drier, dishwashers, refrigerators and the like, nowadays is very widespread and indispensable.

[0004] Said appliances are usually arranged so that they rest on the floor by means of height adjustable feet, or they can also be built-in in modular structures, as it happens for example with the dishwashers or refrigerators inserted in modular kitchens.

[0005] Said appliances usually have an external structure that is typically parallelepiped in shape, provided with proper front or upper access doors. Inside the external structure, mechanical and/or electric devices ensure proper operation of the appliance.

[0006] These mechanical and/or electric devices may comprise, for example, electric motors, pumps, blowers, or other mechanical and hydraulic operation devices. Each one of said devices contributes to a different extent to generating noise, which can be the noise deriving from its operation or the noise caused by the vibrations transmitted to the equipment.

[0007] This drawback is particularly evident in laundry washing machines during the spinning phase of the washing cycle, that is when the drum containing the laundry rotates at a number of revolutions per minute that can be very high, for example 1200-1600 rpm.

[0008] Therefore, there is the need to reduce the noise emissions produced by these equipments.

[0009] Devices for reducing the noise emissions of equipment, in particular of laundry washing machines and/or laundry washing-drying machines, are known for example from the state-of-the-art patent documents FR2343076, JP4187190, KR20000032563 and W02005049910.

[0010] The noise reduction effect described in these documents is obtained by applying the same principle, that is, by closing the gap existing between the bottom of the machine and the floor on which the machine is installed. It is known, in fact, that noise is propagated from the bottom of the machine towards the outside through this gap.

[0011] Document FR2343076 discloses a noise reduction device consisting of a band made of an elastic material applied to the lower part of a washing machine so as to surround its perimeter and thus close the gap towards the floor and obtain tight separation of the bottom from the outside in order to reduce noise propagation. Document JP4187190 discloses a device for reducing noise propagation to be used in a washing machine, consisting of an element made of a flexible material, whose length slightly exceeds the height of the gap between the lower part of the washing machine and the floor, and whose end is slightly bent towards the inside so that it rests on and touches the floor ensuring greater adherence.

[0012] Document KR20000032563 discloses a device for reducing noise propagation to be used in a washing machine, consisting of an element in the shape of a flexible spring tube applied to the lower part of a washing machine so as to surround its perimeter and thus close the gap towards the floor in order to reduce noise propagation.

[0013] Document W02005049910 discloses a device for reducing noise propagation to be used in a washing machine, consisting of an insulation barrier applied to the lower part of a washing machine so as to surround its perimeter and thus close the gap towards the floor in order to reduce noise propagation. In the preferred embodiment, the insulation barrier has a telescopic structure so that its height is adjusted with respect to the working conditions of the washer.

[0014] However, above described devices belonging to the known art pose some drawbacks.

[0015] A drawback posed by these systems of the known type lies in that if the machine is moved from its usual position, for example in order to carry out a maintenance operation or simply to place it in a different position in the room, the adherence of the insulation device to the floor may be negatively affected.

[0016] This drawback causes degradation in the quality of the appliance in terms of silent operation.

[0017] The loss of adherence following the movements to which the appliance is subjected may determine, therefore, a decrease in the noise reduction performance of the device.

[0018] Another drawback of these systems of known type is represented by the fact that a breakage of the element may irreversibly affect its functionality, making it necessary to replace it.

[0019] The main object of the present invention is therefore to overcome said drawbacks.

[0020] In particular, it is one object of the present invention to provide a noise reduction device for appliance that substantially maintains its noise insulation characteristics unchanged, even following movements of the appliance.

[0021] Another object of the present invention is to provide a noise reduction device for appliance that lasts longer than the devices of known type.

DISCLOSURE OF INVENTION

[0022] The present invention therefore relates, in a first aspect thereof, to a noise reduction device for an appliance, in particular a household appliance, comprising a base portion for connection to said appliance, said device comprising at least two at least partially flexible elements positioned side by side and extending from said base portion.

[0023] Opportunely, the elements have opposing development directions.

[0024] The elements preferably comprise corresponding proximal portions and distal portions in relation to the base portion, wherein the distal portions in the direction away from the base portion have opposing development directions.

[0025] In a first embodiment of the invention, the distal portions of the elements that develop in the direction away from the base portion converge one another.

[0026] In a second embodiment of the invention, the distal portions of the elements that develop in the direction away from the base portion diverge one another. Preferably, at least one of the elements is flexible for its entire extension.

[0027] More preferably, both the elements are flexible for their entire extension.

[0028] In a further embodiment, only one portion of said elements is flexible. Advantageously, at least one of the elements comprises an arched portion.

[0029] In the preferred embodiment of the invention, both the elements comprise an arched portion.

[0030] In a preferred embodiment, the elements preferably have the same length. Opportunely, the base portion and the elements constitute a single piece made of the same material.

[0031] Advantageously, the device of the invention can be produced through an extrusion process.

[0032] In an alternative embodiment of the invention, the base portion is more rigid than the elements.

[0033] Advantageously, the base portion and the elements are produced through a co-moulding process or over-moulding process or co-extruding process.

[0034] Preferably, the elements comprise a resilient material which belongs to the group comprising: porous material, rubber, resin and combinations thereof. Advantageously, the elements comprise a resilient material having a viscous damping at temperature ambient higher than 0.4.

[0035] The noise reduction device of the invention advantageously comprises connection means for connection to the appliance.

[0036] The connection means preferably belongs to the group comprising: adhesive substances, magnetic substances, fixing screws, hook and loop fasteners, a shaping for interference or snap coupling with the appliance.

[0037] In a second aspect thereof, the present invention concerns an appliance comprising a noise reduction device of the type described above. Advantageously, the noise reduction device is applied to at least one side of the bottom of the appliance, in order to close the gap between the bottom and the floor on which the appliance rests.

[0038] The noise reduction device is preferably applied to the whole perimeter of the bottom of the appliance.

[0039] The appliance advantageously comprises a connection portion suitable for the connection of the noise reduction device.

[0040] In an advantageous embodiment, the connection portion comprises a shaped seat. In a further embodiment, the connection portion comprises a hook or a loop side of a hook and loop fastener.

[0041] In a further embodiment thereof, the connection portion comprises a magnetic or a ferromagnetic area.

[0042] The appliance preferably is a household appliance.

[0043] More preferably, said household appliance is a laundry washing machine.

BRIEF DESCRIPTION OF THE DRAWINGS

[0044] Further characteristics and advantages of the present invention will be highlighted in greater detail in the following detailed description of some of its preferred embodiments, provided with reference to the enclosed drawings. In said drawings:

- Figure 1 shows a noise reduction device carried out according to a first embodiment of the invention, applied to the bottom of a laundry washing machine;
- Figure 1A shows an enlarged detail of Figure 1;
- Figure 2 shows an axonometric view of the noise reduction device carried out according to the first embodiment of the invention shown in Figure 1;
- Figure 3 shows a section view along line III°-III° of the device of Figure 2 in a first operating condition;
- Figure 4 shows a section view of the device of Figure 3 in a second operating condition;
- Figure 5 shows the side view of the laundry washing machine of Figure 1 resting on the floor;
- Figure 5A shows an enlarged detail of Figure 5;
- Figure 5B shows another enlarged detail of Figure 5;
- Figures 6A and 6B show the device of Figure 2 in two particular conditions of use;
- Figure 7 shows a section view of a noise reduction device carried out according to a second embodiment of the invention;
- Figure 8 shows a section view of a noise reduction device carried out according to a third embodiment of the invention;
- Figures 8A and 8B show the device of Figure 8 in two particular conditions of use.

DETAILED DESCRIPTION OF THE INVENTION

[0045] A noise reduction device 1 carried out according

to a first preferred embodiment of the invention is described here below with reference to Figures from 1 to 6B. In this embodiment the noise reduction device 1 shown in Figure 1 is applied, for example, to the lower part of an appliance consisting of a laundry washing machine 50.

[0046] The device 1 of the present invention has proved to be particularly successful when applied to laundry washing machines. It should in any case be underlined that the present invention is not limited to this type of application. On the contrary, the present invention can be usefully applied substantially to all the appliances, in particular household appliances, which are intended to be positioned on a floor and which require a reduction in the noise they produce during normal operation. Therefore, for example, it is possible to use the device of the invention also in laundry washing-drying machines, in laundry drier, dishwashers, refrigerators, etc.

[0047] In the embodiment shown in Figure 1, the noise reduction device 1 is advantageously applied to the bottom 51 of a laundry washing machine 50.

[0048] Preferably, but not necessarily, a plurality of devices 1 according to the present invention may be applied to the bottom of an appliance, for example to the bottom 51 of the laundry washing machine 50; in the example of Figure 1 the bottom 51 of the laundry washing machine 50 is advantageously substantially rectangular or square-shaped, and four devices 1, each one having a suitable length, are opportunely associated to the bottom 51, preferably in correspondence of one side of the latter.

[0049] The bottom 51 of the washing machine 50 is advantageously provided with a plurality of feet 52 for its positioning on a floor F. In the embodiment of Figure 1, in which the bottom 51 is substantially rectangular or square-shaped, feet 52 are preferably four, and they are advantageously positioned in proximity of the four vertices of the bottom 51.

[0050] Feet 52 are preferably adjustable in height, in order to favour the stable positioning of the laundry washing machine 50 on a floor F even if it is not perfectly flat.

[0051] The noise reduction device 1 has preferably a substantially longitudinal development, with a predetermined length; preferably the noise reduction device 1 comprises a base portion 2, for connection to the bottom of one appliance, for example to the bottom 51 of the laundry washing machine 50, and one pair of elements 3, 4 that extend from the base portion 2.

[0052] The noise reduction device 1 may be associated to the bottom of an appliance which is arranged in such a way that, when such appliance is positioned on a floor F, there is a gap S between the bottom and the floor F; for example (as in the case of the laundry washing machine 50 illustrated in the enclosed figures) the bottom of the appliance may be provided with a plurality of feet, or other spacing devices, for its positioning on the floor at a prefixed distance from the latter.

[0053] Advantageously when the noise reduction device 1 is associated to the bottom of such an appliance, and the latter is positioned on a floor F, elements 3, 4 project from the underside of the bottom of the appliance towards the floor F, in order to at least partially close the gap S between the bottom of the appliance and the floor F.

[0054] For example, with reference to the example of Figures 1 and 5, when the noise reduction device 1 is associated to the bottom 51 of the laundry washing machine 50, and the laundry washing machine 1 is positioned on a floor F, elements 3, 4 project from the underside of the bottom 51 of the laundry washing machine 50, towards the floor F, in order to at least partially close the gap S between the bottom 51 of the laundry washing machine 50 and the floor F, as shown for example in Figure 5.

[0055] The base portion 2 has preferably a substantially plane surface 5 particularly suited to be placed in contact with the bottom 51 of the laundry washing machine 50 and to adhere to it.

[0056] The base portion 2 is preferably provided, on its upper side, with an adhesive layer 6, preferably extending for the whole length of the device 1, adapted for ensuring a comfortable and quick application to the bottom of an appliance, for example to the bottom 51 of the laundry washing machine 50. The adhesive layer 6 can comprise, for example, a double adhesive tape having one side adhering to the plane surface 5 and the other side advantageously provided with a removable protection film, not shown in the figure, which is removed at the moment of application of the device 1 to the bottom of an appliance, for example to the bottom 51 of the laundry washing machine 50.

[0057] The adhesive layer 6 represents one of the possible means which may be used, according to the invention, for connecting the device 1 to an appliance, for example to the bottom 51 of the laundry washing machine 50.

[0058] In further embodiments of the invention said connection means can however be different.

[0059] Connection means may comprise, for example a glue layer applied to the base portion 2 so that the latter may be applied to the bottom of an appliance; in a further embodiment connection means may comprise fixing screws or rivets that engage with the bottom of the appliance.

[0060] In a further embodiment the connection means can be associated partially with the device and partially with the appliance. In this case hook and loop fasteners can be preferably used, for example of one sold under the trademark "VELCRO", in which at least one side of the hook or loop fastener is associated with the base portion 2 and the other one side of the hook or loop fastener is associated with the appliance.

[0061] Ina further embodiment thereof, connection means may comprise a layer with magnetic or ferromagnetic material applied to the base portion 2, and at least a layer with magnetic or ferromagnetic material applied to the appliance. It is evident that if the appliance is made

of ferromagnetic material at least in the connection area of the device 1, to obtain the desired connection means it will be sufficient to use a layer of magnetic material associated with the base portion of the device.

[0062] In a further embodiment the connection means may comprise a particular shape of the base portion 2 and of the bottom of the appliance; for example the base portion can be shaped so as to be able to be housed through interference or snap coupling into a corresponding seat obtained in the bottom of the appliance by providing, for example, a dovetail profile.

[0063] Clearly any other connection means may be used for fixing the noise reduction device 1 to the bottom of the appliance.

[0064] Clearly the noise reduction device 1 may be fixed to the bottom of an appliance by a single connection means, or also by two or more different connection means, for example by an adhesive layer 6 and by screw or rivets.

[0065] The elements 3, 4 that, as explained, extend from the base portion 2 of the device 1, preferably develop for the whole length of the device 1 itself.

[0066] Said elements 3, 4 advantageously face each other, and preferably develop according to a curved pattern.

[0067] Preferably, elements 3, 4 develop in opposite directions.

[0068] In the embodiment of the invention described herein, elements 3 and 4 are preferably, but not necessarily, one the mirror image of the other; advantageously, but not necessarily, elements 3 and 4 are preferably substantially symmetrical with respect to a medial axis X passing through the base portion 2. Each element 3, 4 has preferably a proximal portion 3a, 4a and a distal portion 3b, 4b, the latter being the contact portion with the floor F when the device 1 is applied to the bottom of an appliance, for example to the bottom 51 of the laundry washing machine 50. The elements 3, 4 have preferably the same length. For each element 3, 4 an external surface 7, 8 is defined, which connects the proximal portion 3a, 4a and the distal portion 3b, 4b. In the embodiment illustrated in Figures 1 to 5B, the distal portions 3b, 4b of elements 3, 4 converge one another.

[0069] Preferably both the elements 3, 4 are at least partially flexible.

[0070] Advantageously elements 3, 4 are at least partially made of a resilient material, for example, a porous material, like as sponges or felts with open hole, or a rubber, like as EPDM, or a resin, like as PVC.

[0071] The nature of the resilient materials, together with the shape of the elements 3, 4, gives the elements 3, 4 a desired flexibility.

[0072] Elements 3, 4 are advantageously at least partially flexible, so as not to transmit noise/vibration. Such a result is obtained for example by using elements 3 and 4 made of a material having viscous damping, or $\tan\delta$, at ambient temperature preferably higher than 0.4.

[0073] Furthermore, the device 1 preferably has a density which allows the reduction of the noise transmission from medium frequencies, i.e. the frequencies comprised between 300 Hz and 10000 Hz, 3rd octave bands; preferably such density is comprised between 40 and 60 kg/m^3.

[0074] In the embodiment shown in the enclosed figures, the base portion 2 is advantageously, but not necessarily, made of a different material compared to the elements 3, 4, preferably a more rigid material. Preferably the more rigid material extends partially towards the elements 3, 4; for example, as shown in Figure 3, base portion 2 comprises two appendixes 10, 11 advantageously made in a single-piece construction with portion 2, which at least partially overlaps with elements 3 and 4. Extending portions 10, 11 increase robustness, rigidity and life reliability of the device 1.

[0075] The more rigid material of base portion 2 allows a better connection of the device 1 to the bottom of an appliance, for example to the bottom 51 of the laundry washing machine 50.

[0076] In this case noise reduction device 1 can be advantageously obtained by co-moulding or over-moulding or co-extruding the two materials using known techniques.

[0077] In a further embodiment, the whole device 1 can be made of a single resilient material, for example by extrusion.

[0078] As described previously with reference to Figure 1, four noise reduction devices 1 may be applied to the underside of the bottom 51 of the laundry washing machine 50 so as to extend over the four sides of the bottom 51. There are, therefore, four devices 1 having a given length and suited to almost entirely surround the perimeter of the bottom 51 of the laundry washing machine 50, preferably, but not necessarily, with the exception of the area occupied by the feet 52.

[0079] In a further embodiment, not illustrated, it is possible to use a single noise reduction device 1 applied along the entire perimeter of the bottom of an appliance. In this case the single noise reduction device circumscribes, in a plane view, a closed area. In this embodiment if feet are provided on the bottom of the appliance, these feet can be positioned internally or externally to the closed area circumscribed by the device 1. In both cases, however, the bottom of the appliance is advantageously completely sealed along its entire perimeter.

[0080] In a further embodiment, not illustrated, a single noise reduction device 1 may be applied along part of the perimeter of the bottom of an appliance. For example, if the appliance is a front-loading laundry washing machine 50 with a rectangular bottom 51, a single noise reduction device 1 may be applied along only three sides of the bottom 51, for example along the frontal side (i.e. the side which, when the laundry washing machine is placed on a floor, faces the user during the loading/unloading procedure of the laundry washing machine) and along the lateral sides of the bottom.

[0081] Figure 5 shows a particular arrangement of the

laundry washing machine 50 on a floor F that is not horizontal. By using the adjustable feet 52 it is possible to position the laundry washing machine 50 correctly and stably even on such a not flat floor F.

[0082] The noise reduction devices 1 applied to the bottom 51 on the four sides thereof, three of which are visible in the Figure 5, allows closing the gap S existing between the bottom 51 of the laundry washing machine 50 and the floor F, so as to achieve the desired reduction in the noise emissions from the bottom 51 towards the outside.

[0083] As shown in Figure 5, different regions of the device 1 may deform in different ways according to the shape of the floor F which these region contact.

[0084] For example, with reference to Figure 5, the noise reduction device on the left, numbered 1a, is in contact with the floor F and is in a slightly compressed condition. The external surfaces 7, 8 are in contact with the floor F, guaranteeing adherence and sealing the gap S (Figure 5A).

[0085] The noise reduction device on the right in Figure 5, numbered 1b, is in contact with the floor F and is in a more compressed condition, so that it can adapt to the smaller gap S' (Figure 5B) between the bottom 51 and the floor F. The external surfaces 7, 8 are in contact with the floor F, guaranteeing adherence and sealing the gap S' .

[0086] The noise reduction device at the centre in Figure 5, numbered 1c, adapts to the conditions of the floor F and is slightly compressed at its left side and more compressed at its right side so as to adapt to the variable height of the gap S existing between the bottom 51 and the floor F. The external surfaces 7, 8 of device 1c are, however, substantially always in contact with the floor F along the entire length of the device 1 and guarantee its adherence and tightness.

[0087] Figures 6A and 6B illustrate a noise reduction device 1 according to the invention in two different operative conditions.

[0088] Figure 6A shows an example of a possible condition of the noise reduction device 1 after the appliance to which it is associated (e.g. laundry washing machine 50) has been moved sideways, with respect to the floor F to which the appliance is positioned, along a first direction D1.

[0089] Following this movement the distal portion 4b of element 4 has been moved away from the distal portion 3b of element 3, so that external surface 8 of element 4 doesn't adhere against the floor F; in this condition element 4 operates in an unfavourable condition (i.e. its noise reduction effect is lower) compared to the ideal initial condition indicated by a dashed line in the figure, so that suitable adherence to the floor F is not guaranteed. However, the other element 3, thanks to its flexibility and shape, maintains its external surface 7 adhering against the floor F. Element 3, therefore, guarantees that the gap S is perfectly sealed even if element 4 doesn't perfectly adhere to the floor F, and therefore element 3 guarantees the effectiveness of the device 1 in reducing noise.

[0090] Figure 6B, instead, shows the arrangement of the device 1 after the appliance to which it is associated (e.g. laundry washing machine 50) has been moved sideways along a second direction D2 opposite the first direction D1.

[0091] Following this movement the distal portion 3b of element 3 has been moved away from the distal portion 4b of element 4, so that external surface 7 of element 3 doesn't adhere against the floor F; in this condition element 3 operates in an unfavourable condition compared to the ideal initial condition indicated by a dashed line in the figure, so that suitable adherence to the floor F is not guaranteed. However, the other element 4, thanks to its flexibility and shape, maintains its external surface 8 adhering against the floor F. Element 4, therefore, guarantees that the gap S is perfectly sealed even if element 3 doesn't perfectly adhere to the floor F, and therefore in this condition element 4 guarantees the effectiveness of the device 1 in reducing noise.

[0092] Therefore, whatever the movement to which the appliance to which the noise reduction device 1 is associated (e.g. washing machine 50) is subjected, there will always be one of the two elements 3 or 4 in contact with and adhering to the floor F, so as to guarantee effective and constant noise reduction.

[0093] The converging shape of the distal portions 3b, 4b of elements 3, 4 is particularly effective in obtaining this advantageous effect of the invention.

[0094] The same effect advantageously occurs analogously for the devices positioned on any side of the bottom of the appliance.

[0095] Furthermore, the presence of two facing elements 3, 4 gives the device 1 of the invention greater effectiveness and duration. In fact, if one of the two elements 3, 4 is subjected to deterioration or breakage in any point along its extension, the other element facing it guarantees the tightness of that area.

[0096] It has been shown, therefore, that the device 1 guarantees the required noise reduction performance also following movements of the appliance to which it is associated, movements that can be carried out for example for maintenance or repositioning purposes.

[0097] Figure 7 shows a second embodiment of the device 101 of the invention.

[0098] This embodiment differs from the first embodiment previously described in that the elements 103, 104 are made flexible by the proximal portion 103a, 104a comprising a bellows.

[0099] The distal portion 103b, 104b can in this case be made of a not necessarily resilient material and it can even be at least partially rigid, which may, for example, reduce wear of the surface of the distal part 103b, 104b in contact with the floor F.

[0100] Also in this second embodiment the base portion 102 is preferably made of a rigid material.

[0101] In a further embodiment, not illustrated, the

proximal portion 103a, 104a doesn't comprise a bellows, but they are made of a material more resilient than the material of which the distal portion 103b, 104b are made of.

[0102] Figure 8 shows a third embodiment of a noise reduction device 201 according to the invention.

[0103] The noise reduction device 201 advantageously comprises a base portion 202 for connection to an appliance, for example a washing machine 50, and one pair of elements 203, 204 that extend from the base portion 202.

[0104] Also in this embodiment the noise reduction device 210 comprises connecting means for connecting the device 201 to an appliance, for example to the bottom 51 of a laundry washing machine 50. These connecting means may be the same already described above with reference to the first embodiment of the invention. For example the connecting means may comprise an adhesive layer 206, preferably extending for the whole length of the device 201, adapted for ensuring a comfortable and quick application to the bottom of an appliance, for example to the bottom 51 of the laundry washing machine 50.

[0105] Also in this third embodiment elements 203, 204 preferably face each other, and advantageously develop according to a curved pattern. More preferably these elements 203, 204 are one the mirror image of the other and advantageously they are substantially symmetrical with respect to the medial axis X passing through the base portion 202.

[0106] Each element 203, 204 has a proximal portion 203a, 204a and a distal portion 203b, 204b, the latter being the contact portion with the floor F when the appliance to which the device is associated is installed on the Floor F.

[0107] For each element 203, 204 an internal surface 207, 208 is defined, which connects the proximal portion 203a, 204a and the distal portion 203b, 204b. The distal portions 203b, 204b of elements 203, 204 diverge one another.

[0108] The elements 203, 204 have preferably the same length, are advantageously preferably flexible, and may be preferably made of the materials described above with reference to the first embodiment of the invention.

[0109] Also in this case, the base portion 202 may be made of a different material compared to the elements 203, 204, preferably a more rigid material.

[0110] Figures 8A and 8B illustrate a noise reduction device 201 in two different operative conditions.

[0111] Figure 8A shows an example of a possible condition of the noise reduction device 201 after the appliance to which it is associated (e.g. laundry washing machine 50) has been moved sideways, with respect to the floor F to which the appliance is positioned, along a first direction D1.

[0112] Following this movement element 203 has been bent and its distal portion 203b has been moved towards the distal portion 204b of element 204, so that internal surface 207 of element 203 doesn't adhere against the floor F; in this condition element 203 operates in an unfavourable condition (i.e. its noise reduction effect is lower) compared to the ideal initial condition indicated by a dashed line in the figure, so that suitable adherence to the floor F is not guaranteed. However in this condition element 204, thanks to its flexibility and shape, maintains its internal surface 208 adhering against the floor F. Element 204, therefore, guarantees that the gap S is perfectly sealed even if the other element 203 doesn't perfectly adhere to the floor F, and therefore element 204 guarantees the effectiveness of the device 201 in reducing noise.

[0113] Figure 8B, instead, shows the arrangement of the device 201 after the appliance to which it is associated (e.g. laundry washing machine 50) has been moved sideways along a second direction D2 opposite the first direction D1.

[0114] Following this movement the distal portion 204b of element 204 has been moved towards the distal portion 203b of the other element 203, so that internal surface 208 of element 204 doesn't adhere against the floor F; in this condition element 204 operates in an unfavourable condition compared to the ideal initial condition indicated by a dashed line in the figure, so that suitable adherence to the floor F is not guaranteed. However, the other element 203, thanks to its flexibility and shape, maintains its internal surface 207 adhering against the floor F. Element 203, therefore, guarantees that the gap S is perfectly sealed even if the other element 204 doesn't perfectly adhere to the floor F, and therefore in this condition element 203 guarantees the effectiveness of the device 201 in reducing noise.

[0115] Therefore, whatever the movement to which the appliance to which the noise reduction device 201 is associated (e.g. washing machine 50) is subjected, there will always be one of the two elements 203 or 204 in contact with and adhering to the floor F, so as to guarantee effective and constant noise reduction.

[0116] The diverging shape of the distal portions 203b, 204b of the elements 203, 204 is particularly effective in obtaining this advantageous effect of the invention.

[0117] The same effect advantageously occurs analogously for the devices positioned on any side of the bottom of the appliance.

[0118] It has been shown, therefore, that the device 201 guarantees the necessary tightness and consequently the required noise reduction performance also following movements of the washing machine 50.

[0119] Furthermore, the presence of two facing elements 203, 204 gives the device 201 of the invention greater effectiveness and duration. In fact, if one of the two elements 203, 204 is subjected to deterioration or breakage in any point along its extension, the other element facing it guarantees the tightness of that area.

[0120] In the embodiments described above the noise reduction device is advantageously associated with the bottom of a washing machine and extends over the four

sides of said bottom. However, in alternative embodiments of the invention, the device can be applied to individual sides of an appliance, for example only to the front side of the bottom of a built-in laundry washing machine or dishwasher.

[0121] In other cases, the device can be applied to side walls of the appliance, for example to the sides of a refrigerator inserted in a modular kitchen.

[0122] Again, in the embodiments described above the noise reduction device is advantageously provided with two projecting elements having opposing development and the same length.

[0123] In alternative embodiments of the invention, however, the number of said elements may be more than two, and at least two of said elements may preferably have opposing development in order to ensure the desired advantages in terms of noise reduction, as described above.

[0124] Furthermore, said elements may have different length, and in this case they would compress to a different extent when in contact with the floor, without affecting the desired adherence and tightness characteristics.

[0125] It has thus been shown that the present invention allows all the set objects to be achieved. In particular, the invention achieves the object to provide a noise reduction device for appliance, especially laundry washing machines, which substantially maintains its insulation characteristics unchanged, even following movements of the appliance.

[0126] While the present invention has been described with reference to the particular embodiments shown in the figures, it should be noted that the present invention is not limited to the specific embodiments illustrated and described herein; on the contrary, further variants of the embodiments described herein fall within the scope of the present invention, which is defined in the claims.

Claims

1. A noise reduction device (1; 101; 201) for an appliance (50) comprising a base portion (2; 102; 202) for connection to said appliance, **characterized in that** said device (1; 101; 201) comprises at least two at least partially flexible elements (3, 4; 103, 104; 203, 204) positioned side by side and extending from said base portion (2; 102; 202).

2. Device (1; 101; 201) according to claim 1, **characterized in that** said elements (3, 4; 103, 104; 203, 204) have opposing development directions.

3. Device (1; 101; 201) according to according to anyone of the preceding claims, **characterized in that** said elements (3, 4; 103, 104; 203, 204) comprise corresponding proximal portions (3a, 4a; 103a, 104a; 203a, 204a) and distal portions (3b, 4b; 103b, 104b; 203b, 204b) in relation to said base portion (2; 102; 202), wherein said distal portions (3b, 4b; 103b, 104b; 203b, 204b), in the direction away from said base portion (2; 102; 202), have opposing development directions.

4. Device (1; 101) according to claim 3, **characterized in that** said distal portions (3b, 4b; 103b, 104b) of said elements (3, 4; 103, 104) converge one another.

5. Device (201) according to claim 3, **characterized in that** said distal portions (203b, 204b) of said elements (203, 204) diverge one another.

6. Device (101) according to according to anyone of the preceding claims, **characterized in that** only a portion (103a, 104a) of said elements (103, 104) is flexible.

7. Device (1; 101; 201) according to anyone of the preceding claims, **characterized in that** at least one of said elements (3, 4; 103, 104; 203, 204) comprises an arched portion.

8. Device (1; 101; 201) according to anyone of the preceding claims, **characterized in that** both said elements (3, 4; 103, 104; 203, 204) comprise an arched portion.

9. Device (1; 101; 201) according to anyone of the preceding claims, **characterized in that** said base portion (2; 102; 202) is more rigid than said elements (3, 4; 103, 104; 203, 204).

10. Device (1; 101; 201) according to anyone of the preceding claims, **characterized in that** said base portion (2; 102; 202) and said elements (3, 4; 103, 104; 203, 204) are produced through a co-moulding process or over-moulding process or co-extruding process.

11. Device (1; 101; 201) according to anyone of the preceding claims, **characterized in that** it comprises connection means (6; 206) for connection to said appliance (50).

12. An appliance (50) comprising a noise reduction device (1; 101; 201) according to anyone of the preceding claims.

13. Appliance (50) according to claim 12, **characterized in that** said noise reduction device (1; 101; 201) is applied to at least one side of the bottom (51) of said appliance (50), in order to close a gap (S, S') between said bottom (51) and the floor (F) on which said appliance (50) rests.

14. Appliance (50) according to claim 12 or 13, **characterized in that** it comprises a connection portion suit-

able for the connection of said noise reduction device (1; 101; 201).

15. Appliance (50) according to any claims from 12 to 14, **characterized in that** of being a laundry washing machine.

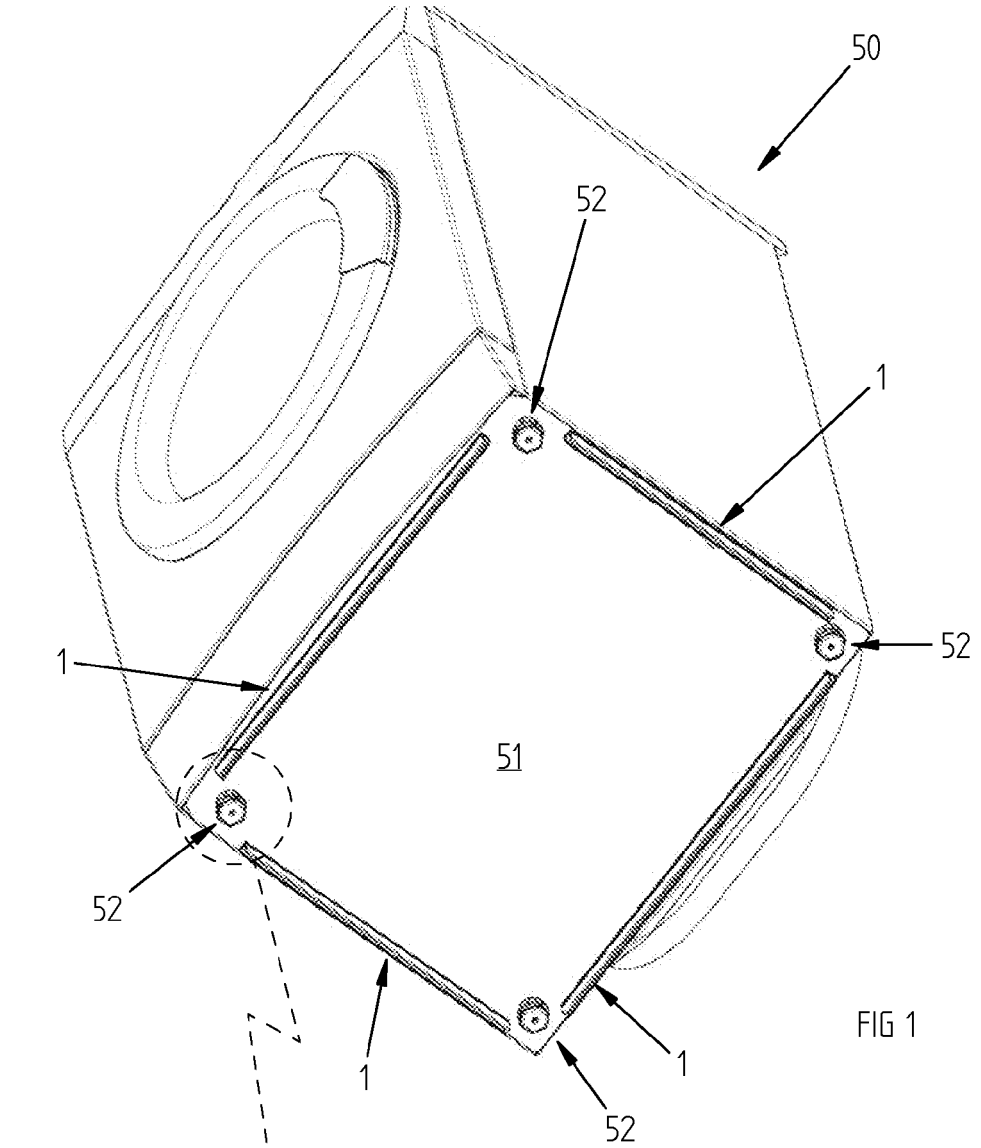

FIG 1

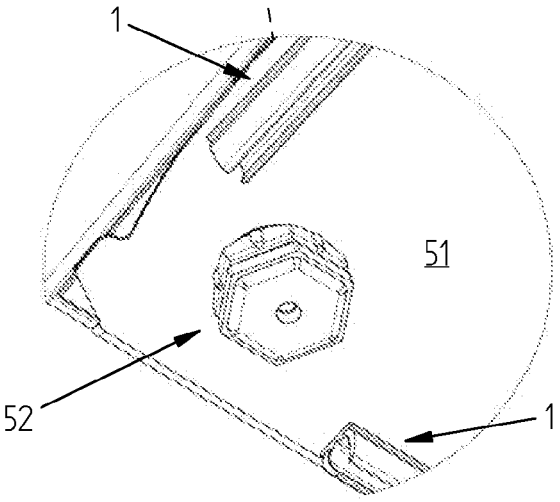

FIG 1A

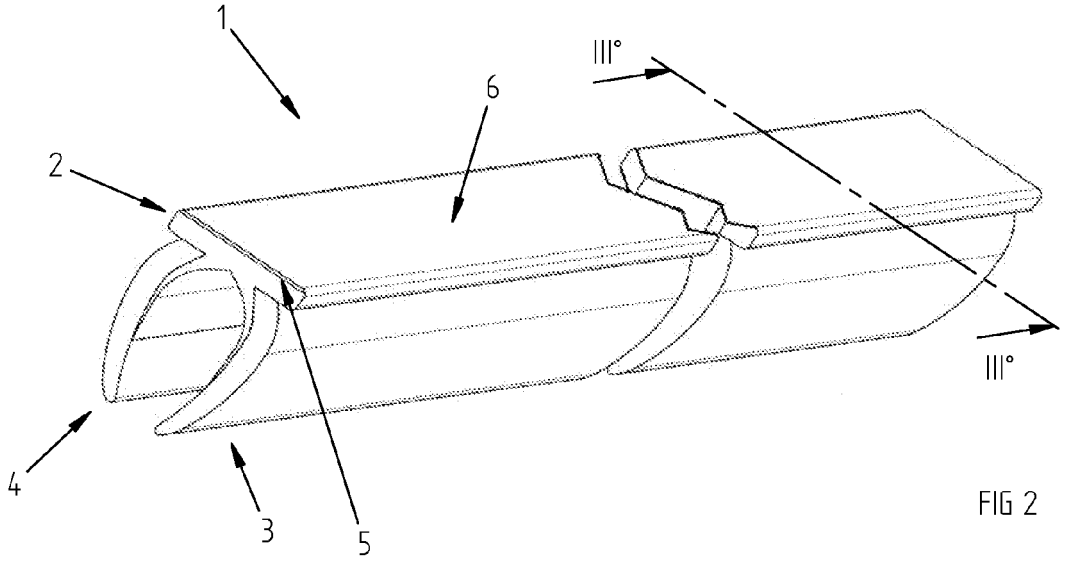

FIG 2

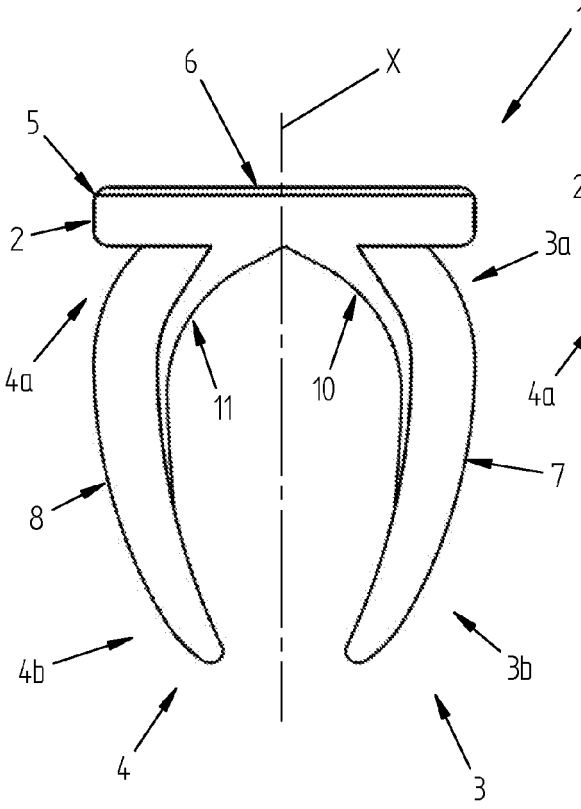

FIG 3

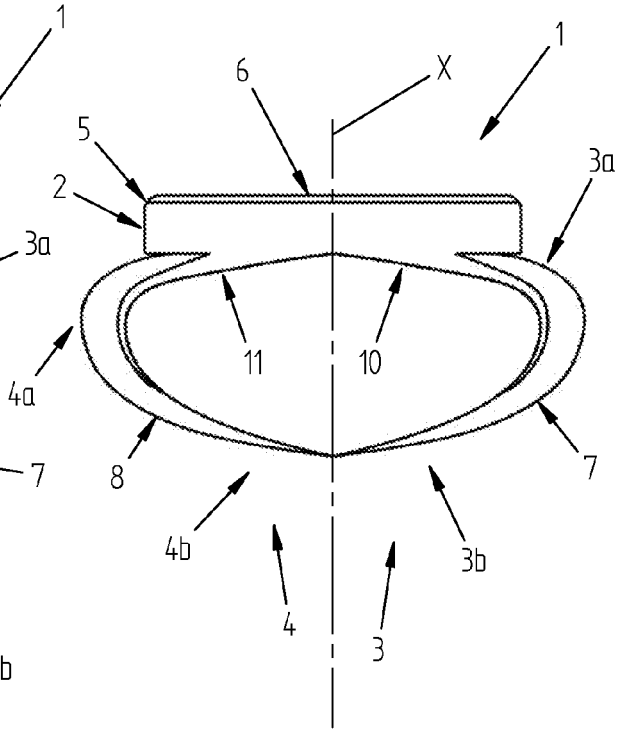

FIG 4

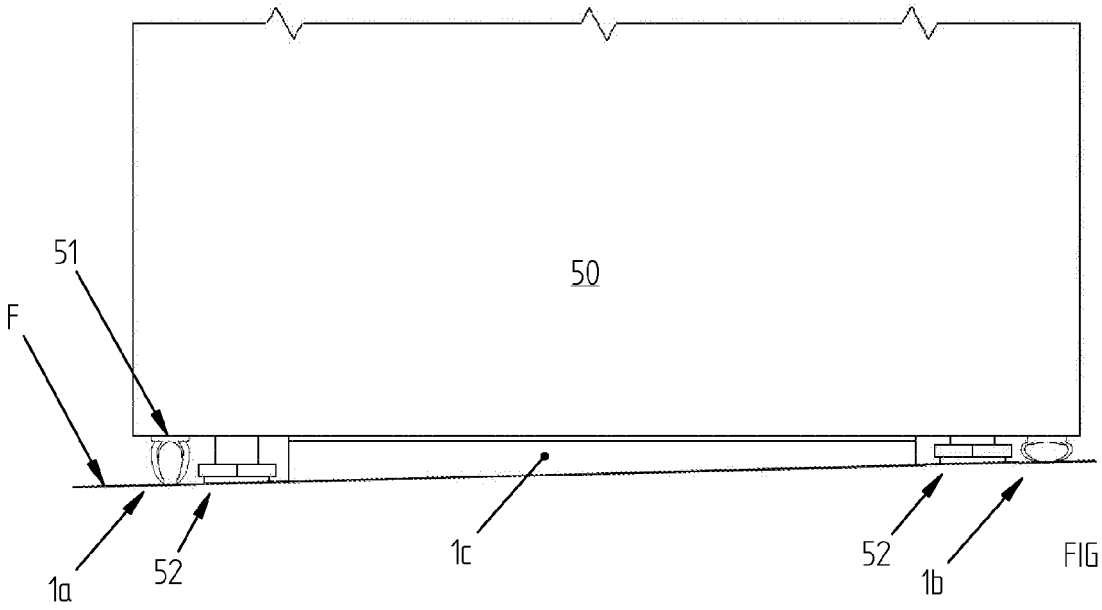

FIG 5

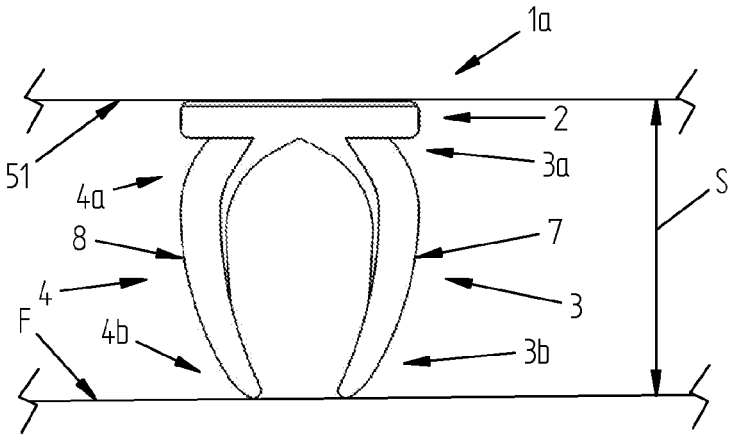

FIG 5A

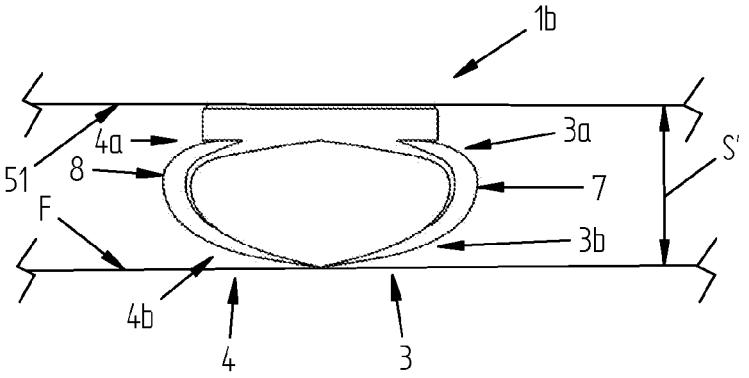

FIG 5B

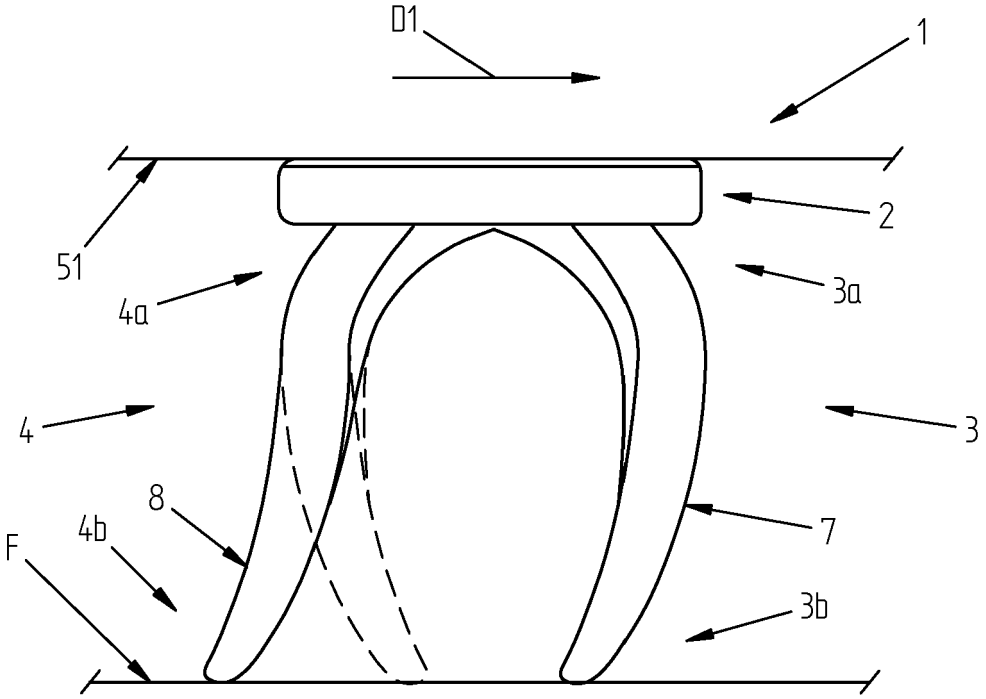

FIG 6A

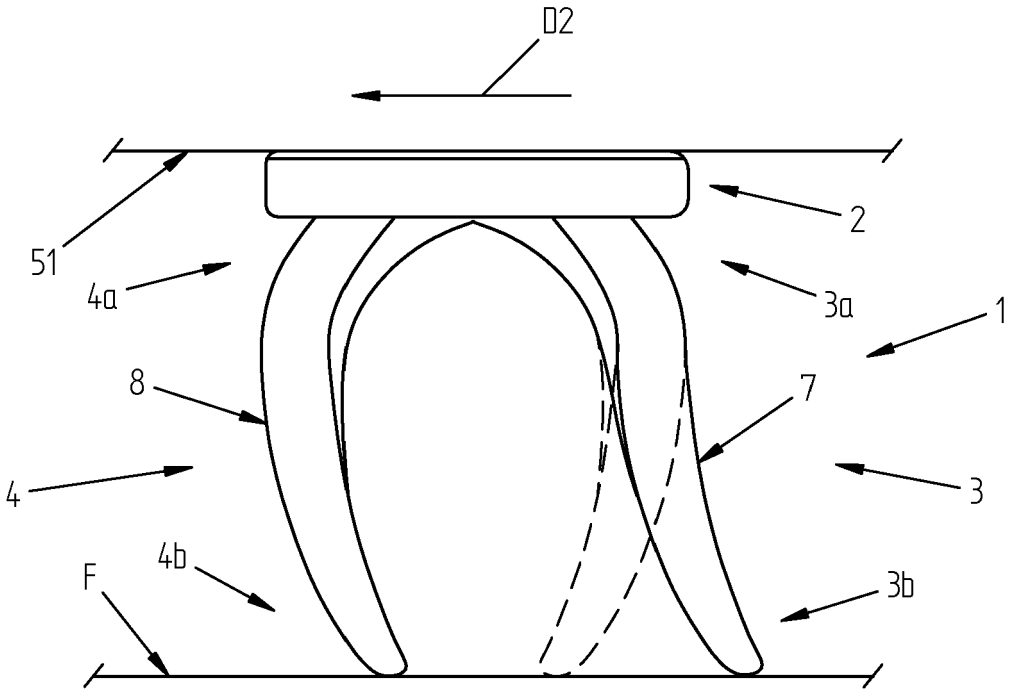

FIG 6B

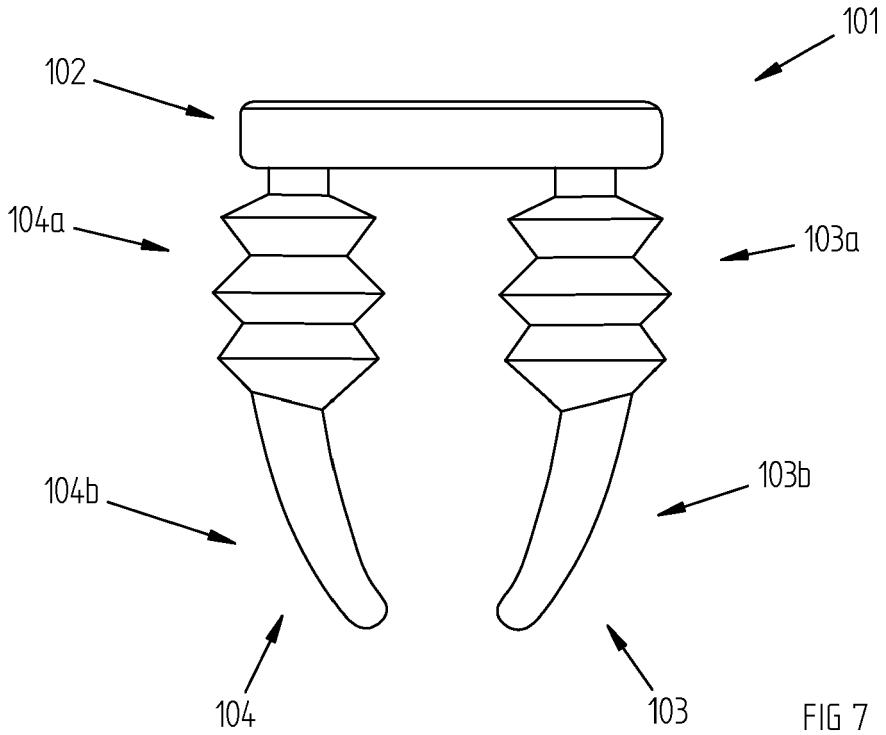
101
102
104a
103a
104b
103b
104
103

FIG 7

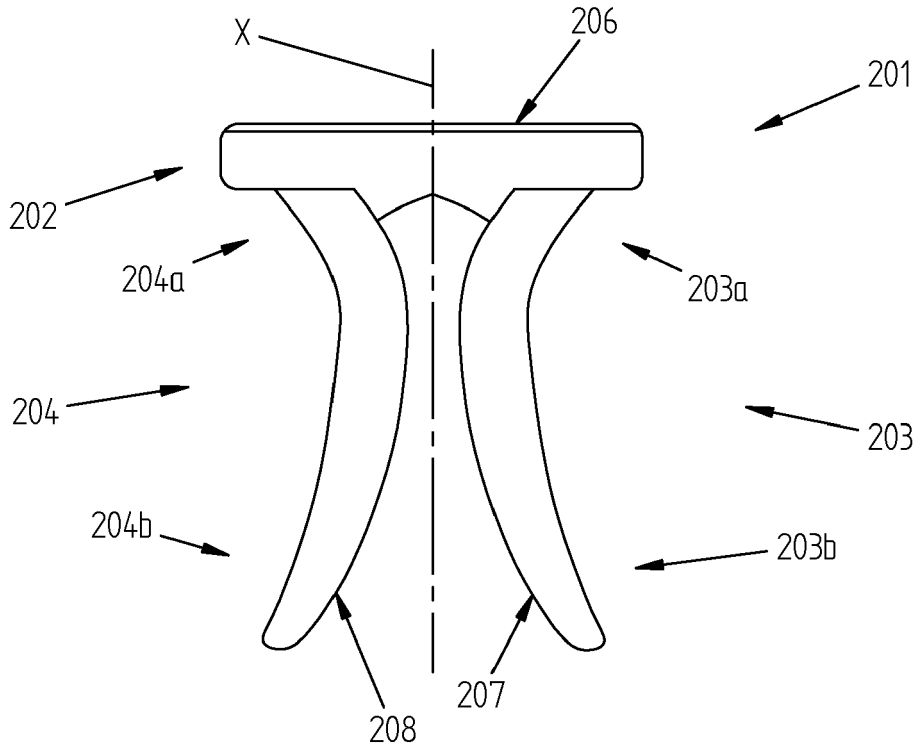
X
206
201
202
204a
203a
204
203
204b
203b
208
207

FIG 8

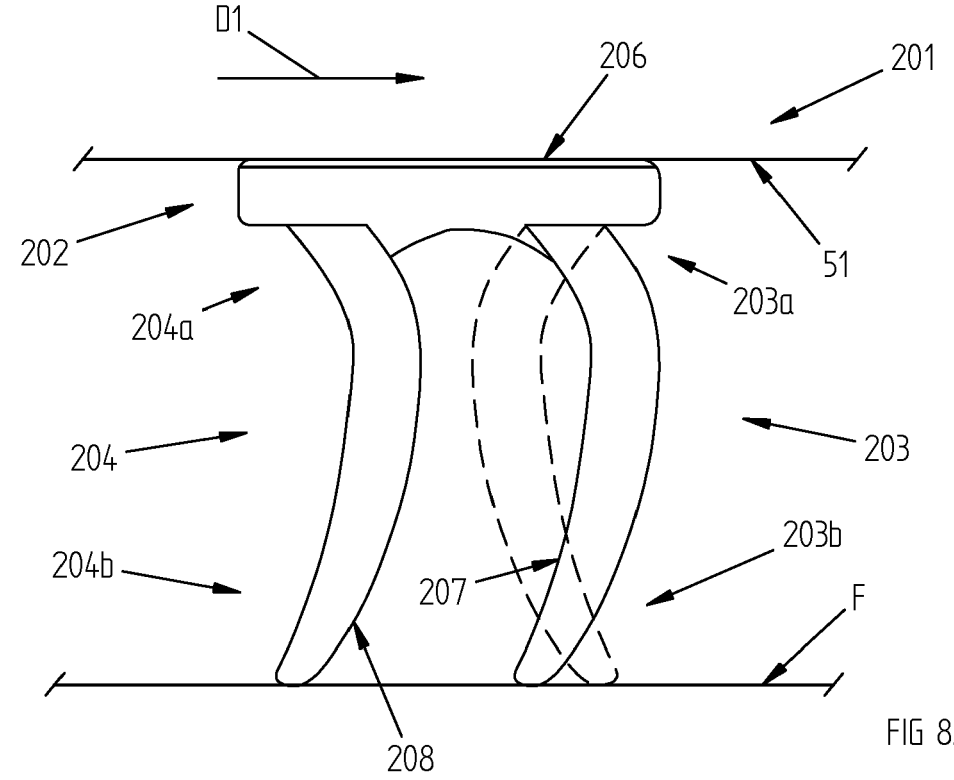
D1
206
201
202
51
203a
204a
204
203
204b
207
203b
F
208

FIG 8A

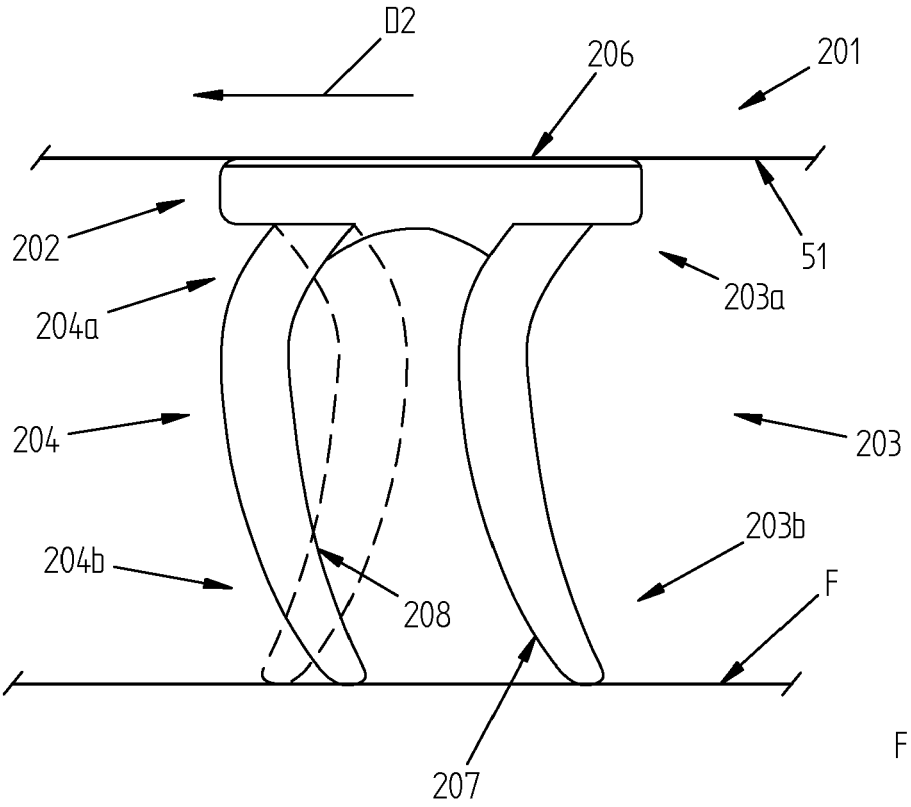
D2
206
201
202
51
203a
204a
204
203
204b
208
203b
F
207

FIG 8B

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EUROPEAN SEARCH REPORT

Application Number
EP 10 19 6732

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 99/20825 A1 (OWENS CORNING FIBERGLASS CORP [US]; HERREMAN KEVIN MICHAEL [US]; WALSH) 29 April 1999 (1999-04-29) * page 15, line 15 - line 24 * * page 15, line 33 - page 16, line 4; figures 7, 8 *	1-3,6,9, 11-15	INV. D06F39/12
A	WO 98/30831 A1 (OWENS CORNING FIBERGLASS CORP [US]) 16 July 1998 (1998-07-16) * abstract; figures 1, 2 *	1-15	
A,D	WO 2005/049910 A1 (ARCELIK AS [TR]; BAHADIR AYDIN [TR]) 2 June 2005 (2005-06-02) * abstract; figures 1-3 *	1-15	

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D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 May 2011	Westermayer, Wilhelm

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30-05-2011

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- WO 2005049910 A **[0009] [0013]**