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(54)

COOKTOP UNIT WITH INTEGRATED EXTRACTOR HOOD

- (57)

A unit (100) comprises a cooktop (1), an extractor hood (2), and a filter (3) arranged in an extraction opening (11) of the cooktop; wherein the filter (3) comprises a first filtering element (4) made of an electrically conductive material, a second filtering element (5), made of an electrically conductive material, a spacer (6) made of an electrically insulating material and suitable for letting the air pass through, it being arranged between the first filtering element (4) and the second filtering element (5); control means (91) send a control signal (S) to an electric motor (23) of the extractor hood in order to stop it when detection means (9) detect an electrical connection between the first filtering element (4) and the second filtering element (5).

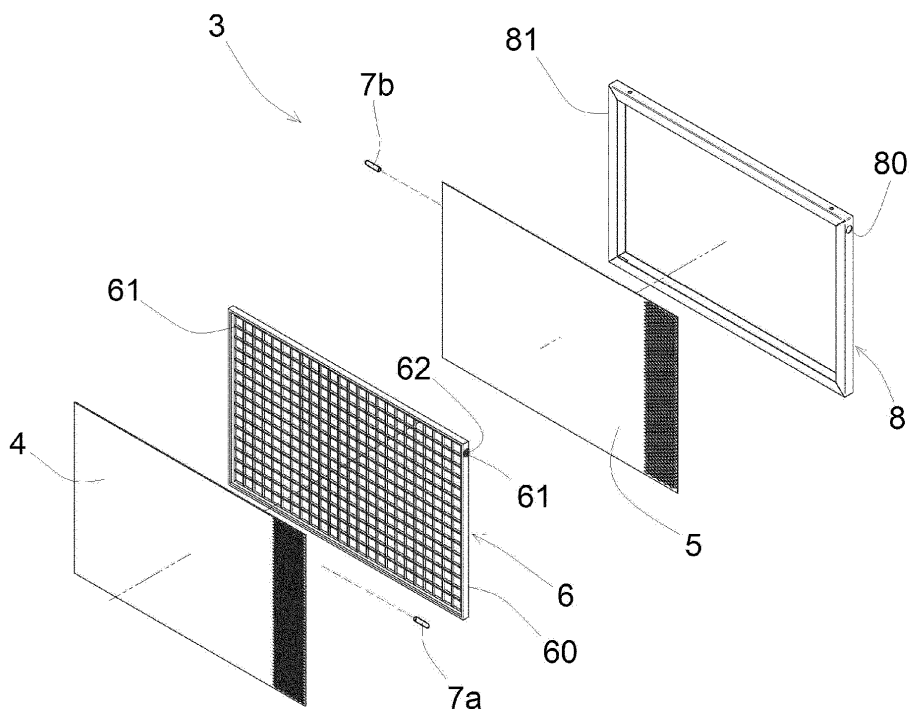


FIG. 2

Description

[0001] The present invention relates to a cooktop unit with an integrated extraction hood.

[0002] Extractor hoods integrated into a cooktop for kitchens are known. Such types of extractor hoods comprise an extraction system arranged under the cooktop in communication with an opening of the cooktop, in such a way that the fumes generated when cooking foods are extracted downwardly through the opening of the cooktop. A filter, generally comprising a plurality of mesh-shaped filtering elements, is arranged in the opening of the cooktop, said filter being suitable for extracting the air, filtering the fats contained in the extracted fumes, and preventing the passage of solid particles with a larger diameter than the holes of the meshes of the filtering element.

[0003] A drawback of such types of extractor hoods integrated in the cooktop consists in the fact that liquids may fall onto the cooktop frequently during the operation of the cooktop and of the extractor hood. By way of example, reference is made to the frequent case in which the water contained in a pot starts boiling, increasing its volume and spilling outside the pot disposed onto the cooktop.

[0004] If a liquid falls onto the cooktop while the extractor hood is operating, the liquid is inevitably extracted through the filter of the extractor hood, reaching and damaging the extraction system.

[0005] In fact, it should be considered that an extraction system of an extractor hood generally comprises a fan driven by an electric motor, which is obviously damaged in case of contact with a liquid.

[0006] The purpose of the present invention is to eliminate the drawbacks of the prior art by providing a cooktop unit with an integrated extractor hood that is capable of detecting the fall of liquids onto the cooktop to stop the operation of the extractor hood.

[0007] Another purpose is to provide a filter for an extractor hood integrated into the cooktop that is capable of detecting the fall of liquids onto the cooktop and at the same time is efficient, versatile, reliable, and easy to make and install.

[0008] These purposes are achieved in accordance with the invention with the features of the appended independent claims.

[0009] Advantageous achievements of the invention appear from the dependent claims.

[0010] Further features of the invention will appear clearer from the following detailed description, referring to its purely illustrative and therefore non-limiting embodiments, illustrated in the appended drawings, wherein:

Fig. 1 is a schematic perspective view of a cooktop unit with integrated extractor hood according to the invention;

Fig. 2 is an exploded perspective view of a first embodiment of a filter for the extractor hood of Fig. 1;

Fig. 3 is a partially sectioned schematic view of the filter of Fig. 2 in assembled condition;

Fig. 4 is a block diagram illustrating the operation of the unit according to the invention;

Fig. 5 is a block diagram illustrating a possible embodiment of the detection means and of the control means of the block diagram in Fig. 4;

Fig. 6 is an exploded perspective view of a second embodiment of a filter for the extraction hood of Fig. 1;

Fig. 7 is a partially sectioned schematic view of the filter of Fig. 7 in assembled condition;

Fig. 7A is an enlarged view of the part enclosed in the circle A of Fig. 7;

Fig. 8 is an exploded perspective view of a third embodiment of a filter for the extraction hood of Fig. 1; Fig. 9 is a sectioned view of the filter of Fig. 8 in assembled condition;

Figs. 9A and 9B are two enlarged views of the parts enclosed in the circles A and B of Fig. 9, respectively.

[0011] With reference to Fig. 1, a cooktop unit with an integrated extractor hood is illustrated, which is comprehensively indicated with reference numeral 100.

[0012] The unit (100) comprises a cooktop (1) and an extractor hood (2) integrated into the cooktop (1).

[0013] The cooktop (1) comprises stoves (10), such as induction stoves.

[0014] An extraction opening (11) is obtained in the cooktop (1). The extraction opening (11) communicates with a housing (20) disposed under the cooktop (1). An extraction system (21) of the extraction hood is arranged in the housing (20), it being suitable for extracting the air from the extraction opening (11) downwardly. The extraction system (21) comprises a fan (22) and an electric motor (23) that operates the fan.

[0015] A filter (3) is arranged in the extraction opening (11). The filter (3) must be suitable for letting the air extracted by the extraction system (21) pass through and at the same time retain the fats contained in the fumes extracted by the extractor hood and the solid particles with a given diameter. The filter (3) is removably mounted in the extraction opening (11) in such a way that it can be removed, cleaned and/or replaced.

[0016] Referring to Figs. 2 and 3, in its simplest version, the filter (3) comprises:

- a first filtering element (4), made of an electrically conductive material,
- a second filtering element (5) made of an electrically conductive material, and
- a spacer (6) made of an electrically insulating material and suitable for letting the air pass through, it being arranged between the first filtering element (4) and the second filtering element (5) in such a way to electrically isolate the first filtering element (4) from the second filtering element (5).

[0017] In view of the above, the first filtering element (4) and the second filtering element (5) operate as two electrical contacts of a normally open switch or as two armatures of a capacitor, in which the spacer (6) operates as dielectric between the armatures of the capacitor.

[0018] The first filtering element (4) and the second filtering element (5) are preferably made of a conductive metal material, such as aluminum or stainless steel. By way of example, the first filtering element (4) and the second filtering element (5) are in the shape of a mesh with diamond-shaped slots having a side of 6 mm. In addition, the first filtering element (4) and the second filtering element (5) have a thickness comprised in the range of 0.5-1.5 mm.

[0019] The spacer (6) is made of an insulating plastic material, preferably a rigid plastic material, such as ABS (acryl-butyl-styrene) or PVC (polyvinyl chloride). The spacer (6) has a grid shape with square slots having a side of about 10 mm. The spacer (6) has a thickness of 2 mm.

[0020] A first pin (7a) is electrically connected to the first filtering element (4), and a second pin (7b) is electrically connected to the second filtering element (5).

[0021] The spacer (6) can be used for the connection of the pins (7a, 7b). In fact, the spacer (6) has a perimeter edge (60). Two shanks (61) provided with respective holes (62) in communication with the first filtering element (4) and the second filtering element (5), respectively, may be provided in the perimeter edge (60). In this way, by inserting the pins (7a, 7b) into the shanks (61) of the spacer, the pins (7a, 7b) respectively go in contact with the first filtering element (4) and the second filtering element (5).

[0022] The filter (3) may also comprise a frame (8) in the form of a perimeter frame that retains and supports the filtering elements (4, 5) and the spacer (6) in package configuration. The frame (8) may be made of an insulating material in such a way not to create an electrical bridge between the first filtering element (4) and the second filtering element (5). In such a case, the frame (8) has two holes (80) that are crossed by the shanks (61) of the spacer, so that the pins (7a, 7b) protrude externally from the frame.

[0023] If the frame (8) is made of an electrically conductive material, such as aluminum, the frame (8) may create an electrical bridge between the first filtering element (4) and the second filtering element (5). In such a case, one of the two filtering elements, for example the first filtering element (4), is arranged so as not to go in contact with the frame (8) in such a way to be isolated from the first filtering element. Instead, the second filtering element (5) can be arranged so as to go in contact with the frame (8). In such a case, being in electrical connection with the first filtering element (4), the first pin (7a) must be isolated from the frame (8), whereas the second pin (7b) can be arranged on the frame (8), ensuring the electrical connection with the second filtering element (5).

[0024] With reference to Fig. 4, the two pins (7a, 7b) of the filter (3) are electrically connected to detection means (9) suitable for detecting an electrical connection between the first filtering element (4) and the second filtering element (5). The detection means (9) are connected to control means (91) configured to send a control signal (S) to the electric motor (23) of the extractor hood in order to stop it when the detection means detect an electrical connection between the first filtering element (4) and the second filtering element (5). Otherwise said, the filter (7) operates as a normally open switch that is closed when water passes through the spacer (6) establishing an electrical connection between the first filtering element (4) and the second filtering element (5).

[0025] Referring to Fig. 5, advantageously, the detection means (9) comprise a capacitive detector (90) suitable for detecting a capacity (C) of the capacitor generated by the spacer (6) arranged between the first filtering element (4) and the second filtering element (5).

[0026] Under normal conditions, when the first filtering element (4) is isolated from the second filtering element (5), the capacity measured by the capacitive detector (90) is very low, e.g. comprised between 25 pF and 35 pF. If water falls on the filter (3), the water will pass through the spacer (6). Given that water is an electrical conductor, the water operates as an electrical bridge between the first filtering element (4) and the second filtering element (5). In such a case, the capacity of the capacitor generated by the spacer (6) arranged between the first filtering element (4) and the second filtering element (5) is significantly increased to values greater than 1 nF.

[0027] In such a case, the control device (91) comprises a comparator (92) configured to compare the detected capacity (C) with a preset capacity threshold value (C1). When the detected capacity (C) exceeds the capacity threshold value (C1), the control device (91) sends a control signal (S) to the electric motor (23) of the extractor hood in order to stop it, thus preventing the extraction system (21) of the extractor hood from extracting the water.

[0028] As an alternative to or in addition to the capacitive detector (90), the detection means (9) may comprise an electrical conductivity detector suitable for detecting the electrical conductivity between the first filtering element (4) and the second filtering element (5). Under normal conditions, the detected electrical conductivity is very low because the spacer (6) operates as insulator between the first filtering element (4) and the second filtering element (5). If the water passes through the spacer (6), the electrical conductivity increases significantly, as the water operates as electrical conductor. When the detected electrical conductivity exceeds a preset electrical conductivity threshold value, the control device (91) sends a control signal (S) to the electric motor (23) of the extractor hood in order to stop it, thus preventing the extraction system (21) of the extractor hood from extracting the water.

[0029] With reference to Figs. 6, 7 and 7A, a second

embodiment of the filter (3) is illustrated, in which at least a third filtering element (104) is added in front of the first filtering element. The third filtering element (104) consists of a mesh substantially similar to that of the first filtering element (4) and of the second filtering element (5). Two overlapping third filtering elements (104) are shown in Fig. 2.

[0030] In such a case, being made of an electrically conductive material, the third filtering element (104) is isolated from the first filtering element (4) by means of a second spacer (106) substantially similar to the first spacer.

[0031] In this second embodiment, the frame (8) is made of a conductive material, the first filtering element (4) is isolated from the frame (8), and the second filtering element (5) is in contact with the frame (8). Therefore, the second pin (7b) is arranged in the frame (8).

[0032] With reference to Figs. 8, 9, 9A and 9A, a third embodiment of the filter (3) is illustrated, in which at least a fourth filtering element (105) is added behind the second filtering element (5). The fourth filtering element (105) consists of a mesh substantially similar to that of the first filtering element (4) and of the second filtering element (5). A third filtering element (104) arranged in front of the first filtering element (4) and a fourth filtering element (105) arranged behind the second filtering element (5) are shown in Fig. 8.

[0033] In such a case, being made of an electrically conductive material, the fourth filtering element (105) is isolated from the second filtering element (5) by means of a third spacer (206) substantially similar to the first spacer (6).

[0034] In this third embodiment, the frame (8) is made of a conductive material, the first filtering element (4) is isolated from the frame (8), and the second filtering element (5) is isolated from the frame (8). The spacer (6) has a perimeter edge (60) with two shanks (61) that protrude from the perimeter edge (60) to penetrate respective holes (81) of the frame (8). The shanks (61) have holes (62) into which the pins (7a, 7b) are press-fitted so that the pins (7a, 7b) protrude from the frame (8) in order to be connected to electrical cables.

[0035] Tests were performed on the filter (3) for the purpose of detecting an accidental fall of hot or cold water from the cooktop (1) into the extraction opening (11) so as to stop the electric motor (23) and at the same time ensure a normal steam extraction when the hot water contained in a pot placed on a stove starts boiling. In fact, the passage of saturated or unsaturated steam through the filter (3) must not be detected by the detection device (90) in such a way that the extractor hood (2) may be operated normally.

[0036] Tests were carried out with the filter (3) in clean conditions and after soiling the filter with an emulsion of water and oil: 20 g of oil in 100 g of water, letting the water evaporate in an oven at 50°C for 8 hours. The capacity values (C) measured in these tests remained unchanged.

[0037] Another test was carried out by placing three pots with a total of 1.5 liters of water on three stoves (10) of the cooktop, in order to simulate the extraction of a sufficient quantity of steam. The extractor hood (2) was set at the maximum extraction speed. During a 30-minute operation of the extraction hood, the formation of condensation on the filter (3) was monitored and a proper operation of the detection device (90) was verified, said detection device (90) being calibrated in such a way that the detected capacity (C) did not exceed the capacity threshold value (C1) with the accumulation of steam on the surfaces of the filter (3).

[0038] Finally, a test was carried out after a normal operation of the cooktop (1) with the electric motor (23) of the extractor hood at the maximum extraction speed for a total of 30 minutes, pouring 300 g of water onto the filter (3), in such a way to simulate an accidental water fall. Under this condition, the detection device (90) detected a capacity (C) higher than the capacity threshold value (C1), and therefore the electric motor (23) of the extractor hood was switched off by the control device (91).

[0039] Tests were carried out with the filter (3) of Fig. 2, with the filter (3) of Fig. 6 and with the filter (3) of Fig. 8, with the same results.

[0040] Equivalent variations and modifications may be made to the present embodiments of the invention, within the scope of a person skilled in the art, but still within the scope of the invention as expressed by the appended claims.

Claims

1. Unit (100) comprising:

- a cooktop (1) having an extraction opening (11),
- an extractor hood (2) integrated under the cooktop (1) and having an electric motor (23) that actuates an extraction system (21) to extract the air from the extraction opening (11), and
- a filter (3) arranged in said extraction opening (11),

wherein said filter (3) comprises:

- a first filtering element (4) made of an electrically conductive material,
- a second filtering element (5) made of an electrically conductive material,
- a spacer (6) made of an electrically insulating material and suitable for letting the air pass through, it being arranged between the first filtering element (4) and the second filtering element (5) so as to electrically isolate the first filtering element (4) from the second filtering element (5),

wherein said unit (100) further comprises:

- detection means (9) electrically connected to the first filtering element (4) and to the second filtering element (5) to detect an electrical connection between the first filtering element (4) and the second filtering element (5), and
 - control means (91) connected to the detection means (9) and configured to send a control signal (S) to the electric motor (23) of the extractor hood to stop the electric motor (23) when the detection means detect an electrical connection between the first filtering element (4) and the second filtering element (5).
2. The unit (100) according to claim 1, wherein the detection means (9) comprise a capacitive detector (90) suitable for detecting a capacity (C) of a capacitor generated by the spacer (6) disposed between the first filtering element (4) and the second filtering element (5).
 3. The unit (100) according to claim 1 or 2, wherein the detection means (9) comprise an electrical conductivity detector.
 4. The unit (100) according to any one of the preceding claims, wherein said first filtering element (4) and said second filtering element (5) are made of a conductive metal and said spacer (6) is made of an insulating plastic material.
 5. The unit (100) according to claim 4, wherein said first filtering element (4) and said second filtering element (5) are made of aluminum or stainless steel and said spacer (6) is made of ABS (acryl-butyl-styrene) or PVC (polyvinyl chloride).
 6. The unit (100) according to any one of the preceding claims, wherein said first filtering element (4) and said second filtering element (5) have a mesh configuration and said spacer (6) has a grid configuration.
 7. The unit (100) according to any one of the preceding claims, wherein said filter (3) further comprises a frame (8) in the form of a perimeter frame that retains and supports the filtering elements (4, 5) and the spacer (6) in package configuration.
 8. The unit (100) according to claim 7, wherein said frame (8) is made of an electrically insulating material.
 9. The unit (100) according to claim 7 or 8, wherein said frame (8) is made of an electrically conductive material, and the first filtering element (4) is disposed so as not to go in contact with the frame (8) in order to be isolated from the second filtering element (5), and the second filtering element (5) is disposed so as to go in contact with the frame (8) which is connected to said detection means (9).
 10. The unit (100) according to any one of the preceding claims, wherein said filter (3) further comprises a first pin (7a) electrically connected to the first filtering element (4) and a second pin (7b) electrically connected to the second filtering element (5).
 11. The unit (100) according to claim 11, wherein said spacer (6) has a perimeter edge (60) having two shanks (61) provided with respective holes (62) communicating respectively with the first filtering element (4) and the second filtering element (5), said pins (7a, 7b) being respectively inserted into the holes (62) of the shanks (61) of the spacer.
 12. The unit (100) according to any one of the preceding claims, wherein said filter (3) comprises at least a third filtering element (104) disposed opposite the first filtering element (4) and a second spacer (106) disposed between the first filtering element (4) and the third filtering element (104).
 13. The unit (100) according to any one of the preceding claims, wherein said filter (3) comprises at least a fourth filtering element (105) disposed behind the second filtering element (5) and a third spacer (206) disposed between the second filtering element (5) and the fourth filtering element (105).

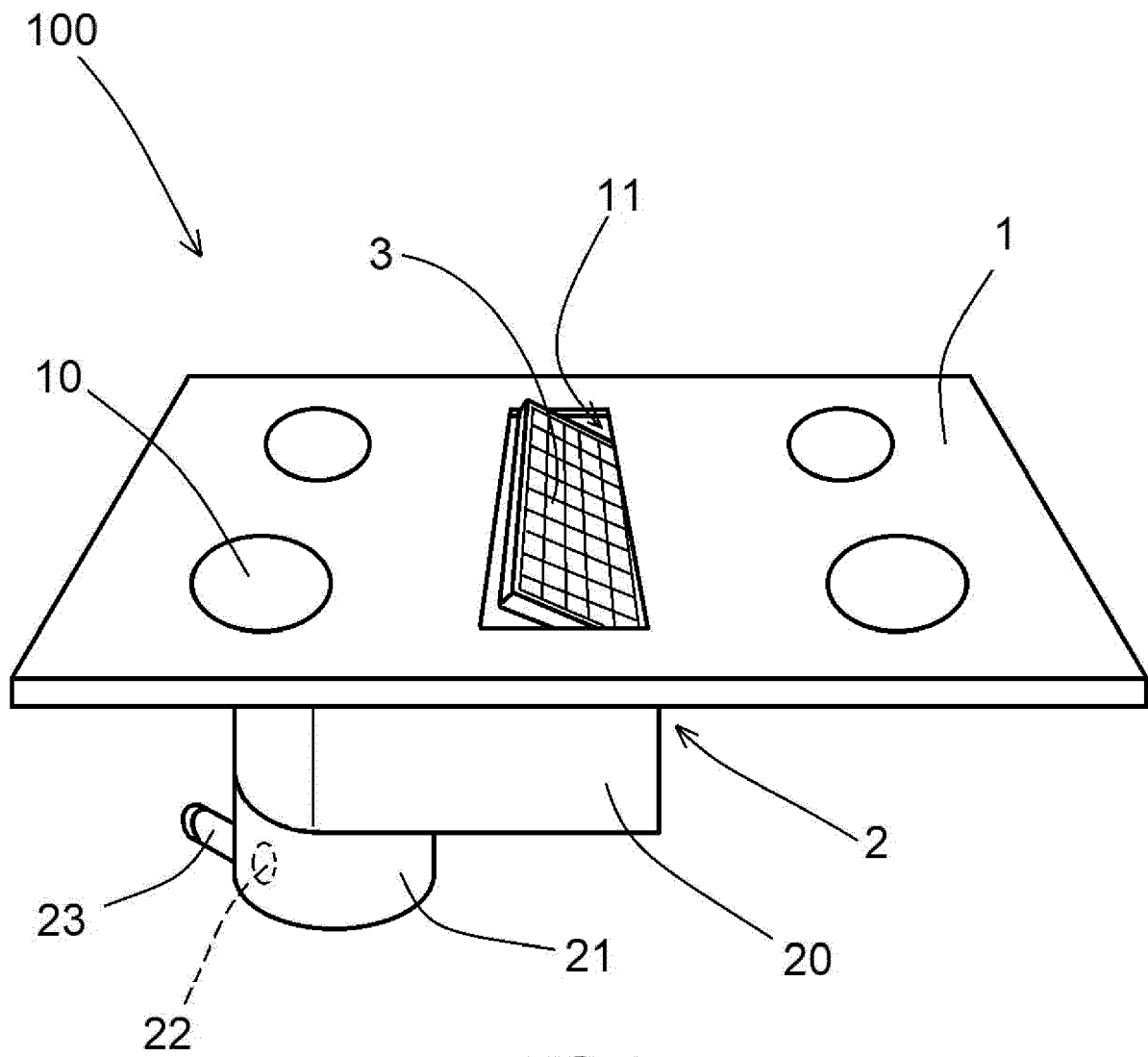


FIG. 1

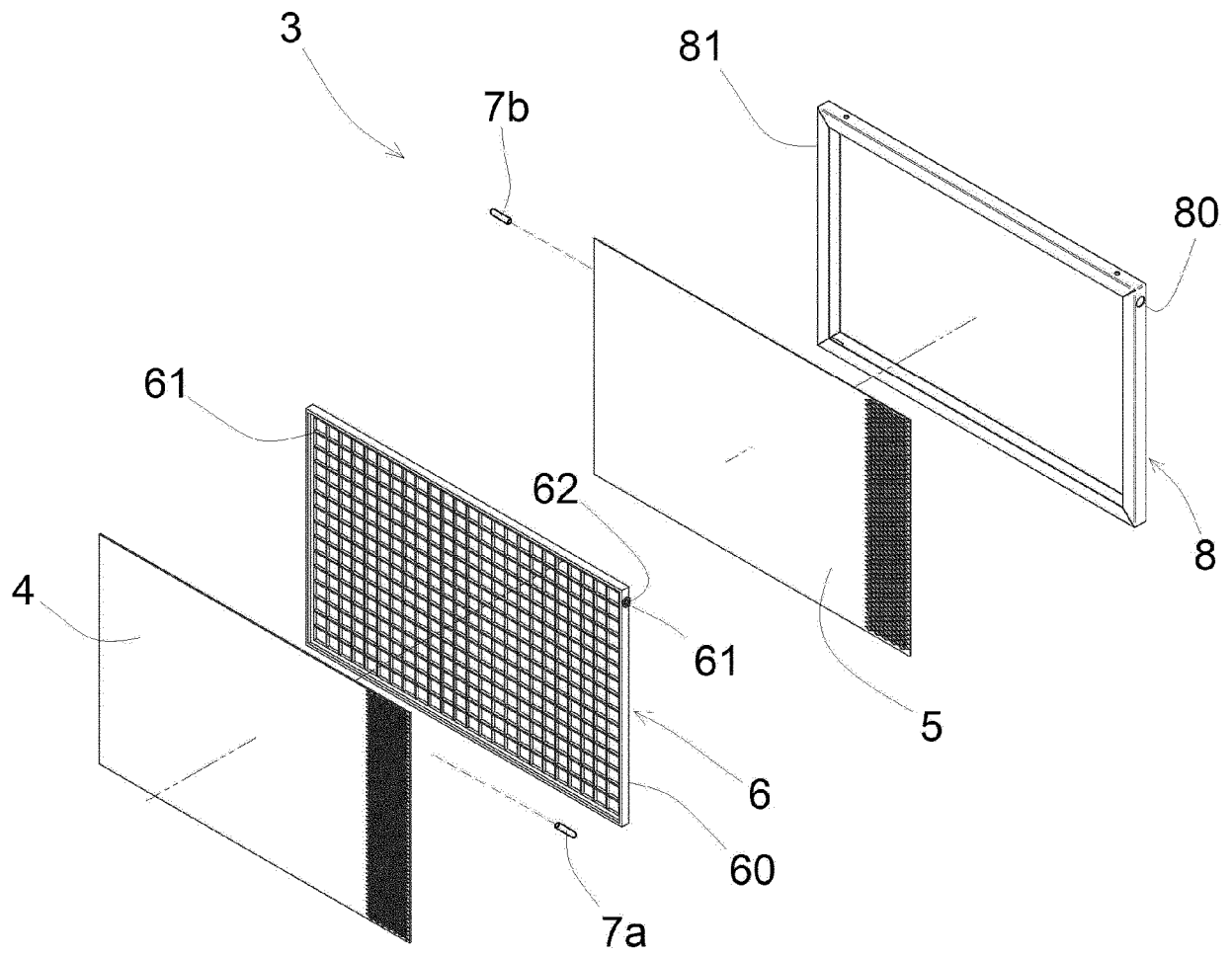


FIG. 2

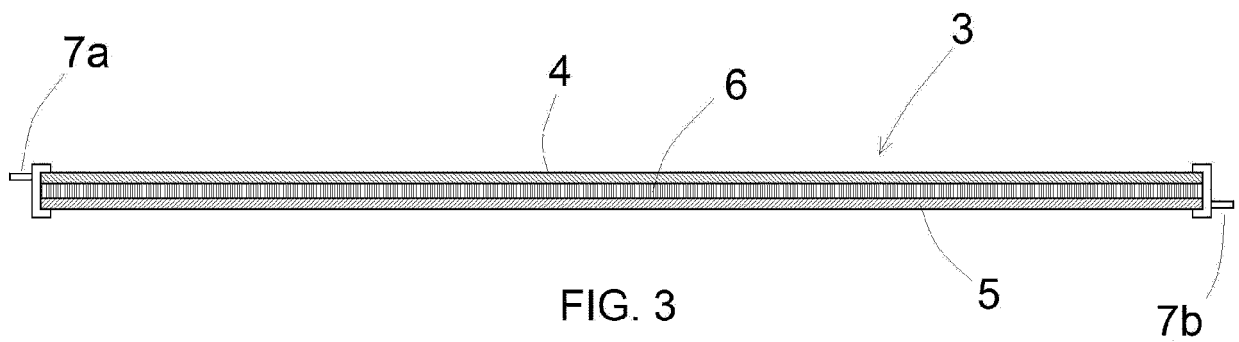


FIG. 3

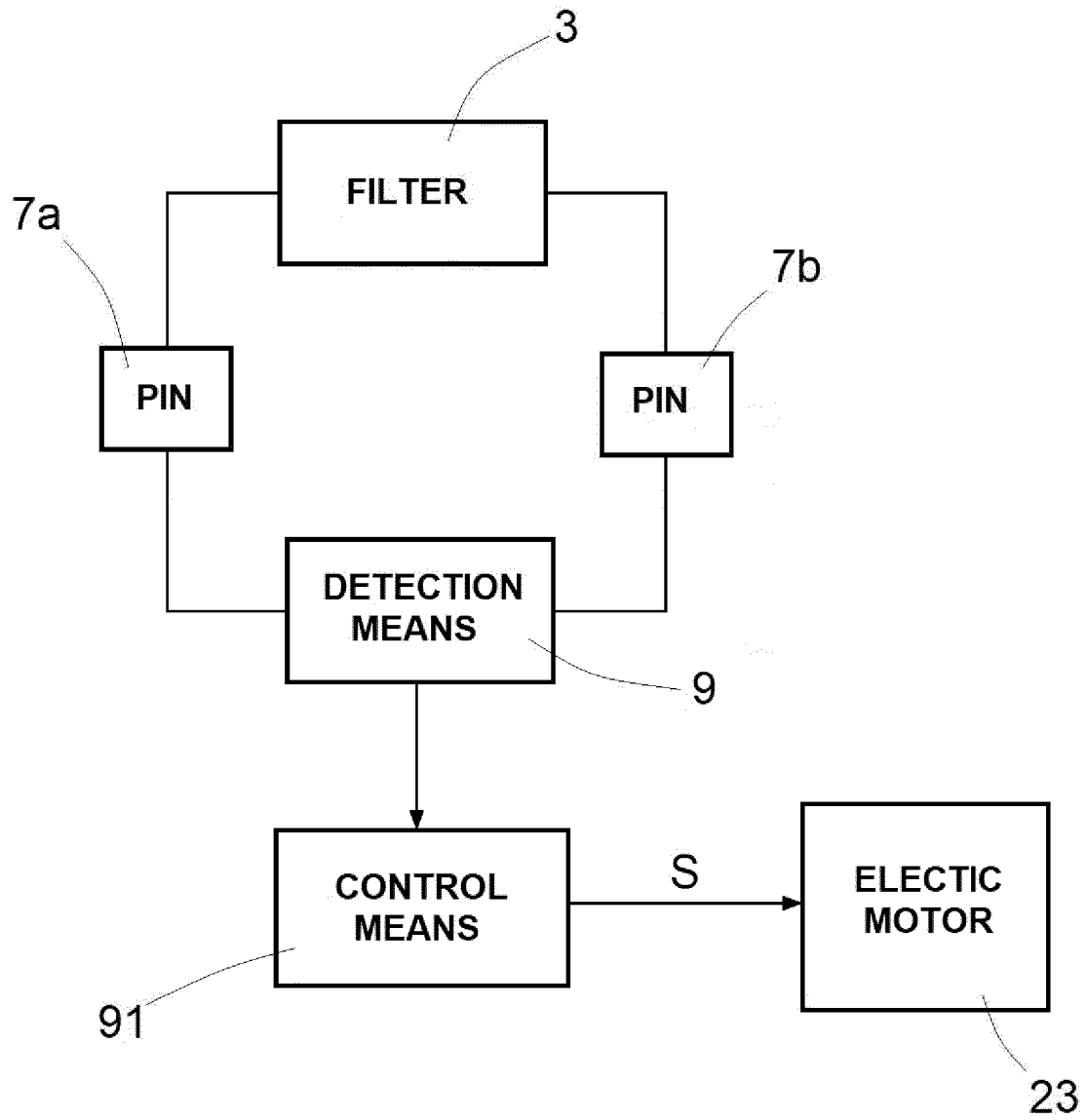


FIG. 4

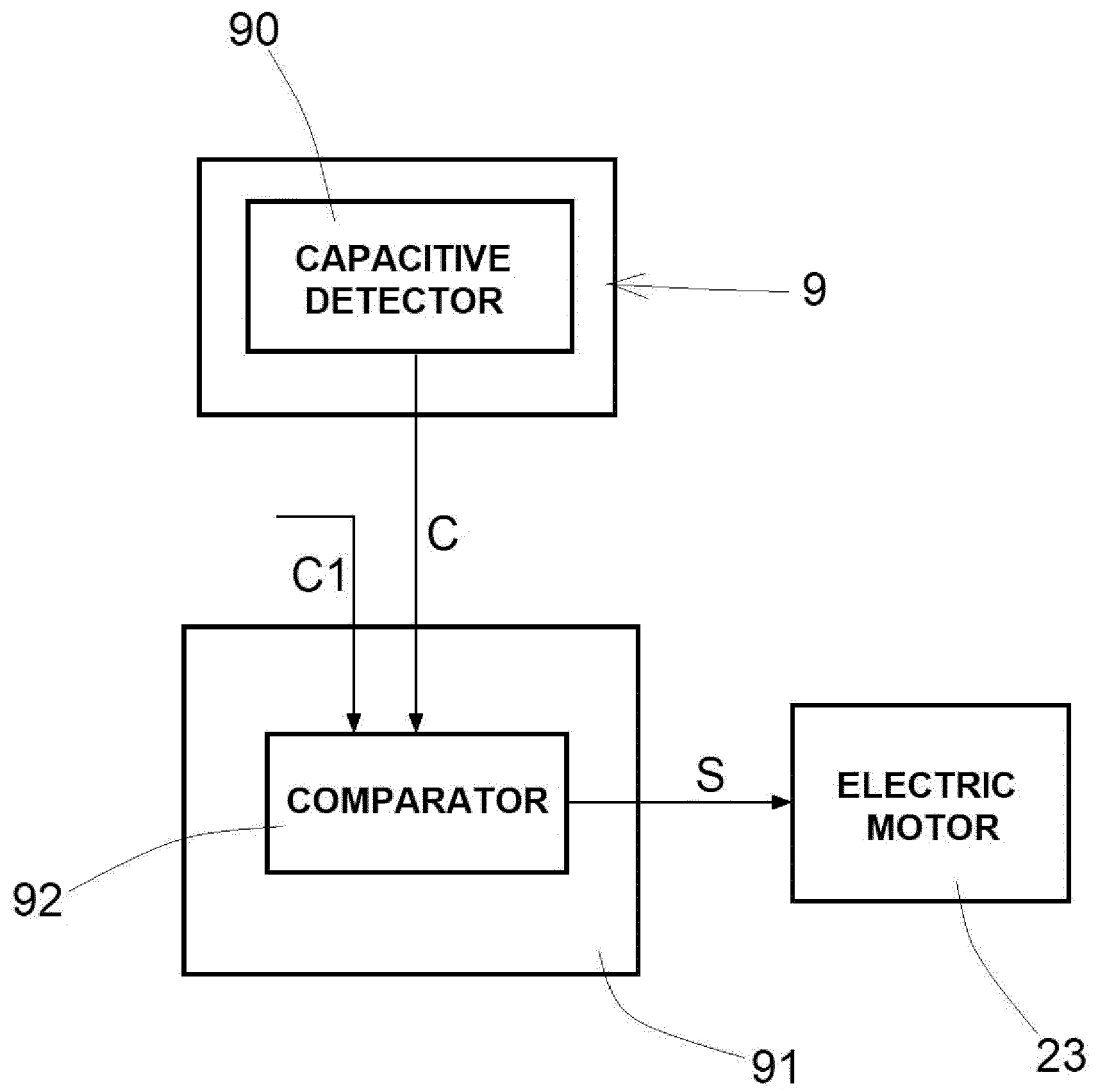


FIG. 5

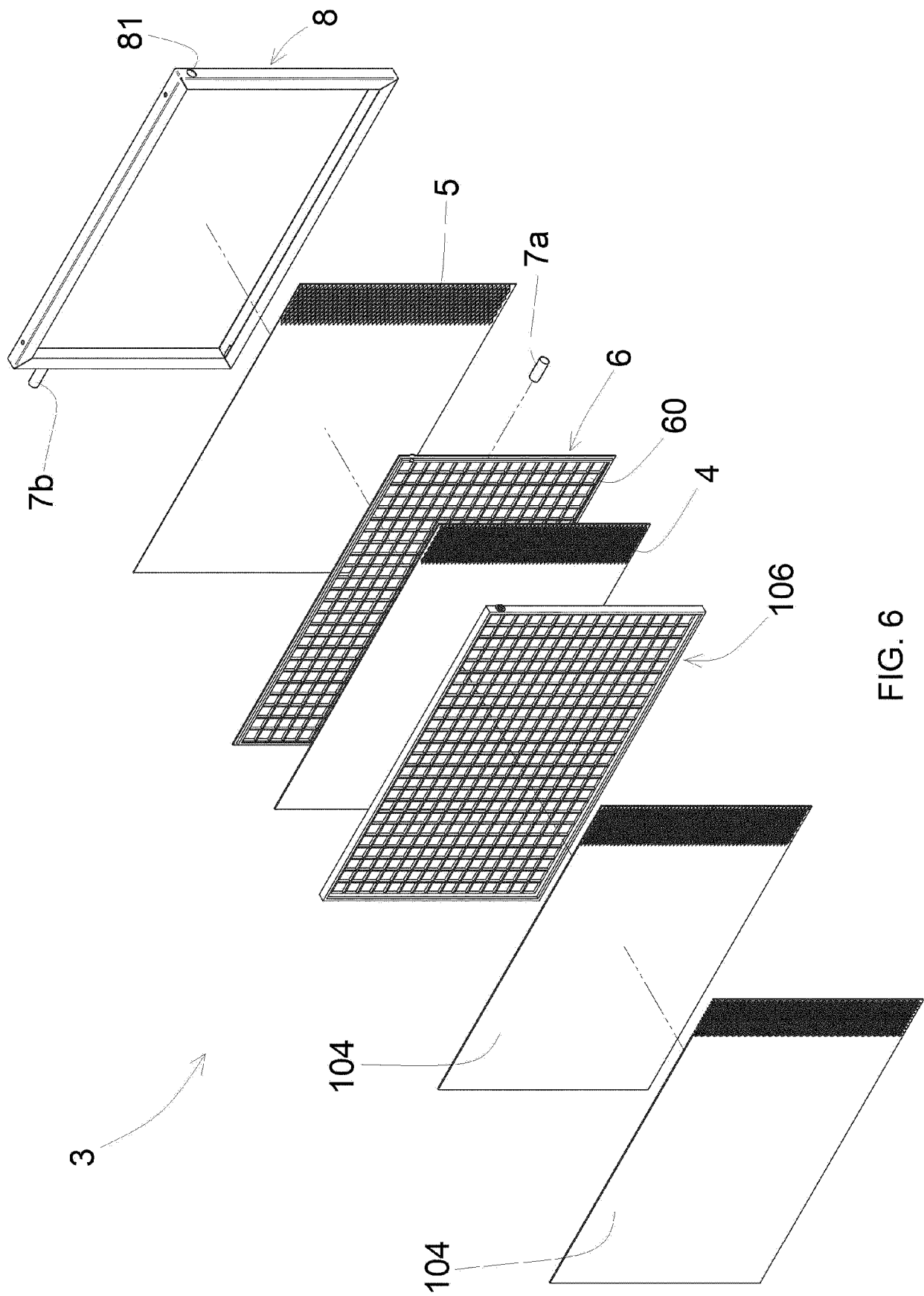
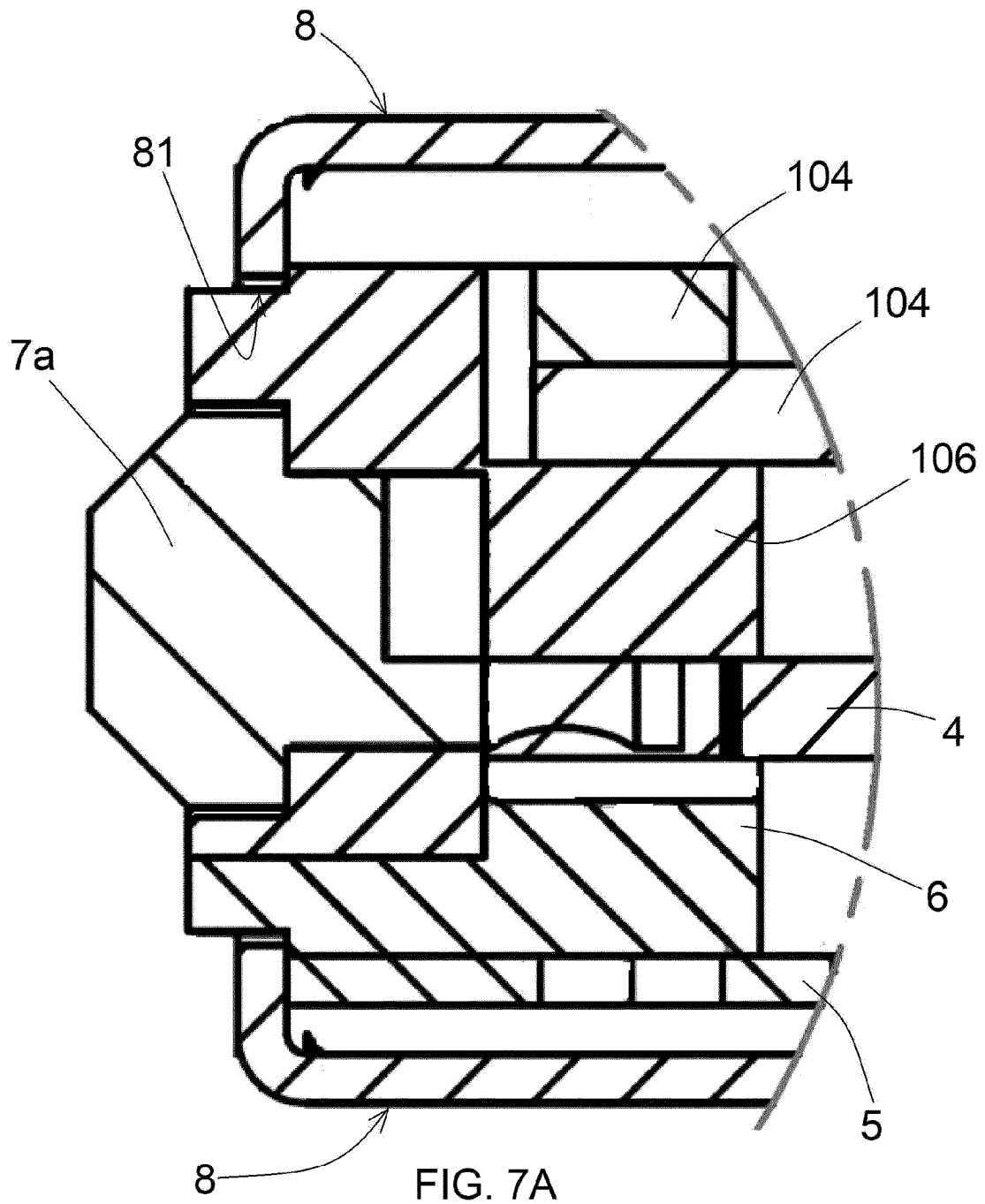
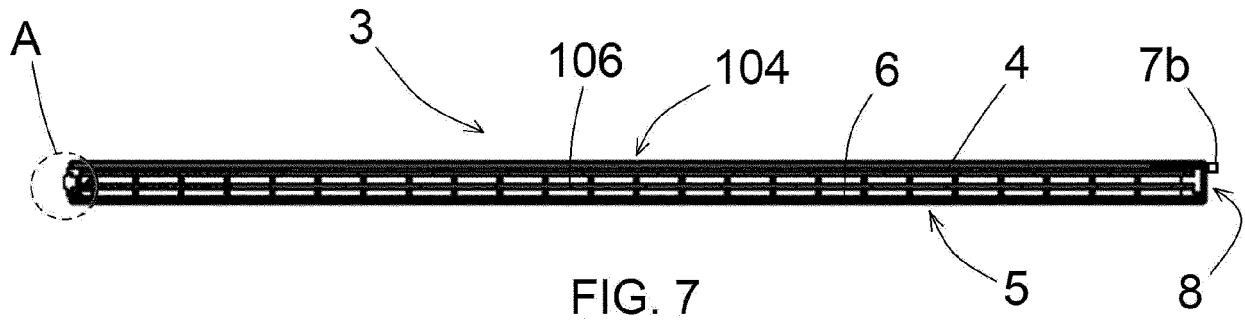


FIG. 6



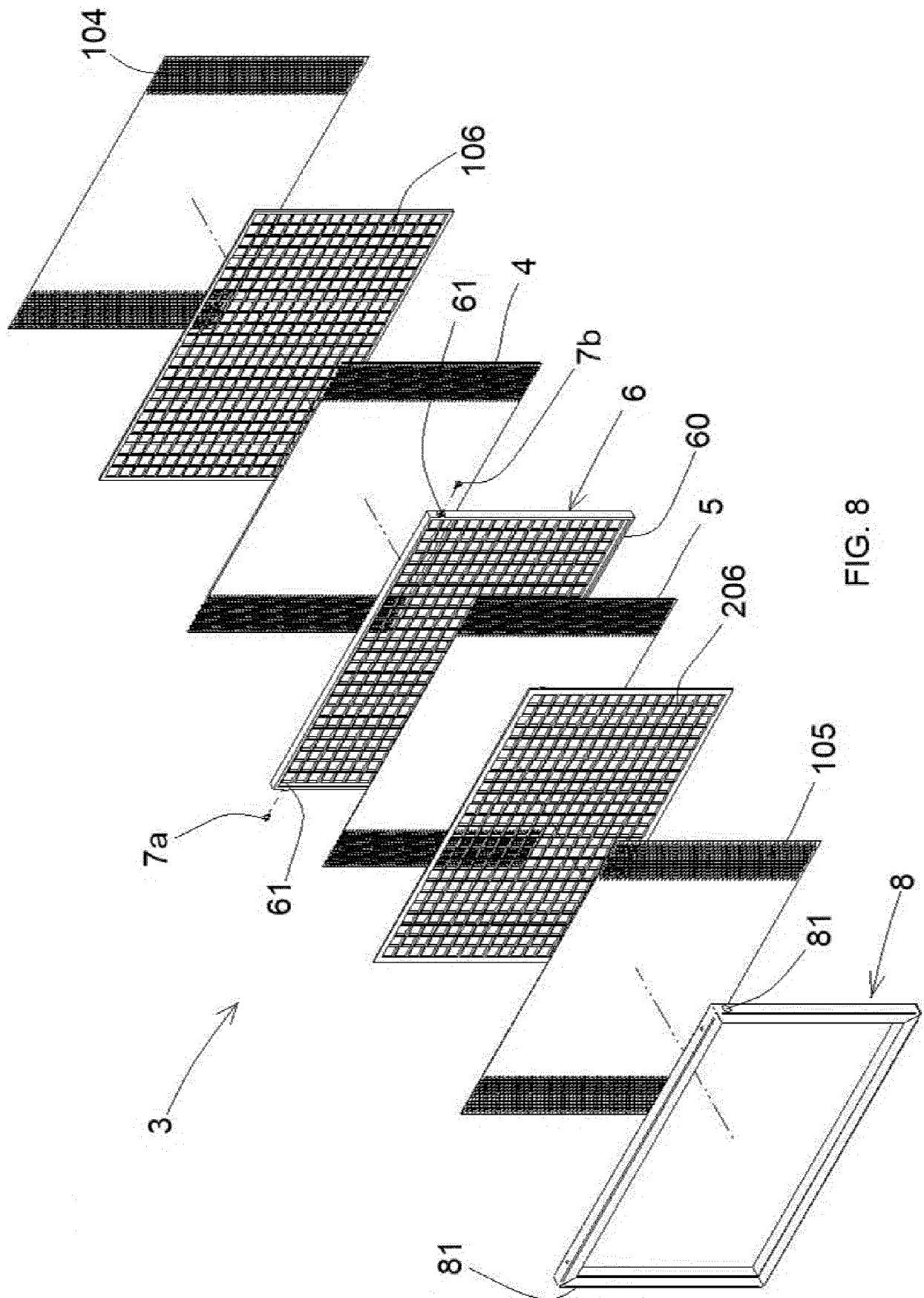
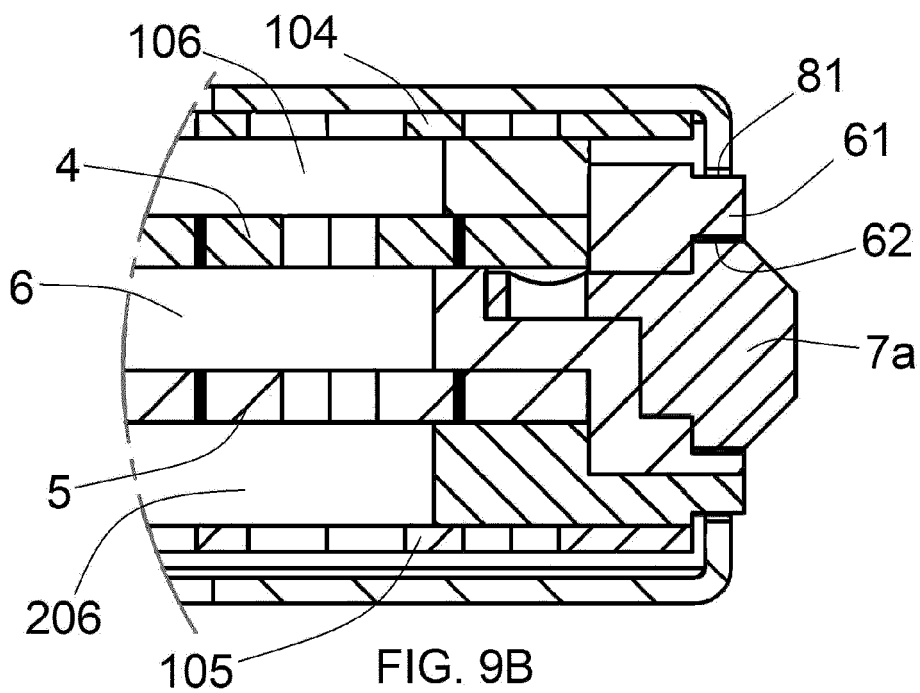
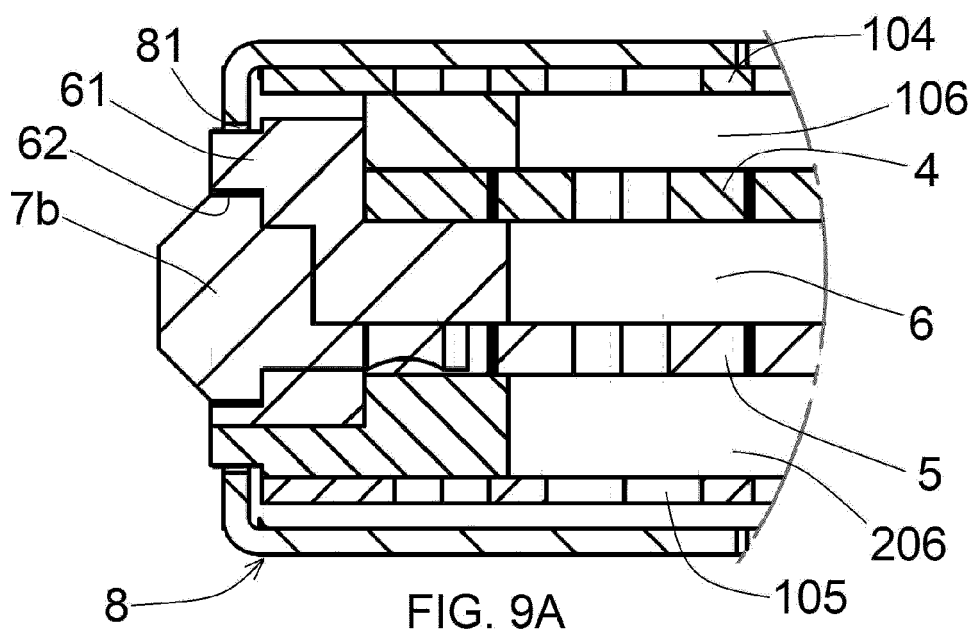
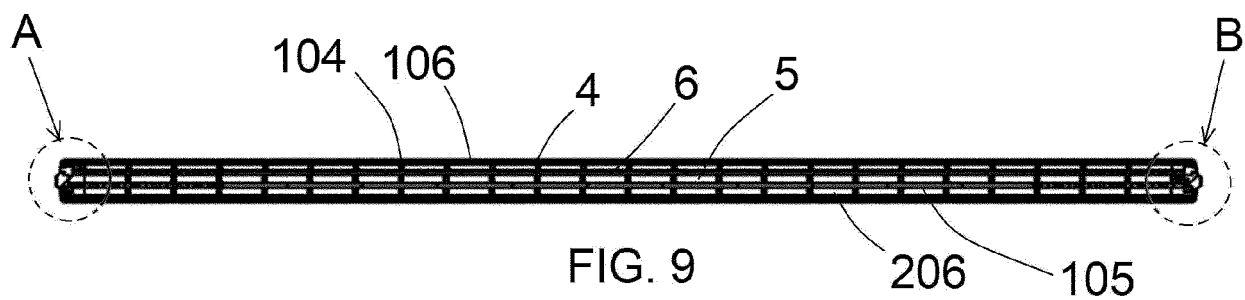


FIG. 8





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