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(54) **DOOR FOR A HOUSEHOLD APPLIANCE, HOUSEHOLD APPLIANCE COMPRISING IT AND METHOD FOR ASSEMBLING A DOOR FOR HOUSEHOLD APPLIANCES**

(57) A household appliance (1), in particular a built-in household appliance like a built-in refrigerator comprises: a body (2), defining at least one compartment (3); a door (4) movably engaged with the body (2) and movable between a closed position wherein the door (4) is configured to seal the corresponding compartment (3), and an open position wherein the compartment (3) is open and not sealed. The door (4) comprises an outer shell (5) defining an inner cavity (6) in which at least one thermal insulating and filling material (7) is arranged. The outer shell (5) has at least one through opening (8). The door (4) comprises at least one closure element (9) which is configured to close the at least one through opening (8) of the outer shell (5) of the door (4). The closure element (9) comprises at least one pocket structure (10) having at least one concavity portion (11) arranged to remain facing

away from the outer shell (5) of the door (4). The concavity portion (11) has a bottom (11a) and an opening (11b) opposite the bottom (11a). The opening (11b) has the same shape of, and corresponding to, the at least one through opening (8) of the door (4). The closure element (9) has also at least one peripheral surface (23) completely surrounding the opening (11b) of the concavity portion (11). The peripheral surface (23) develops from the pocket structure (10) and is configured to engage, according to a superimposed relationship, an inner surface (5d) of the outer shell (5) of the door (4) at the at least one through opening (8) so as to close the latter and prevent, during assembly operations, any leakage of the thermal insulating and filling material (7) through such at least one through opening (8) of the outer shell (5).

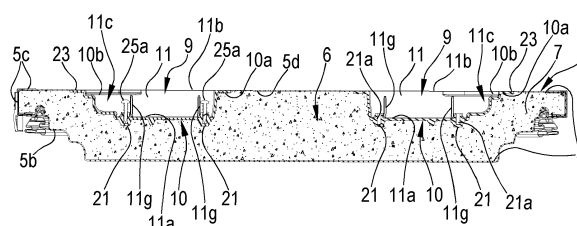


FIG.5

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a household appliance, in particular a built-in household appliance, optionally a built-in refrigerator, normally mounted inside kitchen cabinets or pieces of furniture.

[0002] The present invention also relates to a door for household appliances, in particular built-in household appliances, optionally built-in refrigerators, normally mounted inside kitchen cabinets or pieces of furniture.

[0003] The present invention also relates to a closure element for household appliances, in particular built-in household appliances, optionally built-in refrigerators, which are normally mounted inside kitchen cabinets or pieces of furniture.

[0004] A method of assembling a household appliance, in particular a built-in household appliance, optionally a built-in refrigerator, which are normally mounted inside kitchen cabinets or pieces of furniture, also forms the present invention.

[0005] A method of assembling a door for household appliances, in particular built-in household appliances, optionally built-in refrigerators, which are normally mounted inside kitchen cabinets or pieces of furniture.

[0006] The object of the present invention is suitable for use in the household appliance industry and, in particular, may find numerous applications on various types of large household appliances, such as refrigerators, freezers, ovens, dishwashers and the like.

[0007] The object of the invention is applied to household appliances when, during assembly operations, it is necessary to prevent any leakage of a thermal insulating and filling material through one or more through openings provided in the outer shell and, the same time, to provide a seat for receiving the engagement of an accessory mechanism or a component of the household appliance.

BACKGROUND

[0008] Push-to-open systems are mechanisms designed to open doors or drawers with a simple push, eliminating the need for traditional handles or knobs. These systems are commonly used in a variety of applications, including cabinets, furniture, appliances, and more. They offer a sleek and minimalist design while also providing functional convenience.

[0009] Push-to-open mechanisms rely on a variety of technologies to achieve their function. Common mechanisms include magnetic systems that use magnets to hold doors or drawers closed. When the door is pushed, the magnetic force is overcome, allowing the door to open.

[0010] Other push-to-open mechanisms include spring-loaded systems which use springs to hold doors or drawers closed. When pressure is applied by pushing on the door, the spring tension is released, allowing the

door to open.

[0011] There are also push-to-release latches, which are designed to release and open when pressure is applied. They can be incorporated into various designs, such as hidden in furniture or cabinets.

[0012] In addition to the aesthetic benefits such as creating a clean and streamlined look by eliminating the need for visible handles, resulting in a modern and minimalist appearance, push-to-open systems are easy to use. Users can open doors or drawers with a simple push, making them suitable for applications where hands may be full or dirty.

[0013] Push-to-open systems are hygienic and clean because, with no protruding handles, there are fewer surfaces for dirt and grime to accumulate, making cleaning easier.

[0014] They are also space efficient because they save space by eliminating the need for handles that can extend outwards.

[0015] Push-to-open systems can be found in a variety of contexts, including:

- kitchen cabinets, furniture or pieces of furniture;
- household appliances such as ovens, microwaves, refrigerators, freezers, dishwashers, washing machines, dryers and the like;
- commercial environments, in retail displays, cabinets, and storage solutions.

[0016] In particular, taking into account the push-to-open systems applied to the kitchen cabinet doors they can be integrated directly into the cabinets.

[0017] In accordance with other known solutions the push-to-open systems can be mounted directly on the door of the appliances. An example of such a solution is disclosed in the document EP3690173. In particular, it is disclosed that a household appliance is installed in a cabinet such that the appliance is not visible from outside the cabinet when a cabinet door of the cabinet is closed.

The appliance comprises a compartment and an appliance door which selectively closes the compartment.

[0018] More than one push-to-open system is coupled to the appliance door. In particular, each push-to-open system is screwed to a top or a bottom edge of the appliance door. Each push-to-open system comprises an arm, a push latch and a spring. The arm connects the appliance's door to the cabinet's door and the push latch selectively locks the arm in a locked position. The spring causes the arm to move from the locked position to an unlocked position when the push latch is unlocked.

[0019] Despite the many advantages of the known push-to-open systems have, the applicant has identified a number of disadvantages in relation to the above disclosed connection of the push-to-open systems to the upper and/or lower edges of the appliance's door.

[0020] Firstly, the direct screwing of each push-to-open system to the upper and/or lower edges of the appliance's door can damage the door and create some irregularities

in the fixing of the system.

[0021] Furthermore, the fixing operations of the push-to-open systems to the top and/or bottom edges of the door of an appliance still take time, which has a negative impact on the overall production time of the household appliances and installation time.

[0022] Last but not least, since the push-to-open systems are installed on the top and/or bottom edges of the door of the corresponding appliance, being positioned peripherally with respect to the body of the door, the push-to-open systems are not able to ensure the opening of the door when the user provides pushing actions in central areas of the door. Therefore, the activation area of each push-to-open system is very small and is located very close to the system itself.

SUMMARY

[0023] It is an objective of the present invention to preserve the door structure of the household appliances, avoiding any direct fastening of an accessory mechanism or component to the structure of the corresponding door.

[0024] It is also an objective of the present invention to reduce the overall production time of the household appliances, in particular with regard to the operations of installing any push-to-open system or similar accessory mechanism or any other necessary external component on the corresponding doors.

[0025] It is also an objective of the present invention to maximize the capabilities of the push-to-open systems in relation to the push activation regions of the appliance door of the household appliances.

[0026] In the light of the disclosure set out herein, and without in any way limiting the disclosure, in a 1st aspect, which may be combined with any other aspect or part thereof described herein, a household appliance (1), in particular a built-in household appliance, optionally a built-in refrigerator comprises:

- a body (2), defining at least one compartment (3);
- a door (4) movably engaged with the body (2), the door (4) being movable between a closed position wherein the door (4) is configured to seal the corresponding compartment (3), and an open position wherein the compartment (3) is open and not sealed, the door (4) comprising an outer shell (5) defining an inner cavity (6) in which at least one thermal insulating and filling material (7) is arranged, the outer shell (5) of the door (4) having at least one through opening (8), the door (4) comprising at least one closure element (9) which is configured to close the at least one through opening (8) of the outer shell (5) of the door (4), the closure element (9) comprising:

- a pocket structure (10) having at least one concavity portion (11) arranged to remain facing away from the outer shell (5) of the door (4), the concavity portion (11) having a bottom (11a) and

an opening (11b) opposite the bottom (11a), the opening (11b) having, the same shape of, and corresponding to, the at least one through opening (8) of the door (4);

- at least one peripheral surface (23) at least partially, optionally completely, surrounding the opening (11b) of the concavity portion (11), the peripheral surface (23) developing from the pocket structure (10) and being configured to engage, according to a superimposed relationship, an inner surface (5d) of the outer shell (5) of the door (4) at the at least one through opening (8) so as to close the latter and prevent any leakage of the thermal insulating and filling material (7) through such at least one through opening (8) of the outer shell (5).

[0027] In a further independent aspect 1st bis, which can be combined with the previous aspect and/or anyone of the following aspects, a door (4) for household appliances (1), in particular built-in household appliances, optionally built-in refrigerators, the door (4) comprising:

- an outer shell (5) defining an inner cavity (6) in which at least one thermal insulating and filling material (7) is arranged, the outer shell (5) of the door (4) having at least one through opening (8);
- at least one closure element (9) which is configured to close the corresponding through opening (8) of the outer shell (5) of the door (4), wherein the closure element (9) comprising:

- a pocket structure (10) having at least one concavity portion (11) arranged to remain facing away from the outer shell (5) of the door (4), the concavity portion (11) having a bottom (11a) and an opening (11b) opposite the bottom (11a), the opening (11b) having the same shape of, and corresponding to, the corresponding through opening (8) of the door (4);

- at least one peripheral surface (23) at least partially, optionally completely, surrounding the opening (11b) of the concavity portion (11), the peripheral surface (23) developing from the pocket structure (10) and being configured to engage, according to a superimposed relationship, an inner surface (5d) of the outer shell (5) of the door (4) at the corresponding through opening (8) so as to close the latter and prevent any leakage of the thermal insulating and filling material (7) through such through opening (8) of the outer shell (5).

[0028] In a further independent aspect 1st ter, which can be combined with anyone of the previous aspects and/or anyone of the following aspects, a closure element (9) for household appliances (1), in particular built-in household appliances, optionally built-in refrigerators,

is configured to close a corresponding through opening (8) of an outer shell (5) of a door (4) of a household appliance (1), the closure element (9) comprising:

- a pocket structure (10) having at least one concavity portion (11) arranged to remain facing away from the outer shell (5) of the door (4), the concavity portion (11) having a bottom (11a) and an opening (11b) opposite the bottom (11a), the opening (11b) having the same shape of, and corresponding to, a corresponding through opening (8) of the door (4);
- at least one peripheral surface (23) at least partially, optionally completely, surrounding the opening (11b) of the concavity portion (11), the peripheral surface (23) developing from the pocket structure (10) and being configured to engage, according to a superimposed relationship, an inner surface (5d) of the outer shell (5) of the door (4) at the corresponding through opening (8) so as to close the latter and prevent any leakage of the thermal insulating and filling material (7) through such through opening (8) of the outer shell (5).

[0029] In the following aspects, details are added with respect to the closure element (9) considered in the previous independent aspects.

[0030] Further details of the door (4) of the household appliance (1) are also given in the following aspects.

[0031] Each and every aspect relating to the features of the closure element (9) and/or to the features of the door (4) according to anyone of the previous independent aspects is clearly combinable with anyone of the following depending aspects of the closure element (9) and/or the following method aspects.

[0032] In a 2nd aspect according to anyone of the previous aspects, the concavity portion (11) of the pocket structure (10) has a substantially parallelepiped or prismatic shape, in particular the length of the concavity portion being at least two times its width, optionally at least four times its width, more optionally at least six times its width.

[0033] In a 3rd aspect according to anyone of the previous aspects, the concavity portion (11) of the pocket structure (10) has at least one stepped side (11c).

[0034] In a 4th aspect according to the previous aspects, the stepped side (11c) of the concavity portion (11) of the pocket structure (10), comprises at least two steps (11d) between a bottom (11a) and the opening (11b) of the concavity portion (11).

[0035] In a 5th aspect according to the previous aspect, the two steps (11d) of the concavity portion (11) of the pocket structure (10) are connected to each other by an intermediate arched connection (11e).

[0036] In a 6th aspect according to the anyone of the previous aspects, the concavity portion (11) of the pocket structure (10) is provided with a plurality of sliding ribs (11g) disposed on side opposite surfaces (11f) of the concavity portion (11) transversely, optionally orthogon-

ally, to the bottom (11a) of the concavity portion (11).

[0037] In a 7th aspect according to the previous aspect, each sliding rib (11g) of the concavity portion (11) of the pocket structure (10) develops between the bottom (11a) and the opening (11b) of the concavity portion (11), optionally each sliding rib (11g) has one end spaced from the opening (11b) of the concavity portion (11), optionally one end of each sliding rib (11g) not ending at the opening (11b) of the concavity portion (11).

[0038] In an 8th aspect according to anyone of the previous aspects, the pocket structure (10) has a frame (10a) which at least partially, optionally completely, surrounds the opening (11b) of the concavity portion (11), the peripheral surface (23) being defined by the frame (10a) of the pocket structure (10) of the closure element (9) and being configured to close, in particular seal, the corresponding through opening (8) of the door (4) by adhering to the inner surface (5d) of the outer shell (5) of the door (4).

[0039] In a 9th aspect according to the previous aspect, the closure element (9) is provided with at least one engagement element (24) configured to maintain the peripheral surface (23) defined by the frame (10a) of the corresponding pocket structure (10) of the closure element (9) attached to the inner surface (5d) of the outer shell (5) of the door (4).

[0040] In a 10th aspect according to the previous aspect, the engagement element of the closure element (9) comprises a bonding substance applied on the peripheral surface (23) defined by the frame (10a) of the corresponding pocket structure (10) of the closure element (9), the bonding substance being configured to maintain the peripheral surface (23) attached to the inner surface (5d) of the outer shell (5) of the door (4).

[0041] In a 11th aspect according to the aspect 9th, the engagement element (24) of the closure element (9) comprises at least a portion of an adhesive tape (24a), optionally two or more portions of an adhesive tape (24a), optionally the portion of the adhesive tape (24a) being applied straddling between the frame (10a) of the corresponding pocket structure (10) of the closure element (9) and the inner surface (5d) of the outer shell (5) of the door (4), in particular the portion of the adhesive tape (24a) being partially superimposed on the frame (10a) of the pocket structure (10) of the closure element (9) and partially on the inner surface (5d) of the outer shell (5) of the door (4).

[0042] In a 12th aspect according to the previous aspect, the frame (10a) of the pocket structure (10) is provided with at least a pair of lowers (10b) located on one side of the concavity portion (11), the concavity portion (11) being located between the pair of lowers (10b) of the frame (10a).

[0043] In a 13th aspect according to the previous aspect when the 8th aspect depends on the 3rd aspect or anyone of the aspects from 4th to 11th when depending on the 3rd aspect, the pair of lowers (10b) of the frame (10a) of the pocket structure (10) of the closure element (9)

being located in correspondence of the stepped side (11c) of the concavity portion (11) of the pocket structure (10).

[0044] In a 14th aspect according to anyone of the previous two aspects, each lower (10b) of the pair of lowers (10b) of the frame surface (10a) of the pocket structure (10) of the closure element (9) has a trapezoidal shape, in particular a rectangular trapezoidal shape, or a substantially triangular shape.

[0045] In a 15th aspect according to anyone of the previous aspects, the pocket structure (10) of the closure element (9) has a convexity portion (18) facing away from the concavity portion (11) of the closure element (9), the convexity portion (18) having at least two thickened portions (21) to allow a body, optionally an accessory mechanism or another component (25), to be fixed within the concavity portion (11) by means of corresponding threaded fasteners (25a).

[0046] In a 16th aspect according to the previous aspect, each thickened portion (21) of the convexity portion (18) of the pocket structure (10) of the closure element (9) is substantially cylindrical.

[0047] In a 17th aspect according to anyone of the two previous aspects, each thickened portion (21) develops outwards the convexity portion (18) of the pocket structure (10) and towards the concavity portion (11) occupying a part of this latter, in particular each thickened portion (21) emerging also from a bottom (11a) of the concavity portion (11).

[0048] In a 18th aspect according to anyone of the three previous aspects, each thickened portion (21) of the convexity portion (18) of the pocket structure (10) is configured to be pierced by a threaded fastener (25a), optionally of an accessory mechanism or another component (25), from the concavity portion (11) to the convexity portion (18).

[0049] In a 19th aspect according to anyone of the four previous aspects, each thickened portion (21) has an engagement hole (21a) arranged to be engaged by a threaded fastener (25a), optionally a screw, optionally of the accessory mechanism or component (25), from the concavity portion (11) to the convexity portion (18).

[0050] In a 20th aspect according to anyone of the five previous aspects, each thickened portion (21) is placed on a median plane that cuts longitudinally in half the closure element (9).

[0051] In a 21st aspect according to anyone of the previous aspects, the opening (11b) of the concavity portion (11) of the pocket structure (10) of the closure element (9) has the same shape of the through opening (8) of the door (4).

[0052] In a 22nd aspect according to the previous aspect, the opening (11b) of the concavity portion (11) of the pocket structure (10) of the closure element (9) has a protruding surrounding edge (11b') developing along the peripheral outline of the opening (11b).

[0053] In a 23rd aspect according to the previous aspect, the protruding and surrounding edge (11b') of the

opening (11b) of the concavity portion (11) of the pocket structure (10) of the closure element (9) having substantially the same shape of the opening (11b) and the through opening (8) of the door (4).

[0054] In a 24th aspect according to the two previous aspects, the protruding and surrounding edge (11b') of the opening (11b) of the concavity portion (11) of the pocket structure (10) of the closure element (9) is configured to occupy, at least partially, the through opening (8) of the door (4) along a contour edge of the latter.

[0055] In a 25th aspect according to anyone of the three previous aspects when the 21st aspect depends on the 12th aspect or anyone of the aspects from 13th to 20th when depending on the 12th aspect, the protruding and surrounding edge (11b') of the opening (11b) of the concavity portion (11) of the pocket structure (10) of the closure element (9) circumscribes the lowers (10b) of the pair of lowers (10b), delimiting such lowers (10b) with respect to peripheral surface (23) defined by the frame (10a) of the pocket structure (10).

[0056] In a 26th aspect according to anyone of the previous aspects, the outer shell (5) of the door (4) has two through openings (8).

[0057] In a 27th aspect according to the previous aspect, the two through openings (8) of the outer shell (5) of the door (4) are positioned at the same level of the outer shell (5).

[0058] In a 28th aspect according to anyone of the two previous aspects, the two through openings (8) of the outer shell (5) of the door (4) are aligned longitudinally along a direction orthogonal to two opposite sides, optionally the longer sides (5e), of the outer shell (5) and parallel to the other opposite sides, optionally the shorter sides (5f) of the outer shell (5).

[0059] In a 29th aspect according to anyone of the three previous aspects, each of the two through openings (8) of the outer shell (5) of the door (4) is positioned close to a corresponding side of the outer shell (5), optionally a corresponding longer side (5e) of the outer shell (5).

[0060] In a 30th aspect according to anyone of the previous four aspects, each of the through openings (8) of the outer shell (5) of the door (4) has the same shape as the one of the opening (11b) of the concavity portion (11) of the pocket structure (10) of the corresponding closure element (9).

[0061] In a 31st aspect according to anyone of the previous five aspects, each of the through openings (8) of the outer shell (5) of the door (4) has the same shape as the one of the protruding and surrounding edge (11b') of the opening (11b) of the concavity portion (11) of the pocket structure (10) of the corresponding closure element (9).

[0062] In a 32nd aspect according to anyone of the six previous aspects, the two through openings (8) of the outer shell (5) of the door (4) are identical, optionally specularly identical.

[0063] In a 33rd aspect according to anyone of the seven previous aspects, each of the through openings

(8) of the outer shell (5) of door (4) is closed by, or can be closed by, a corresponding closure element (9).

[0064] In a 34th aspect according to the previous aspect, the closure elements (9) are identical, optionally specularly identical.

[0065] In a 35th aspect according to the previous aspect, the closure elements (9) are configured to specularly engage in the corresponding through openings (8) of the outer shell (5) of the door (4).

[0066] In a 36th aspect according to the aspects from the 26th aspect to the 32nd aspect when the 26th aspect depends on the 1st aspect or the aspect 1st bis or the aspect 1st ter, the closure element (9) is configured to close both the two through openings (8) of the outer shell (5) of the door (4).

[0067] In a 37th aspect according to the previous aspects, the closure element (9) comprises:

- a pocket structure (10) for each corresponding through opening (8) of the outer shell (5) of the door (4), each pocket structure (10) of the closure element (9) having at least one concavity portion (11) arranged to remain facing away from the outer shell (5) of the door (4), in correspondence of the respective through opening (8), the concavity portion (11) of each pocket structure (10) having a bottom (11a) and an opening (11b) opposite the bottom (11a), the opening (11b) having the same shape of, and corresponding to, the respective through opening (8) of the outer shell (5) of the door (4);
- at least one peripheral surface (23) at least partially, optionally completely, surrounding the openings (11b) of the concavity portions (11) of the pocket structures (10) of the closure element (9), the peripheral surface (23) developing from, and around, the pocket structures (10) and being configured to engage, according to a superimposed relationship, an inner surface (5d) of the outer shell (5) of the door (4) along a band region of the inner surface (5d) corresponding to the two through openings (8) of the outer shell (5) of the door (4) so as to close such through openings (8) and prevent any leakage of the thermal insulating and filling material (7) through the through openings (8) of the outer shell (5).

[0068] In a 38th aspect according to the previous aspect, the concavity portion (11) of each pocket structure (10) of the closure element (9) has a substantially parallelepiped or prismatic shape.

[0069] In a 39th aspect according to anyone of the previous two aspects, the concavity portion (11) of each pocket structure (10) has at least one stepped side (11c).

[0070] In a 40th aspect according to the previous aspect, the stepped side (11c) of the concavity portion (11) of each pocket structure (10), comprises at least two steps (11d) between the corresponding bottom (11a) and the corresponding opening (11b) of the corresponding concavity portion (11).

[0071] In a 41st aspect according to the previous aspect, the two steps (11d) of the stepped side (11c) of the concavity portion (11) of each pocket structure (10) are connected to each other by an intermediate arched connection (11e).

[0072] In a 42nd aspect according to the anyone of the previous aspects, the concavity portion (11) of each pocket structure (10) is provided with a plurality of sliding ribs (11g) disposed on opposite surfaces (11f) of the concavity portion (11) transversely, optionally orthogonally, to the bottom (11a) of the concavity portion (11).

[0073] In a 43rd aspect according to the previous aspect, each sliding rib (11g) of the concavity portion (11) of each pocket structure (10) develops between the bottom (11a) and the opening (11b) of the concavity portion (11), optionally each sliding rib (11g) has one end spaced from the opening (11b) of the concavity portion (11), optionally one end of each sliding rib (11g) not ending at the opening (11b) of the concavity portion (11).

[0074] In a 44th aspect according to anyone of the seven previous aspects, the closure element (9) has a frame (10a) which at least partially, optionally completely, surrounds the openings (11b) of the concavity portions (11) of the pocket structures (10), the peripheral surface (23) being defined by the frame (10a) of the closure element (9) and being configured to close, in particular seal, both the through openings (8) of the outer shell (5) of the door (4) by adhering to the inner surface (5d) of the outer shell (5) of the door (4).

[0075] In a 45th aspect according to the previous aspect, the frame (10a) of the closure element (9) also develops between both the pocket structures (10) extending the peripheral surface (23) between such pocket structures (10).

[0076] In a 46th aspect according to the two previous aspects, the closure element (9) is provided with at least one engagement element (24) configured to maintain the peripheral surface (23) defined by the frame (10a) of the closure element (9) attached to the inner surface (5d) of the outer shell (5) of the door (4).

[0077] In a 47th aspect according to the previous aspect, the engagement element of the closure element (9) comprises a bonding substance applied on the peripheral surface (23) defined by the frame (10a) of the closure element (9), the bonding substance is configured to maintain the peripheral surface (23) attached to the inner surface (5d) of the outer shell (5) of the door (4).

[0078] In a 48th aspect according to the 46th aspect, the engagement element (24) of the closure element (9) comprises at least a portion of an adhesive tape (24a), optionally two or more portions of an adhesive tape (24a), optionally the portion of the adhesive tape (24a) being applied straddling between the frame (10a) of the closure element (9) and the inner surface (5d) of the outer shell (5) of the door (4), in particular the portion of the adhesive tape (24a) being partially superimposed on the frame (10a) of the closure element (9) and partially on the inner surface (5d) of the outer shell (5) of the door (4).

[0079] In a 49th aspect according to anyone of the thirteen previous aspects, each pocket structure (10) of the closure element (9) has a convexity portion (18) facing away from the concavity portion (11) of the closure element (9), each convexity portion (18) having at least two thickened portions (21) to allow a body, optionally an accessory mechanism or another component (25), to be fixed within the corresponding concavity portion (11) by means of corresponding threaded fasteners (25a).

[0080] In a 50th aspect according to the previous aspect, each thickened portion (21) of the convexity portion (18) of each pocket structure (10) of the closure element (9) is substantially cylindrical.

[0081] In a 51st aspect according to anyone of the two previous aspects, each thickened portion (21) of the convexity portion (18) of each pocket structure (10) of the closure element (9) develops towards the corresponding concavity portion (11) occupying a part of this latter, in particular each thickened portion (21) emerging also from the bottom (11a) of the corresponding concavity portion (11).

[0082] In a 52nd aspect according to anyone of the three previous aspects, each thickened portion (21) of the convexity portion (18) of each pocket structure (10) of the closure element (9) is configured to be pierced by a threaded fastener (25a), optionally of an accessory mechanism or another component (25), from the concavity portion (11) to the corresponding convexity portion (18).

[0083] In a 53rd aspect according to anyone of the four previous aspects, each thickened portion (21) of the convexity portion (18) of each pocket structure (10) of the closure element (9) has an engagement hole (21a) arranged to be engaged by a threaded fastener (25a), optionally a screw, of the accessory mechanism or component (25), from the corresponding concavity portion (11) to the convexity portion (18).

[0084] In a 54th aspect according to anyone of the five previous aspects, each thickened portion (21) of the convexity portion (18) of each pocket structure (10) of the closure element (9) is located on a median plane that cuts longitudinally in half the closure element (9).

[0085] In a 55th aspect according to anyone of the eighteen previous aspects, the opening (11b) of the concavity portion (11) of each pocket structure (10) of the closure element (9) has the same shape of the corresponding through opening (8) of the door (4).

[0086] In a 56th aspect according to the previous aspect, the opening (11b) of the concavity portion (11) of each pocket structure (10) of the closure element (9) has a protruding surrounding edge (11b') developing along a peripheral outline of the opening (11b).

[0087] In a 57th aspect according to the previous aspect, the protruding and surrounding edge (11b') of the opening (11b) of the concavity portion (11) of each pocket structure (10) of the closure element (9) having substantially the same shape of the corresponding opening (11b) of the corresponding concavity (11) and the corresponding through opening (8) of the door (8).

[0088] In a 58th aspect according to anyone of the two previous aspects, the protruding and surrounding edge (11b') of the opening (11b) of the concavity portion (11) of each pocket structure (10) of the closure element (9) is configured to occupy, at least partially, the corresponding through opening (8) of the door (4) along an contour edge of the latter.

[0089] In a 59th aspect according to anyone of the twenty-two previous aspects, the closure element (9) comprises a plurality of reinforcing baffles (19) arranged on the side opposite to the peripheral surface (23), namely the side of the closure element (9) facing to the cavity (6) of the door (4) when the closure element (9) is engaged to the inner surface (5d) of the outer shell (5) of the door (4).

[0090] In a 60th aspect according to the previous aspect, the reinforcing baffles (19) of the closure element (9) cover also a region extending from one pocket structure (10) to the other pocket structure (10), including a region in the middle of the pocket structures (10).

[0091] In a 61st aspect according to the two previous aspects, the reinforcing baffles (19) of the plurality of the reinforcing baffles (19) develop perpendicular with respect to the peripheral surface (23).

[0092] In a 62nd aspect according to the three previous aspects, the plurality of the reinforcing baffles (19) comprises:

- a first type of reinforcing baffles (19a) developing perpendicularly to the peripheral surface (23) and to a prevailing direction of longitudinal development of the closure element (9);
- a second type of reinforcing baffles (19b) developing perpendicularly to the peripheral surface (23) and to the first type of reinforcing baffles (19a).

[0093] In a 63rd aspect according to anyone of the previous aspects, the outer shell (5) of the door (4) is defined by:

- a first half shell (5b), configured to remain facing to the compartment (3) of the body (2) of the household appliance (1) when the door (4) is movably engaged with such a body (2) and it is in the closed position;
- a second half shell (5c), configured to remain facing outwards when the door (4) is movably engaged with the body (2) of the household appliance (1) and it is in the closed position, the first half shell (5b) and the second half shell (5c) being connected each other to define the outer shell (5) of the door (4) and the inner cavity (6) housing the thermal insulating and filling material (7), the through opening (8) being made through the second half shell (5c).

[0094] In a further 64th aspect, independent of the other previous aspects, a method of assembling of a household appliance (1), in particular a built-in household appliance, optionally a built-in refrigerator, comprises the

steps of:

- providing a body (2) having at least one compartment (3);
- providing a door (4) comprising an outer shell (5) having at least one through opening (8), the outer shell (5) defining an inner cavity (6) to be filled with a thermal insulating and filling material (7);
- closing the at least one through opening (8) of the outer shell (5) of the door (4) by means of a closure element (9), the closure element (9) sealing the at least one through opening (8) of the outer shell (5) to prevent any leakage of the thermal insulating and filling material (7), the closure element (9) having a pocket structure (10) having at least a concavity portion (11) arranged to remain facing away from inner cavity (6) of the outer shell (5) of the door (4) to receive an accessory mechanism or component (25) of the household appliance (1);
- filling the inner cavity (6) of the door (4) with the thermal insulating and filling material (7), the thermal insulating and filling material (7) occupying, at least partially, optionally completely, the inner cavity (6), without coming out of the at least one through opening (8) of the outer shell (5) of the door (4) since it is resisted by the closure element (9);
- positioning and fixing the accessory mechanism or component (25) inside the concavity portion (11) of the pocket structure (10); and,
- rotatively engaging the door (4) with the body (2).

[0095] In a further 65th aspect, independent with respect to the other previous aspects, a method of assembling of a door (4) for household appliances (1), in particular built-in household appliances, optionally built-in refrigerators, comprises the steps of:

- producing an outer shell (5) having at least one through opening (8), the outer shell (5) defining an inner cavity (6) to be filled with a thermal insulating and filling material (7);
- closing the at least one through opening (8) of the outer shell (5) by means of a closure element (9), the closure element (9) sealing the at least one through opening (8) of the outer shell (5) to prevent any leakage of the thermal insulating and filling material (7), the closure element (9) having a pocket structure (10) with at least one concavity portion (11) arranged to remain facing away from the inner cavity (6) of the outer shell (5) of the closing door (4) for receiving an accessory mechanism or component (25) of the door (4);
- filling the inner cavity (6) of outer shell (5) with the thermal insulating and filling material (7), the thermal insulating and filling material (7) occupying, at least partially, optionally completely, the inner cavity (6), without coming out of the at least one through opening (8) of the outer shell (5) as it is resisted by the

closure element (9);

- positioning and fixing the accessory mechanism or component (25) inside the concavity portion (11) of the pocket structure (10).

[0096] In a 66th aspect according to anyone of the two previous aspects, the step of closing the through opening (8) of the outer shell (5) of the door (4) by means of the closure element (9) is carried out before the step of filling the inner cavity (6) of the door (4) with the thermal insulating and filling material (7).

[0097] In a 67th aspect according to anyone of the three previous aspects, the step of closing the through opening (8) of the outer shell (5) of the door (4) by means of the closure element (9) is carried out according to the following steps:

- aligning an opening (11b) of the concavity portion (11) of the corresponding pocket structure (10) with the through opening (8) of the outer shell (5) of the door (4) from the side of an inner surface (5d) of the outer shell (5);
- engaging the closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the through opening (8).

[0098] In a 68th aspect according to anyone of the previous four aspects, the step of engaging the closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the through opening (8) is carried out by attaching the closure element (9) on such inner surface (5d) of the outer shell (5) of the door (4).

[0099] In a 69th aspect according to anyone of the two previous aspects, the step of engaging the closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the through opening (8) is carried out by superimposing a peripheral surface (23) defined by a frame (10a) of the pocket structure (10) of the closure element (9) on such inner surface (5d) of the outer shell (5) of the door (4), the peripheral surface (23) of the closure element (9) resting on the inner surface (5d) of the outer shell (5) of the door (4) by completely surrounding the corresponding through opening (8) and the concavity portion (11) matching the latter.

[0100] In a 70th aspect according to the previous of three previous aspects, the step of engaging the closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the through opening (8) is carried out by means of at least one engagement element (24) configured to maintain the peripheral surface (23) attached to the inner surface (5d) of the outer shell (5) of the door (4).

[0101] In a 71st aspect according to the four previous aspects, the step of engaging the closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the through opening (8) is carried out by providing a bonding substance on a peripheral

surface (23) defined by a frame (10a) of the pocket structure (10) of the closure element (9), the bonding substance being configured to maintain the peripheral surface (23) attached to the inner surface (5d) of the outer shell (5) of the door (4) when the peripheral surface (23) rests on the inner surface (5d) of the outer shell (5) of the door (4).

[0102] In a 72nd aspect according to the five previous aspects, the step of engaging the closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the through opening (8) is carried out by applying at least a portion of an adhesive tape (24a), optionally two or more portions of an adhesive tape (24a), on a frame (10a) of the pocket structure (10) of the closure element (9) which defines the peripheral surface (23).

[0103] In a 73rd aspect according to the previous aspect, the portion of the adhesive tape (24a) is applied straddling between the frame (10a) of the pocket structure (10) of the closure element (9) and the inner surface (5d) of the outer shell (5) of the door (4).

[0104] In a 74th aspect according to the two previous aspects, the portion of the adhesive tape (24a) is partially superimposed on the frame (10a) of the pocket structure (10) of the closure element (9) and partially on the inner surface (5d) of the outer shell (5) of the door (4).

[0105] In a 75th aspect according to the anyone of the eight previous aspects, the method of assembling also includes a transition step between the step of aligning and the step of engaging wherein a protruding surrounding edge (11b') of the opening (11b) of the pocket structure (10) of the closure element (9), having substantially the same shape of the opening (11b) and the through opening (8) of the outer shell (5) of the door (4), is inserted, at least partially, in the through opening (8).

[0106] In a further 76th aspect, independent of the other previous aspects, a method of assembling of a household appliance (1), in particular a built-in household appliance, optionally a built-in refrigerator, comprises the steps of:

- providing a body (2) having at least one compartment (3);
- providing a door (4) comprising an outer shell (5) having two through openings (8) located on a same face of the door (4), the outer shell (5) defining an inner cavity (6) to be filled with a thermal insulating and filling material (7);
- closing each through opening (8) of the outer shell (5) by means of a corresponding closure element (9), each closure element (9) sealing the corresponding through opening (8) of the outer shell (5) to prevent any leakage of the thermal insulating and filling material (7), each closure element (9) having a pocket structure (10) with at least one concavity portion (11) arranged to remain facing away from inner cavity (6) of the outer shell (5) of the door (4) to receive a corresponding accessory mechanism or component

(25) of the household appliance (1);

- filling the inner cavity (6) of the door (4) with the thermal insulating and filling material (7), the thermal insulating and filling material (7) occupying, at least partially, optionally completely, the inner cavity (6), without coming out of the through openings (8) of the outer shell (5) of the door (4) since it is resisted by the closure element (9);
- positioning and fixing the accessory mechanism or component (25) inside the concavity portion (11) of the pocket structure (10);
- rotatively engaging the door (4) to the body (2).

[0107] In a further 77th aspect, independent with respect to the other previous aspects, a method of assembling of a door (4) for household appliances (1), in particular built-in household appliances, optionally built-in refrigerators, comprises the steps of:

- producing an outer shell (5) having two through openings (8) located on a same face of the door (4), the outer shell (5) defining an inner cavity (6) to be filled with a thermal insulating and filling material (7);
- closing each through opening (8) of the outer shell (5) by means of a corresponding closure element (9), each closure element (9) sealing the corresponding through opening (8) of the outer shell (5) to prevent any leakage of the thermal insulating and filling material (7), each closure element (9) having a pocket structure (10) with at least one concavity portion (11) arranged to remain facing away from the inner cavity (6) of the outer shell (5) of the closing door (4) for receiving an accessory mechanism or component (25) of the door (4);
- filling the inner cavity (6) of outer shell (5) with the thermal insulating and filling material (7), the thermal insulating and filling material (7) occupying, at least partially, optionally completely, the inner cavity (6), without coming out of the through openings (8) of the outer shell (5) as it is opposed by the closure elements (9);
- positioning and fixing the accessory mechanism or component (25) inside the concavity portion (11) of the pocket structure (10).

[0108] In a 78th aspect according to anyone of the two previous aspects, the step of closing each through opening (8) of the outer shell (5) of the door (4) by means of the corresponding closure element (9) is carried out before the step of filling the inner cavity (6) of the door (4) with the thermal insulating and filling material (7).

[0109] In a 79th aspect according to anyone of the three previous aspects, the step of closing each through opening (8) of the outer shell (5) of the door (4) by the corresponding closure element (9) is carried out according to the following steps:

- aligning an opening (11b) of the concavity portion (11) of the corresponding pocket structure (10) of each closure element (9) with the corresponding through opening (8) of the outer shell (5) of the door (4) from the side of an inner surface (5d) of the outer shell (5);
- engaging each closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the corresponding through opening (8).

[0110] In an 80th aspect according to anyone of the previous four aspects, the step of engaging each closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the corresponding through opening (8) is carried out by attaching the corresponding closure element (9) on such inner surface (5d) of the outer shell (5) of the door (4).

[0111] In an 81st aspect according to anyone of the two previous aspects, the step of engaging each closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the corresponding through opening (8) is carried out by superimposing a peripheral surface (23) defined by a frame (10a) of the pocket structure (10) of the corresponding closure element (9) on such inner surface (5d) of the outer shell (5) of the door (4), the peripheral surface (23) of the corresponding closure element (9) resting on the inner surface (5d) of the outer shell (5) of the door (4) by completely surrounding the corresponding through opening (8) and the concavity portion (11) matching the latter.

[0112] In an 82nd aspect according to the previous of three previous aspects, the step of engaging each closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the corresponding through opening (8) is carried out by means of at least one engagement element (24) configured to maintain the peripheral surface (23) attached to the inner surface (5d) of the outer shell (5) of the door (4).

[0113] In an 83rd aspect according to the four previous aspects, the step of engaging each closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the corresponding through opening (8) is carried out by providing a bonding substance on a peripheral surface (23) defined by a frame (10) of the pocket structure (10) of the corresponding closure element (9), the bonding substance being configured to maintain the corresponding peripheral surface (23) attached to the inner surface (5d) of the outer shell (5) of the door (4) when the corresponding peripheral surface (23) rests on the inner surface (5d) of the outer shell (5) of the door (4).

[0114] In an 84th aspect according to the five previous aspects, the step of engaging each closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the corresponding through opening (8) is carried out by applying at least a portion of an adhesive tape (24a), optionally two or more portions

of an adhesive tape (24a) on a frame (10a) of the pocket structure (10) of the corresponding closure element (9) which defines the peripheral surface (23).

[0115] In an 85th aspect according to the previous aspect, the portion of the adhesive tape (24a) is applied straddling between the frame (10a) of the pocket structure (10) of the corresponding closure element (9) and the inner surface (5d) of the outer shell (5) of the door (4).

[0116] In an 86th aspect according to the two previous aspects, the portion of the adhesive tape (24a) is partially superimposed on the frame (10a) of the pocket structure (10) of the corresponding closure element (9) and partially on the inner surface (5d) of the outer shell (5) of the door (4).

[0117] In an 87th aspect according to the anyone of the eight previous aspects, the method of assembling also includes a transition step between the step of aligning and the step of engaging wherein a protruding surrounding edge (11b') of the opening (11b) of the pocket structure (10) of each closure element (9), having substantially the same shape of the opening (11b) and the corresponding through opening (8) of the outer shell (5) of the door (4), is inserted, at least partially, in the corresponding through opening (8).

[0118] In a further 88th aspect, independent of the other previous aspects, a method of assembling of a household appliance (1), in particular a built-in household appliance, optionally a built-in refrigerator, comprises the steps of:

- providing a body (2) having at least one compartment (3);
- providing a door (4) having an outer shell (5) having two through openings (8) located on a same face of the door (4), the outer shell (5) defining an inner cavity (6) to be filled with a thermal insulating and filling material (7);
- closing both through openings (8) of the outer shell (5) by means of one closure element (9), the closure element (9) sealing both the through openings (8) of the outer shell (5) to prevent any leakage of the thermal insulating and filling material (7), the closure element (9) having two pocket structures (10) each having at least one concavity portion (11) arranged to remain facing away from inner cavity (6) of the outer shell (5) of the door (4) to receive a corresponding accessory mechanism or component (25) of the household appliance (1);
- filling the inner cavity (6) of the door (4) with the thermal insulating and filling material (7), the thermal insulating and filling material (7) occupying, at least partially, optionally completely, the inner cavity (6), without coming out of the through openings (8) of the outer shell (5) of the door (4) since it is resisted by the closure element (9);
- positioning and fixing the accessory mechanism or component (25) inside the corresponding concavity portion (11) of each pocket structure (10) of the

closure element (9); and,

- rotatively engaging the door (4) to the body (2).

[0119] In a further 89th aspect, independent with respect to the other previous aspects, a method of assembling of a door (4) for household appliances (1), in particular built-in household appliances, optionally built-in refrigerators, comprises the steps of:

- producing an outer shell (5) having two through openings (8) located on a same face of the door (4), the outer shell (5) defining an inner cavity (6) to be filled with a thermal insulating and filling material (7);
- closing both through openings (8) of the outer shell (5) by means of one closure element (9), the closure element (9) sealing both the through openings (8) of the outer shell (5) to avoid any leakage of the thermal insulating and filling material (7), the closure element (9) having two pocket structures (10) each having at least one concavity portion (11) arranged to remain facing away from inner cavity (6) of the outer shell (5) of the door (4) to receive a corresponding accessory mechanism or component (25) of the household appliance (1);
- filling the inner cavity (6) of outer shell (5) with the thermal insulating and filling material (7), the thermal insulating and filling material (7) occupying, at least partially, optionally completely, the inner cavity (6), without coming out of the through openings (8) of the outer shell (5) as it is resisted by the closure element (9);
- positioning and fixing the accessory mechanism or component (25) inside the concavity portion (11) of the pocket structure (10).

[0120] In a 90th aspect according to anyone of the two previous aspects, the step of closing both through openings (8) of the outer shell (5) of the door (4) by means of the closure element (9) is carried out before the step of filling the inner cavity (6) of the door (4) with the thermal insulating and filling material (7).

[0121] In a 91st aspect according to anyone of the three previous aspects, the step of closing the both through openings (8) of the outer shell (5) of the door (4) by the corresponding closure element (9) is carried out according to the following steps:

- aligning an opening (11b) of the concavity portion (11) of each pocket structure (10) of the closure element (9) with the corresponding through opening (8) of the outer shell (5) of the door (4) from the side of an inner surface (5d) of the outer shell (5);
- engaging the closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) along a band region of the inner surface (5d) corresponding to both through openings (8).

[0122] In a 92nd aspect according to anyone of the previous four aspects, the step of engaging each closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) in correspondence of the corresponding through opening (8) is carried out by attaching the corresponding closure element (9) on such inner surface (5d) of the outer shell (5) of the door (4).

[0123] In a 93rd aspect according to anyone of the two previous aspects, the step of engaging the closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) is carried out by superimposing a peripheral surface (23) defined by a frame (10a) the closure element (9) on such inner surface (5d) so that the peripheral surface (23) of the corresponding closure element (9) rests on the inner surface (5d) of the outer shell (5) of the door (4) completely surrounding the through openings (8), the concavity portions (11) matching the corresponding through openings (8).

[0124] In a 94th aspect according to the previous of three previous aspects, the step of engaging the closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) is carried out by means of at least one engagement element (24) configured to maintain the peripheral surface (23) attached to the inner surface (5d) of the outer shell (5) of the door (4).

[0125] In a 95th aspect according to the four previous aspects, the step of engaging each closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) is carried out by providing a bonding substance on a peripheral surface (23) defined by a frame (10) of the corresponding closure element (9), the bonding substance being configured to maintain the peripheral surface (23) attached to the inner surface (5d) of the outer shell (5) of the door (4) when the corresponding peripheral surface (23) rests on the inner surface (5d) of the outer shell (5) of the door (4).

[0126] In a 96th aspect according to the five previous aspects, the step of engaging the closure element (9) on the inner surface (5d) of the outer shell (5) of the door (4) is carried out by applying at least a portion of an adhesive tape (24a), optionally two or more portions of an adhesive tape (24a) on a frame (10a) of the pocket structure (10) of the corresponding closure element (9) which defines the peripheral surface (23).

[0127] In a 97th aspect according to the previous aspect, the portion of the adhesive tape (24a) is applied straddling between the frame (10a) of the closure element (9) and the inner surface (5d) of the outer shell (5) of the door (4).

[0128] In a 98th aspect according to the two previous aspects, the portion of the adhesive tape (24a) is partially superimposed on the frame (10a) of the closure element (9) and partially on the inner surface (5d) of the outer shell (5) of the door (4).

[0129] In a 99th aspect according to the anyone of the eight previous aspects, the method of assembling also includes a transition step between the step of aligning and the step of engaging wherein a protruding surround-

ing edge (11b') of the opening (11b) of each pocket structure (10) of the closure element (9), having substantially the same shape of the corresponding opening (11b) and the corresponding through opening (8) of the outer shell (5) of the door (4), is inserted, at least partially, in the corresponding through opening (8).

BRIEF DESCRIPTION OF THE FIGURES

[0130]

Figure 1 is a schematic view of a household appliance, in particular a built-in household appliance, optionally a built-in refrigerator, according to an embodiment of the present invention;

Figure 2 is a perspective view, of a door for household appliances, in particular for built-in household appliances, optionally built-in refrigerators, according to another embodiment of the present invention, wherein an accessory mechanism or component, such as a push-to-open mechanism is mounted;

Figure 3 is an enlarged detail of the door shown in Figure 2, without the accessory mechanism or component visible in Figure 2;

Figure 4 is a perspective view of the closure of an inner detail of the door shown in Figure 2;

Figure 5 is a transversal cross-section view of the door shown in Figure 2 carried out along the track V-V of Figure 3;

Figure 6 is a perspective view of one of the closure elements of the door shown in Figures 2 to 5, engageable to a corresponding through opening of the door and provided with the accessory mechanism or component visible in Figure 2;

Figure 7 is a perspective view of the closure element shown in Figure 6, without the accessory mechanism or component;

Figures 8 and 9 are views from above and below of the closure element shown in Figures 6 and 7, without the accessory mechanism or component;

Figure 10 is a front elevation view of the closure element shown in Figures 6 to 9 without the accessory mechanism or component;

Figure 11 is a longitudinal cross-section view of the closure element shown in Figures 6 to 10, carried out along the track XI-XI of Figure 8;

Figures 12 and 13 are enlarged details of one of the closure elements of the door derived from the cross-section of Figure 5;

Figure 14 is a perspective view of a door for household appliances, in particular for built-in household appliances, optionally built-in refrigerators, according to a further embodiment of the present invention, wherein an accessory mechanism or component, such as a push-to-open mechanism is mounted;

Figure 15 is an enlarged detail of the door shown in Figure 14, without the accessory mechanism or component;

Figure 16 is a perspective view of an inner detail of the door shown in Figure 14;

Figure 17 is a transversal cross-section view of the door shown in Figure 14 carried out along the track XVII-XVII of Figure 15;

Figure 18 is a perspective view of a closure element of the door shown in Figures 14 to 17, engageable along a band of an inner surface of an outer shell of the door and provided with the accessory mechanism or component visible in Figure 14;

Figures 19 and 20 are views from above and below of the closure element shown in Figures 14 to 18, without the accessory mechanism or component;

Figure 21 is a front elevation view of the closure element shown in Figures 14 to 20 without the accessory mechanism or component;

Figure 22 is a longitudinal cross-section view of the closure element shown in Figures 14 to 21, carried out along the track XXI-XXI of Figure 19;

Figures 23 and 24 are enlarged details of a concavity portion of a pocket structure of the closure element derived from the cross-section of Figure 17.

DETAILED DESCRIPTION

[0131] Detailed embodiments of the present invention are disclosed herein. However, it is to be understood that the disclosed embodiments are merely exemplary of the invention which may be embodied in various and alternative forms. The Figures are not necessarily to scale, and some features may be exaggerated or minimized to show details of particular components. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting but merely as a representative basis for teaching one skilled in the art how to construct and use the present invention.

[0132] With reference to Figure 1, it is shown a household appliance 1, in particular a built-in household appliance which can be mounted in a cabinet (not shown) of a piece of furniture, as a kitchen.

[0133] More specifically, the household appliance 1 shown in Figure 1 is a built-in refrigerator comprising a body 2 defining at least one compartment 3 and a door 4 rotatively engaged with the body 2. The door 4 can be rotated between a closed position wherein the door 4 is configured to close and seal the corresponding compartment 3, and an open position (shown in Figure 1) wherein the compartment 3 is open, unsealed and accessible from outside.

[0134] According to the embodiments of Figures 2 to 5 and 14 to 17 the door 4 of the household appliance 1, comprises an outer shell 5 defining an inner cavity 6 in which at least one thermal insulating and filling material 7 is arranged, such as for example an expanded polyurethane or another similar material.

[0135] The outer shell 5 of the door 4 is defined by a first half shell 5b and a second half shell 5c which are duly connected to each other so as to define the inner cavity 6

housing the thermal insulating and filling material 7. When the door 4 is mounted on the body 2 of the household appliance 1 and it is in the closed position, the first half shell 5b of the outer shell 5 of the door 4 remains facing the compartment 3 of the body 2 of the household appliance 1, whereas the second half shell 5c of the outer shell 5 of the door 4 remains facing outwards.

[0136] Advantageously, the second half shell 5c of the outer shell 5c of the door 4 has at least one through opening 8, the function of which will be described below.

[0137] As shown in Figures 2 to 5 and 14 to 17, the second half shell 5c of the outer shell 5c of the door is provided with two through openings 8. The two through openings 8 of the outer shell 5 of the door 4 are identical, optionally specularly identical. In addition, the two through openings 8 of the outer shell 5a of the door 4 are aligned longitudinally along a direction orthogonal to two opposite sides, namely the longer sides 5e, of the outer shell 5 and parallel to the other opposite sides, namely the shorter sides 5f. Each of the two through openings 8 is positioned close to a corresponding longer side 5e of the outer shell 5.

[0138] The shape of the two through openings 8 can be modified as required and can be chosen in relation to the different applications that can be provided.

[0139] According to the embodiment shown in Figures 2 and 3, the shape of each through opening 8 has a complex contour edge with a thinner part facing a central region of the outer shell 5 of the door 4 and a larger part facing the corresponding longer side 5e of the outer shell 5 of the door 4. The thinner part and the larger part of each through opening are connected by respective intermediate inclined parts.

[0140] According to the embodiment shown in Figures 14 and 15, the shape of each through opening 8 has a regular contour edge, which is substantially rectangular.

[0141] In order to close each through opening 8 of the outer shell 5 of the door 4 and provide, at the same time, a suitable location for accommodating a respective body, such as an accessory mechanism 25, such as a push-to-open mechanism, or another component, the household appliance 1 and/or the door 4 can be provided with one or more closure elements 9 which are configured to close at least one corresponding through opening 8.

[0142] According to the embodiment shown in Figures 2 to 13, the present invention provides for the use of an independent closure element 9 for each through opening 8 of the outer shell 5 of the door 4 and since the through openings 8 are two, the closure elements 9 are also two. Furthermore, similarly to the two through openings 8, the two closure elements 9 are identical and they are positioned in a mirror image relative to each other. In other words, the two closure elements 9 are configured to engage in a specular manner in the corresponding through openings 8 of the second half shell 5c of the outer shell 5 of the door 4.

[0143] Each closure element 9 comprises a pocket structure 10 having a corresponding concavity portion

11 of substantially parallelepiped or prismatic shape. The concavity portion 11 is arranged to remain facing away from the outer shell 5 of the door 4 when the closure element 9 engages in the corresponding through opening 8 and a convexity portion 18, facing the opposite side, namely towards the inner cavity 6 of the outer shell 5 of the door 4.

[0144] The concavity portion 11 of the pocket structure 10 of each closure element 9 has a bottom 11a and an opening 11b opposite the bottom 11a, which advantageously has the same shape as, and corresponds to, a corresponding through opening 8 of the second half shell 5 of the outer shell 5 of the door 4.

[0145] The concavity portion 11 of the pocket structure 10 of each closure element 9 also has a protruding surrounding edge 11b' which develops along the peripheral contour edge of the corresponding opening 11b. The protruding and surrounding edge 11b' has substantially the same shape as the opening 11b of the corresponding concavity portion 11 and the corresponding through opening 8 of the second half shell 5c of the outer shell 5 of the door 8.

[0146] According to the invention, the protruding and surrounding edge 11b' of the opening 11b of the corresponding concavity portion 11 is configured to at least partially occupy the corresponding through opening 8 of the second half 5c of the outer shell 5 of the door 4 along the contour edge of the corresponding through opening 8 so as to ensure a quick and easy coupling between the latter and the corresponding closure element 9. In other words, the protruding and surrounding edge 11b' of the opening 11b of each concavity portion 11 allows the corresponding closure element 9 to be easily centered with respect to the corresponding through opening of the second half shell 5c of the outer shell 5 of the door 4.

[0147] Opposite side surfaces 11f develop from the bottom 11a of each concavity portion 11 to end at the corresponding opening 11b. Each one of the opposite side surfaces 11f of each concavity portion 11 is provided with at least one pair of sliding ribs 11g which develop transversely, optionally orthogonally, to the bottom 11a of the concavity portion 11, without reaching the corresponding opening 11b. Indeed, each sliding rib 11g has an end spaced from the opening 11b of the corresponding concavity portion 11 whereby such an end of each sliding rib 11g does not end at the opening 11b of the corresponding concavity portion 11.

[0148] On one side of each concavity portion 11, in particular on the side facing the corresponding longer side 5e of the outer shell 5 of the door 4, a stepped side 11c is provided. The stepped side 11c comprises at least two steps 11d located between the bottom 11a and the opening 11b of the concavity portion 11. The two steps 11d of the stepped side 11c of each concavity portion 11 are properly connected to each other by an intermediate arched connection 11e, which is concave towards the corresponding opening 11b. The stepped side 11 provides different support surfaces arranged on different

levels from each other and different from the bottom 11a of the corresponding concavity portion 11, for supporting an arm part 25b of the accessory mechanism 25 when it is in a retracted condition, being located within the corresponding concavity portion 11.

[0149] According to the embodiment shown in Figures 6 to 13, each closure element 9 comprises at least one peripheral surface 23 completely surrounding the opening 11b of the corresponding concavity portion 11. The peripheral surface 23 develops outwards from the corresponding pocket structure 10 in a plane of lie substantially parallel, preferably coincident, with the plane of lie of the opening 11b of the corresponding concavity 11. The peripheral surface 23 of each closure element 9 is configured to engage, according to a superimposed relationship (as visible in Figures 4, 5, 12 and 13) an inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4 at the corresponding through opening 8 so as to close the latter and prevent, during assembly operations of the door 4, any leakage of the thermal insulating and filling material 7 through such through opening 8 of the outer shell 5.

[0150] The peripheral surface 23 is defined by a frame 10a of the pocket structure 10 of each closure element 9, which is configured to close, in particular to seal, the corresponding through opening 8 of the door 4 by adhering to the inner surface 5d of the outer shell 5 of the door 4. The action of closing each through opening 8, in particular during the assembly operations of the door 4, is carried out by maintaining the peripheral surface 23 of the corresponding closure element 9 in perfect adherence with the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4.

[0151] In order to maintain the peripheral surface 23 defined by the frame 10a of the corresponding pocket structure 10 of each closure element 9 attached to the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4, one or more engagement elements 24 are provided which are configured to interact with each of the closure elements 9 in order to bond the latter to the second half shell 5c of the outer shell 5 of the door 4.

[0152] The engagement element 24 of the closure element 9 may comprise a bonding substance (not shown in the Figures) which is properly applied to the peripheral surface 23 defined by the frame 10a of the pocket structure 10 of each closure element 9 to provide a bonding action between the corresponding peripheral surface 23 and the corresponding region of the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4.

[0153] As an alternative or in addition to the use of a bonding substance, it is possible that the engagement element 24 to comprise, for each closure element 9, two or more portions of an adhesive tape 24a which are applied straddling between the frame 10a of the corresponding pocket structure 10 and the inner surface 5d of second half shell 5c of the outer shell 5 of the door 4. In particular, each portion of the adhesive tape 24a is par-

tially superimposed on the frame 10a of the pocket structure 10 of the closure element 9 and partially on the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4 so as to keep the corresponding closure element 9 against the second half shell 5c of the outer shell 5 of the door 4, by isolating, like a seal, the corresponding through opening 8 with respect to the inner cavity 6 of the outer shell 5 of the door 4.

[0154] According to the embodiment shown in Figure 2, 3, 5 to 8, 11 and 12, the frame 10a of the pocket structure 10 of each closure element 9 is provided with at least one pair of lowers 10b located on one side of the corresponding concavity portion 11, in particular in correspondence of the steeped side 11c of the corresponding concavity portion 11. The pair of lowers 10b is slightly lower than the plane of the opening 10b of the corresponding concavity 11 and the latter is located between the pair of lowers 10b as clearly visible in Figures 7 and 8.

[0155] Each lower of the pairs of lowers 10b of the frame 10a of the pocket structure 10 of each closure element 9 can have various shapes as needed. According to the embodiment shown in Figures 2 to 4 and 6 to 9, each lower 10b of the pair of lowers 10b of each closure element 9 has a trapezoidal shape, in particular a rectangular trapezoidal shape, or a substantially triangular shape. Similarly to the stepped side 11c of the corresponding concavity portion 11, the pair of lowers 10b of the frame 10a of the corresponding pocket structure 10, provide corresponding supporting support surfaces for supporting an end engagement flange 25c of the accessory mechanism or component 25 to reach a retracted condition wherein it is located inside the corresponding concavity portion 11.

[0156] The protruding and surrounding edge 11b' of the opening 11b of the concavity portion 11 of the pocket structure 10 of each closure element 9, also circumscribes the lowers 10b of the pair of lowers 10b, delimiting such lowers 10b with respect to peripheral surface 23 defined by the frame 10a of the pocket structure 10.

[0157] Considering the embodiment shown in Figures 3 to 11, the convexity portion 18 of the pocket structure 10 of each closure element 9 is provided with at least two thickened portions 21, in particular substantially cylindrical, to allow the accessory mechanism or component 25 (Figures 2 and 6), to be fixed within the corresponding concavity portion 11 by means of corresponding threaded fasteners 25a (Figure 5). Each thickened portion 21 is located on a median plane which cuts the closure element 9 longitudinally in half.

[0158] Each thickened portion 21 of the convexity portion 18 of the pocket structure 10 of each closure element 9 develops both outwards from the corresponding convexity portion 18 and towards the corresponding concavity portion 11 occupying a part of this latter. In other words, each thickened portion 21 emerges also from the bottom 11a of concavity portion 11 of the corresponding pocket structure 10. Each thickened portion 21 also has an engagement hole 21a arranged to be engaged by a

corresponding threaded fastener 25a, optionally a screw, of the accessory mechanism or component 25.

[0159] According to this configuration, each thickened portion 21 of the convexity portion 18 of the pocket structure 10 of the corresponding closure element 9 is ready to be pierced by a corresponding threaded fastener 25a of the accessory mechanism or component 25, from the concavity portion 11 to the convexity portion 18. By means of the threaded fasteners 25a, it is possible to adjust the position of the corresponding accessory mechanism or component 25 with respect to the corresponding concavity 11, by intervening both on the distance and on the inclination of the same with respect to the bottom 11a of the corresponding concavity 11.

[0160] According to the embodiment shown in Figures 14 to 24, the invention relates to a single closure element 9 configured to close and seal both the two through openings 8 of the second half shell 5c of the outer shell 5 of the closure element 9.

[0161] The closure element 9 comprises two specularly identical pocket structures 10, namely one pocket structure 10 for each corresponding through opening 8 of the second half shell 5c of the outer shell 5 of the door 4. Each pocket structure 10 has a corresponding concavity portion 11, having a substantially rectangular or prismatic shape, arranged to remain facing away from the outer shell 5 of the door 4, in correspondence of the respective through opening 8, when the closure element 9 engages a band region of the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4, by covering the two through openings 8 and a convexity portion 18, facing the opposite side, namely towards the inner cavity 6 of the outer shell 5 of the door 4.

[0162] Similarly to the previous embodiment disclosed, each concavity portion 11 of the closure element 9 has a bottom 11a and an opening 11b opposite the bottom 11a which, advantageously, has the same shape of, and corresponds to, the corresponding through opening 8 of the second half shell 5 of the outer shell of the door 8.

[0163] Each concavity portion 11 of the closure element 9 also has a protruding surrounding edge 11b' developing along the peripheral outline of the corresponding opening 11b. The protruding and surrounding edge 11b' has substantially the same shape of the opening 11b of the corresponding concavity portion 11 and the corresponding through opening 8 of the second half shell 5c of the outer shell 5 of the door 8.

[0164] Also in this case, the protruding and surrounding edge 11b' of the opening 11b of each concavity portion 11 of the closure element 9 is configured to at least partially occupy the corresponding through opening 8 of the second half shell 5c of the outer shell 5 of the door 4 along the contour edge of the corresponding through opening 8 so as to ensure a quick and easy coupling between the closure element 9 and the two through openings 8. The protruding and surrounding edge 11b' of the opening 11b of each concavity portion 11 makes

easy to center the closure element 9 with respect to the two through openings 8.

[0165] As is clearly visible in Figures 17, 18 and 22, opposite side surfaces 11f develop from the bottom 11a of each concavity portion 11 to end at the corresponding opening 11b. Each one of the opposite side surfaces 11f of each concavity portion 11 are provided with at least one pair of sliding ribs 11g developing transversely, optionally orthogonally, to the bottom 11a of the concavity portion 11, without reaching the corresponding opening 11b. Each sliding rib 11g has one end spaced from the opening 11b of the corresponding concavity portion 11 whereby such an end does not end at the opening 11b of the corresponding concavity portion 11.

[0166] On one side of each concavity portion 11 of the closure element 9, namely the side facing the corresponding longer side 5e of the outer shell 5 of the door 4, a stepped side 11c is provided. The stepped side 11c comprises at least two steps 11d located between the bottom 11a and the opening 11b of the concavity portion 11. The two steps 11d of the stepped side 11c of each concavity portion 11 are properly connected to each other by an intermediate arched connection 11e which is concave towards the corresponding opening 11b. The stepped side 11 provides different support surfaces arranged on different levels from each other and different from the bottom 11a of the corresponding concavity portion 11, for supporting an arm part 25b of the accessory mechanism 25 when it is in a retracted condition wherein it is located within the corresponding concavity portion 11.

[0167] According to the embodiment shown in Figures 18 to 20, the closure element 9 comprises a peripheral surface 23 which completely surrounds the opening 11b of each concavity portion 11. The peripheral surface 23 develops outwards from the corresponding pocket structure 10 in a plane of lie substantially parallel, preferably coincident, to the plane of lie of the opening 11b of the two concavity portions 11. The peripheral surface 23 is configured to engage, according to a superimposed relationship (as visible in Figures 16, 17, 23 and 24), an inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4 along a band region corresponding to the two through openings 8 so as to close the latter and prevent, during assembly operations of the door 4, any leakage of the thermal insulating and filling material 7 through the through openings 8 of the outer shell 5.

[0168] The peripheral surface 23 is defined by a frame 10a of the closure element 9, which is designed to close, in particular to seal, the two through openings 8 of the second half shell 5c of the outer shell 5 of the door 4 by adhering to the inner surface 5d around the two through openings 8. The closure element 9 also develops between both the pocket structures 10, extending the peripheral surface 23 between these pocket structures 10 and thus between the corresponding concavity portions 11. The action of closing each through opening 8, in particular during the assembly operations of the door 4 is carried out by maintaining the peripheral surface 23 of

the corresponding closure element 9 perfectly adhered to the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4.

[0169] In order to maintain the peripheral surface 23 defined by the frame 10a of the closure element 9 on the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4 during the assembly operations, one or more engagement elements 24, configured to interact with the closure element 9 to bond the latter to the second half shell 5c of the outer shell 5 of the door 4, are provided.

[0170] The engagement element 24 can comprise a bonding substance (not shown in the Figures) properly applied to the peripheral surface 23 to provide a bonding action by keeping the closure element 9 attached to the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4.

[0171] Alternatively or in addition to the bonding substance, the engagement element 24 can be defined by two or more portions of an adhesive tape 24a which are applied straddling between the frame 10a and the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4, in particular partially superimposed on the frame 10a of the pocket structure 10 of the closure element 9 and partially superimposed on the inner surface 5d of the second half shell 5c of the outer shell 5 of the door.

[0172] In departure from the embodiment previously disclosed in relation to Figures 2 to 13, the embodiment shown in Figures 14 to 24 does not provide any lower located in correspondence of the steeped side 11c of each concavity portion 11 of the closure element 9. However, it is preferable to arrange such lowers 10b in order to facilitate the end engagement flange 25c of the accessory mechanism or component 25 to reach the retraced condition within the corresponding concavity portion.

[0173] With regard to the embodiment shown in Figures 16, 17, 10 to 22, the convexity portion 18 of each pocket structure 10 of the closure element 9 is provided with at least two thickened portions 21, in particular substantially cylindrical, to allow the accessory mechanism or component 25 (Figures 14 and 18), to be fixed within the corresponding concavity portion 11 by means of corresponding threaded fasteners 25a (Figures 17 and 22). Each thickened portion 21 is located on a median plane which cuts the closure element 9 longitudinally in half.

[0174] Each thickened portion 21 develops both outwards from the corresponding convexity portion 18 and towards the corresponding concavity portion 11 occupying a part of the latter and emerging from the bottom 11a of the latter. Each thickened portion 21 also has an engagement hole 21a arranged to be engaged by a corresponding threaded fastener 25a, optionally a screw, of the accessory mechanism or component 25. In this way, each thickened portion 21 is ready to be pierced from the concavity portion 11 to the convexity portion 18 by a corresponding threaded fastener 25a of the acces-

sory mechanism or component 25. By means of the threaded fasteners 25a, the corresponding accessory mechanism or component 25 is adjusted in its position with respect to the distance and/or the inclination thereof with respect to the bottom 11a of the corresponding concavity 11.

[0175] According to what is shown in Figures 16, 17, 20 to 22, the closure element comprises a plurality of reinforcing baffles 19 arranged on the side opposite to the peripheral surface 23, namely the side of the closure element 9 facing to the cavity 6 of the door 4 when the closure element 9 is engaged to the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4. The reinforcing baffles 19 of the closure element 9 develop perpendicularly with respect to the peripheral surface 23 and cover a region extending from one pocket structure 10 to the other pocket structure 10, including a region in the middle of the two pocket structures 10.

[0176] Among the reinforcing baffles 19 of the plurality of reinforcing baffles 19, it is possible to identify a first type of reinforcing baffles 19a which develop perpendicularly to the peripheral surface 23 and to a prevailing direction of longitudinal development of the closure element 9 and a second type of reinforcing baffles 19b which develop perpendicularly to the peripheral surface 23 and to the first type of reinforcing baffles 19a. Such reinforcing baffles 19a, 19b define a reinforcing skeleton which embraces both convexity portions 18 of the corresponding pocket structures of the closure element 9 by covering the frame 10a interposed between such pocket structures 10.

[0177] The present invention also relates both to a method of assembling of a household appliance 1, in particular a built-in household appliance such as a built-in refrigerator and to a method of assembling of a door 4 for household appliances 1.

[0178] With regard to the method of assembling of a household appliance 1, such a method comprises the steps of:

- providing a body 2 comprising at least one compartment 3;
- providing a door 4 comprising an outer shell 5 having two through openings 8 located on a same face of the door 4, preferably on the front face of the closure 4 wherein the outer shell 5 defines an inner cavity 6 to be filled with a thermal insulating and filling material 7;
- closing the two through openings 8 of the outer shell 5 by means of a corresponding closure element 9 for each through opening 8 or by means of a single closure element 9 configured to close both through openings 8 in order to prevent any leakage of the thermal insulating and filling material 7 during the assembly operations;
- filling the inner cavity 6 of the door 4 with the thermal insulating and filling material 7 which at least partially, optionally completely, occupies the inner cavity

6 of the door 4, without coming out of the two through openings 8;

- positioning and fixing an accessory mechanism or component 25 within a corresponding concavity portion 11 defined by the corresponding closure element 9;
- rotatively engaging the door 4 to the body 2.

[0179] With respect to the method of assembling a door 4 for household appliances, such a method differs from the previous method in the steps strictly related to the formation of the household appliance 1, namely providing the household appliance's body 2 and rotatively engaging the door 4 with the household appliance body 2.

[0180] The method of assembling a door 4 comprises the steps of:

- producing an outer shell 5 having two through openings 8 located on a same face of the door 4, preferably on the front face of the door 4, so as to define an inner cavity 6 to be filled with a thermal insulating and filling material 7;
- closing the two through openings 8 of the outer shell 5 by means of a corresponding closure element 9 for each through opening 8 or by means of a single closure element 9 configured to close both through openings 8, in order to prevent any leakage of the thermal insulating and filling material 7 during the assembly operations;
- filling the inner cavity 6 of outer shell 5 with the thermal insulating and filling material 7 which occupies, at least partially, optionally completely, the inner cavity 6, without coming out of the two through openings 8, since it is resisted by corresponding closure elements 9 or by the only closure element 9 provided;
- positioning and fixing an accessory mechanism or component 25 in a concavity portion 11 defined by the corresponding closure element 9.

[0181] Irrespective of the fact that the method of assembling a household appliance 1 or a door 4 for a household appliance is carried out by using two separate closure elements 9, one for the each through opening 8 to be closed, or a single closure element 9 for closing both through openings 8, most of the steps related to the closure of the through openings 8 are quite the same. The assembly operations will be described in detail below with reference to the structural features of the doors 4 and the closure elements 9 according to the embodiments already disclosed.

[0182] The step of closing the two through openings 8 of the outer shell 5 of the door 4 by means of corresponding closure elements 9 or a single closure element 9 is carried out before the step of filling the inner cavity 6 of the door 4 with the thermal insulating and filling material 7. In this way, the through openings 8 are closed and sealed, preventing the thermal insulating and filling material 7 escaping from the inner cavity 6 of the door 4.

[0183] In particular, the step of closing the two through openings 8 of the outer shell 5 of the door 4 by corresponding closure elements 9 or by a single closure element 9 is carried out according to the following substeps.

[0184] In the case where two separate closure elements 9 are used:

- aligning an opening 11b of the concavity portion 11 of the corresponding pocket structure 10 of each closure element 9 with the corresponding through opening 8 of the outer shell 5 of the door 4 from the side of an inner surface 5d of the outer shell 5;
- engaging each closure element 9 with the inner surface 5d of the outer shell 5 of the door 4 in correspondence of the corresponding through opening 8.

[0185] In the case where a single closure element 9 is used:

- aligning an opening 11b of the concavity portion 11 of each pocket structure 10 of the closure element 9 with the corresponding through opening 8 of the outer shell 5 of the door 4 from the side of an inner surface 5d of the outer shell 5;
- engaging the closure element 9 on the inner surface 5d of the outer shell 5 of the door 4 along a band region of the inner surface 5d corresponding to both through openings 8.

[0186] A transition step between the step of aligning and the step of engaging is further provided. In the transition step, a protruding surrounding edge 11b' of the opening 11b of each concavity portion 11 involved is at least partially inserted in the corresponding through opening 8 of the second half shell 5c of the outer shell 5 of the door 5.

[0187] The step of engaging two separate closure elements 9 or a single closure element 9 on the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4 to close the corresponding through openings 8 is carried out by an attaching operation.

[0188] In particular, in order to carry out the fixing operation, the peripheral surface 23 of the closure element 9, which is intended to close one or both the through openings 8, is firstly superimposed on the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4 so as to rest on this inner surface 5d by completely surrounding the corresponding through opening 8 or both through openings 8 with the corresponding concavity portions 11 properly matched.

[0189] The step of engaging two separate closure elements 9 or a single closure element 9 on the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4 in order to close the corresponding through openings 8 is carried out by using at least one engaging element 24, namely a bonding substance and/or one or more portions of an adhesive tape 24a.

[0190] When a bonding substance is used such a bonding substance is applied to the peripheral surface 23 of the closure elements 9 or the closure element 9 used to close the through openings 8 of the second half shell 5c of the outer shell of the door 4, before the peripheral surface is superimposed on the corresponding inner surface 5d of the outer shell 5 of the door.

[0191] In the event that one or more portions of an adhesive tape 24a are used to keep the closure elements 9 or the closure element 9 against the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4 in order to close the through openings 8 of the latter, each portion of the adhesive tape 24a is applied to the corresponding frame(s) 10a, straddling between the frame(s) 10a and the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4. In particular, each portion of the adhesive tape 24a applied to the frame 10a of a closure element 9 used, is partially superimposed on the frame 10a of the corresponding closure element 9 and partially on the inner surface 5d of the second half shell 5c of the outer shell 5 of the door 4.

ADVANTAGES

[0192] First of all, the provision of one or more closure elements providing concavity portions for accommodating corresponding accessory mechanisms as push-to-open mechanisms on a front face of the outer shell of the doors of the household appliances increases the activation region of such push-to-open mechanisms when the user performs a pushing action on the doors of the piece of furniture which are connected to the doors of the household appliances by the push-to-open mechanisms.

[0193] Furthermore, the positioning of the push-to-open mechanisms on the front faces of the doors of the household appliances improves the reactivity of such push-to-open mechanisms when activated by the users, resulting in a timely response of the latter when triggered.

[0194] It should also to be noted that the use of one or more closure elements provided with one or more concavity portions for housing the corresponding accessory push-to-open mechanisms prevents any damage to the outer shells of the door because such accessory push-to-open mechanisms are screwed directly to the thickened portions of the corresponding pocket structures of the corresponding closure elements.

[0195] In addition, the provision of one or more closure elements on the front face of the outer shell of the doors allows the overall time for assembling the doors of the household appliances to be significantly reduced by making the operations for closing the through openings of the doors as well as the operations for fixing and adjusting the accessory push-to-open mechanisms, easy and simple to perform.

Claims

1. Household appliance (1), in particular a built-in household appliance, optionally a built-in refrigerating appliance such as a fridge or a freezer or an integrated fridge-freezer, comprising:

- a body (2), defining at least one compartment (3);
- a door (4) movably engaged with the body (2) and preferably connected to the body (2) through at least one rotation hinge, the door (4) being movable between a closed position wherein the door (4) is configured to isolate the corresponding compartment (3) from an external environment, and at least one open position wherein the compartment (3) is in communication with the external environment, the door (4) comprising an outer shell (5) defining, at least partly and preferably in combination with an inner liner of the door (4), an inner cavity (6) in which at least one thermal insulating and/or filling material (7) such as polyurethane foam is arranged, the outer shell (5) of the door (4) having at least one through opening (8), the door (4) comprising at least one closure element (9) preferably made of a plastic material, the at least one closure element (9) being configured to obstruct the at least one through opening (8) of the outer shell (5) of the door (4), wherein the closure element (9) comprises:

- at least one pocket structure (10) having at least one concavity portion (11) arranged to remain facing away from the outer shell (5) of the door (4), the concavity portion (11) having a bottom (11a) and an opening (11b) opposite the bottom (11a), the opening (11b) being in correspondence with the at least one through opening (8) of the door (4), wherein the at least one through opening (8) of the outer shell (5) of the door (4) and the opening (11b) of the at least one concavity portion (11) of the at least one pocket structure (10) preferably share substantially the same shape;
- at least one frame (10a) at least partially, optionally completely, surrounding the opening (11b) of the concavity portion (11), wherein a peripheral surface (23), preferably a substantially flat peripheral surface (23), developing from the pocket structure (10) is defined by the frame (10a) and is configured to be pressed against and/or to be attached or glued on and/or to engage, according to a superimposed relationship, an inner surface (5d) of the outer shell (5) of the door (4) at the at least one through

- opening (8), so as to prevent or to limit leakages of the thermal insulating and/or filling material (7) through the at least one through opening (8) of the outer shell (5) of the door (4), in particular during a filling, optionally pressure filling, operation of the inner cavity (6) with the thermal insulating and/or filling material (7), optionally wherein the frame (10a) is configured to cause an obstruction of, in particular to seal, the respective through opening (8) of the outer shell (5) of the door (4) when the respective peripheral surface (23) is adhered to the inner surface (5d) of the outer shell (5) of the door (4).
2. Household appliance (1) according to the previous claim, wherein the door (4) further comprises at least one attachment element (24) operative between said at least one frame (10a) of the at least one closure element (9) and said outer shell (5), said at least one attachment element (24) being configured to establish an at least temporary adhesion of the peripheral surface (23) defined by the frame (10a) of the closure element (9) to the inner surface (5d) of the outer shell (5) of the door (4), said at least temporary adhesion being in particular effective at least during the manufacturing of the door (4), in particular during the filling, optionally pressure filling, operation of the inner cavity (6) with the thermal insulating and/or filling material (7) and during the possible subsequent hardening of the thermal insulating and/or filling material (7) within the inner cavity (6), in particular the at least one attachment element (24) comprising a bonding substance such as glue.
 3. Household appliance (1) according to the previous claim, wherein the attachment element (24) comprises at least one strip of bi-adhesive tape (24a), optionally two or more strips of bi-adhesive tape (24a), applied straddling between the frame (10a) of the corresponding pocket structure (10) of the closure element (9) and the outer shell (5) of the door (4) and/or at least one strip of adhesive tape (24a), optionally two or more strips of adhesive tape (24a), applied to the frame (10a) of the corresponding pocket structure (10) of the closure element (9) and the outer shell (5) of the door (4) so as to be partially on the frame (10a) of the closure element (9) and partially on the outer shell (5) of the door (4).
 4. Household appliance (1) according to anyone of the previous claims, wherein the concavity portion (11) of the at least one pocket structure (10) of the closure element (9) has a shape configured to house an accessory mechanism or component (25) of the household appliance (1), optionally a push-to-open mechanism configured for coupling the door (4) of the household appliance (1) with a door of a cabinet, in particular the concavity portion (11) having a substantially parallelepiped or prismatic shape wherein the length is at least two times the width, optionally at least four times the width, more optionally at least six times the width, preferably wherein the concavity portion (11) of the at least one pocket structure (10) of the closure element (9) is roughly counter-shaped compared to the shape of the push-to-open mechanism and/or preferably wherein the concavity portion (11) of the at least one pocket structure (10) of the closure element (9) is configured to establish a shape coupling with the push-to-open mechanism.
 5. Household appliance (1) according to anyone of the previous claims, wherein:
 - the concavity portion (11) of the at least one pocket structure (10) of the closure element (9) has at least one stepped side (11c) comprising at least two steps (11d) between a bottom (11a) and the opening (11b) of the concavity portion (11) connected to each other by an intermediate arched connection (11e), optionally the concavity portion (11) of the pocket structure (10) being provided with a plurality of sliding ribs (11g) disposed on side opposite surfaces (11f) of the concavity portion (11) transversely, optionally orthogonally, to the bottom (11a) of the concavity portion (11), in particular each sliding rib (11g) of the concavity portion (11) of the pocket structure (10) developing between the bottom (11a) and the opening (11b) of the concavity portion (11) with one end spaced from the opening (11b) of the concavity portion (11), namely not ending at the opening (11b) of the concavity portion (11); and/or
 - the opening (11b) of the concavity portion (11) of the at least one pocket structure (10) of the closure element (9) has a protruding surrounding edge (11b') developing along a peripheral outline of the opening (11b), the protruding and surrounding edge (11b') having substantially the same shape of the opening (11b) of the corresponding concavity (11) and the at least one through opening (8) of the door (4) and being configured to occupy, at least partially, the at least one through opening (8) of the door (4) along an contour edge of the at least one through opening (8) of the door (4).
 6. Household appliance (1) according to anyone of the previous claims, wherein the at least one pocket structure (10) of the closure element (9) has a convexity portion (18) facing away from the concavity portion (11) of the closure element (9), the convexity portion (18) having at least two thickened portions (21), optionally at least two substantially cylindrical

thickened portions (21), developing outwards the concavity portion (11) and configured to allow the accessory mechanism or component (25) of the household appliance (1), optionally push-to-open mechanism, to be fixed within the concavity portion (11) by means of corresponding threaded fasteners (25a), in particular each thickened portion (21) being located on a median plane that cuts longitudinally in half the closure element (9), optionally wherein each thickened portion (21) develops outwards the convexity portion (18) of the at least one pocket structure (10) and optionally towards the concavity portion (11) occupying a part of the concavity portion (11), in particular each thickened portion (21) emerging from the bottom (11a) of the concavity portion (11) and being configured to be pierced by a threaded fastener (25a), optionally accessory mechanism or component (25) of the household appliance (1), more optionally each thickened portion (21) having an engagement hole (21a) arranged to be engaged by a threaded fastener (25a), in particular a screw, of the accessory mechanism or component (25) of the household appliance (1).

7. Household appliance (1) according to anyone of the previous claims, wherein the outer shell (5) of the door (4) has two through openings (8), optionally located on the same face of the outer shell (5) of the door (4), more optionally positioned at the same level and/or height of the outer shell (5) of the door (4), in particular aligned longitudinally along a direction orthogonal to two opposite sides of the outer shell (5) of the door (4), optionally the longer sides (5e), and parallel to the other opposite sides of the outer shell (5) of the door (4), optionally the shorter sides (5f), in particular each of the two through openings (8) of the outer shell (5) of the door (4) being positioned close to a corresponding longer side (5e) of the outer shell (5) of the door (4).
8. Household appliance (1) according to anyone of the claims 1 to 7, wherein the household appliance (1) comprises a closure element (9) for each of the two through openings (8) of the outer shell (5) of the door (4), each closure element (9) being configured to close the corresponding through opening (8) of the outer shell (5) of the door (4), the closure elements (9) being in particular specularly identical.
9. Household appliance (1) according to anyone of the claims 1 to 7, wherein the household appliance (1) comprises a single closure element (9) configured to close the two through openings (8) of the outer shell (5) of the door (4), optionally wherein the closure element (9) comprises:
 - a pocket structure (10) for each of the two through openings (8) of the outer shell (5) of

the door (4), each pocket structure (10) of the closure element (9) having at least one concavity portion (11) arranged to remain facing away from the outer shell (5) of the door (4), each concavity portion (11) having a bottom (11a) and an opening (11b) opposite the bottom (11a), each opening (11b) being in correspondence with the respective through opening (8) of the outer shell (5) of the door (4), each through opening (8) of the outer shell (5) of the door (4) and the opening (11b) of the concavity portion (11) of the respective pocket structure (10) preferably sharing substantially the same shape;

- a frame (10a) at least partially, optionally completely, surrounding the openings (11b) of the concavity portions (11) of the pocket structures (10) of the closure element (9), wherein the peripheral surface (23), preferably the substantially flat peripheral surface (23), is defined by the frame (10a) and develops from, and around, the pocket structures (10), the peripheral surface (23) being configured to be pressed against and/or to be attached or glued on and/or to engage, according to a superimposed relationship, an inner surface (5d) of the outer shell (5) of the door (4) along a band region of the inner surface (5d) corresponding to the two through openings (8) of the door (4) and/or bridging the two through openings (8) of the outer shell (5) of the door (4), so as to prevent or to limit leakages of the thermal insulating and/or filling material (7) through the two through openings (8) of the door (4), in particular during a filling, optionally pressure filling, operation of the inner cavity (6) with the thermal insulating and/or filling material (7), optionally wherein the frame (10a) is configured to cause an obstruction of, in particular to seal, the two through openings (8) of the door (4) when the peripheral surface (23) is adhered to the inner surface (5d) of the outer shell (5) of the door (4), wherein the frame (10a) of the closure element (9) also develops between the two pocket structures (10), optionally wherein the peripheral surface (23) is extended between the two pocket structures (10); and
- optionally a plurality of reinforcing baffles (19) arranged on the side opposite to the peripheral surface (23), namely the side of the closure element (9) facing to the cavity (6) of the door (4) when the closure element (9) is attached to the inner surface (5d) of the outer shell (5) of the door (4), the reinforcing baffles (19) of the closure element (9) covering an area extending from a first of the pocket structures (10) to a second of the pocket structures (10), in particular in an area arranged at the middle of the two pocket structures (10), optionally the reinforcing baffles (19) of the plurality of the reinforcing

baffles (19) developing perpendicular with respect to the peripheral surface (23), in particular the plurality of the reinforcing baffles (19) comprising reinforcing baffles of a first type (19a) and reinforcing baffles of a second type (19b), wherein the reinforcing baffles of the first type (19a) develop substantially perpendicularly to the peripheral surface (23) and to a prevailing direction of longitudinal development of the closure element (9) and wherein the reinforcement baffles of the second type (19b) develop substantially perpendicularly to the peripheral surface (23) and to the reinforcing baffles of the first type (19a).

10. Household appliance (1), in particular built-in household appliance, optionally built-in refrigerating appliance such as a fridge or a freezer or an integrated fridge-freezer, the household appliance (1) being preferably but not exclusively according to anyone of the previous claims, wherein the household appliance (1) comprises:

- a body (2), defining at least one compartment (3);
- at least one door (4) connected to the body through at least one rotation hinge, the door (4) of the household appliance (1) being movable between a closed position wherein the door (4) is configured to isolate the corresponding compartment (3) from an external environment, and an open position wherein the compartment (3) is in communication with the external environment, wherein the door (4) of the household appliance (1) exhibits a front surface and extends in height between a first edge of the door (4) and a second edge of the door (4), wherein the first edge of the door (4) can be an upper edge of the door (4) and the second edge of the door (4) can be a lower edge of the door (4) or wherein the first edge of the door (4) can be a lower edge of the door (4) and the second edge of the door (4) can be an upper edge of the door (4); and
- at least one push-to-open mechanism configured for coupling the door (4) of the household appliance (1) with a door of a cabinet, wherein the push-to-open mechanism comprises:
 - an arm configured to connect the door (4) of the household appliance (1) to the door of the cabinet;
 - a push latch configured to selectively lock the arm in a locked position; and
 - optionally at least one spring configured to cause movement of the arm from the locked position to an unlocked position when the push latch is unlocked,

characterised in that the push-to-open mechanism is assembled to, in particular fastened to, the door (4) of the household appliance (1) in correspondence of the front surface and **in that**, when the push-to-open mechanism is assembled to the door (4), the distance between the barycenter of the push-to-open mechanism and the first edge of the door (4) is less than ten times, preferably less than five times, more preferably less than twice, the distance between the barycenter of the push-to-open mechanism and the second edge of the door (4), in particular wherein:

- the push-to-open system further includes a runner configured to be coupled to the door of the cabinet door and a slide coupled to the arm and configured to move along the runner and/or
- one of the push latch and the arm has a receiver and the other of the push latch and the arm has a plunger configured to selectively mate with the receiver and/or
- the arm is configured to pivot relative to the door (4) of the household appliance (1) between the locked position and the unlocked position such that, when the household appliance (1) is installed within the cabinet with the arm connecting the door (4) of the household appliance (1) to the door of the cabinet, pushing the door of the cabinet towards the door (4) of the household appliance (1) unlocks the push latch and movement of the arm from the locked position to the unlocked position causes movement of the door of the cabinet relative to the door (4) of the household appliance (1) enabling a user to grasp the door of the cabinet door and pull on the door of the cabinet to open the door (4) of the household appliance (1).

11. Door (4) for household appliances (1), in particular built-in household appliances, optionally built-in refrigerating appliances such as fridges or fridges or freezers or integrated fridge-freezers, comprising:

- an outer shell (5) defining, at least partly and preferably in combination with an inner liner of the door (4), an inner cavity (6) in which at least one thermal insulating and/or filling material (7) such as polyurethane foam is arranged, the outer shell (5) of the door (4) having two through openings (8) located on a same face of the outer shell (5) of the door (4);
- a pair of distinct closure elements (9), each of the distinct closure elements (9) being preferably made of a plastic material and being con-

figured to obstruct a respective of the two through openings (8) of the outer shell (5) of the door (4) or a single closure element (9) preferably made of a plastic material and configured to obstruct the two through openings (8) of the outer shell (5) of the door (4), wherein each of the distinct closure element (9) comprises or wherein the single closure element (9) comprises:

- at least one pocket structure (10), in particular a pocket structure (10) or two pocket structures (10), the at least one pocket structure (10) having at least one concavity portion (11) arranged to remain facing away from the outer shell (5) of the door (4), the at least one concavity portion (11) having a bottom (11a) and an opening (11b) opposite the bottom (11a), the opening (11b) being in correspondence with a respective through opening (8) of the outer shell (5) of the door (4), wherein the at least one through opening (8) of the outer shell (5) of the door (4) and the opening (11b) of the at least one concavity portion (11) of the at least one pocket structure (10) preferably share substantially the same shape;
- at least one frame (10a) at least partially, optionally completely, surrounding the opening (11b) of at least one concavity portion (11), wherein a peripheral surface (23), preferably a substantially flat peripheral surface (23), developing from at least one pocket structure (10) is defined by the at least one frame (10a) and is configured to be pressed against and/or to be attached or glued on and/or to engage, according to a superimposed relationship, an inner surface (5d) of the outer shell (5) of the door (4) at the at least one through opening (8), so as to prevent or to limit leakages of the thermal insulating and/or filling material (7) through the at least one through opening (8) of the outer shell (5) of the door (4), in particular during a filling, optionally pressure filling, operation of the inner cavity (6) with the thermal insulating and/or filling material (7), optionally wherein the at least one frame (10a) is configured to cause an obstruction of, in particular to seal, the respective through opening (8) of the outer shell (5) of the door (4) when the respective peripheral surface (23) is adhered to the inner surface (5d) of the outer shell (5) of the door (4).

12. Method for manufacturing a door (4) for household appliances (1), in particular built-in household appli-

ances, optionally built-in refrigerating appliances such as fridges or freezers or integrated fridge-freezers, comprising the steps of:

- i. providing an outer shell (5), an inner liner and at least one closure element (9), wherein the outer shell (5) has at least one through opening (8) and the closure element (9) has at least one pocket structure (10), the at least one pocket structure (10) comprising at least one concavity portion (11) and at least one frame (10a), the at least one concavity portion (11) having a bottom (11a) and an opening (11b) opposite the bottom (11a), the at least one frame (10a) at least partially, optionally completely, surrounding the opening (11b) of the at least one concavity portion (11), a peripheral surface (23), preferably a substantially flat peripheral surface (23), developing from the at least one pocket structure (10) being defined by the at least one frame (10a);
- ii. attaching at least one closure element (9) an inner surface (5d) of the outer shell (5) of the door (4) by means of an at least temporary adhesion of the at least one closure element (9) to the outer shell (5) of the door (4), the at least one temporary adhesion being established between the peripheral surface (23) of the at least one frame (10a) of the at least one closure element (9) and the inner surface (5d) of the outer shell (5) of the door (4) with the opening (11b) of the at least one concavity portion (11) substantially aligned with the at least one through opening (8) of the outer shell (5) of the door (4), so as to obstruct the at least one through opening (8) of the outer shell (5) of the door (4) by means of the at least one closure element (9), with the at least one concavity portion (11) facing away from inner cavity (6) of the outer shell (5) of the door (4);
- iii. filling, in particular under pressure, the inner cavity (6) of the door (4) with a thermal insulating and/or filling material (7) such as polyurethane foam, the thermal insulating and/or filling material (7) occupying, at least partially, optionally completely, the inner cavity (6), with the at least one closure element (9) counteracting possible thermal insulating and/or filling material coming out of the at least one through opening (8) of the outer shell (5) of the door (4).

13. Method according to claim 12, further comprising the step of:

- iv. positioning an accessory mechanism or component (25), in particular a push-to-open mechanism configured for coupling the door (4) of the household appliance (1) with a door of a cabinet, inside the at least one concavity portion (11) of the at least one pocket structure (10),

wherein the accessory mechanism or component (25) received inside the at least one concavity portion (11) of the at least one pocket structure (10) is preferably fixed to the at least one closure element (9), in particular to the at least one pocket structure (10) of the at least one closure element (9), preferably by means of at least one threaded fastener (25a). 5

14. Method according to claim 12 or to claim 13, wherein the step of attaching is performed by means of an at least one attachment element (24) operative between the at least one frame (10a) of the at least one closure element (9) and said outer shell (5), in particular between the peripheral surface (23) defined by at least one frame (10a) of the at least one closure element (9) and the inner surface (5d) of the outer shell (5) of the door (4), wherein the attachment element (24) comprises at least one strip of bi-adhesive tape (24a), optionally two or more strips of bi-adhesive tape (24a), applied straddling between the at least one frame (10a) of the at least one pocket structure (10) of the at least one closure element (9) and the outer shell (5) of the door (4) and/or at least one strip of adhesive tape (24a), optionally two or more strips of adhesive tape (24a), applied to the at least one frame (10a) of the at least one pocket structure (10) of the at least one closure element (9) and the outer shell (5) of the door (4) so as to be partially on the at least one frame (10a) of the at least one closure element (9) and partially on the outer shell (5) of the door (4). 10 15 20 25 30

15. Method according to anyone of claims 12 to 14, wherein the outer shell (5) has two through openings (8) and the at least one closure element (9) is a single closure element (9) having two pocket structures (10) comprising each a concavity portion (11), wherein the at least one frame (10a) surrounds the openings (11b) of the two concavity portions (11) and develops between the two pocket structures (10), wherein in the step of attaching the openings (11b) of the two concavity portions (11) are substantially aligned with the respective through opening (8) of the outer shell (5) of the door (4) with the two concavity portions (11) facing both away from inner cavity (6) of the outer shell (5) of the door (4), so that the two through openings (8) of the outer shell (5) of the door (4) are simultaneously obstructed by means of said single one closure element (9). 35 40 45 50

55

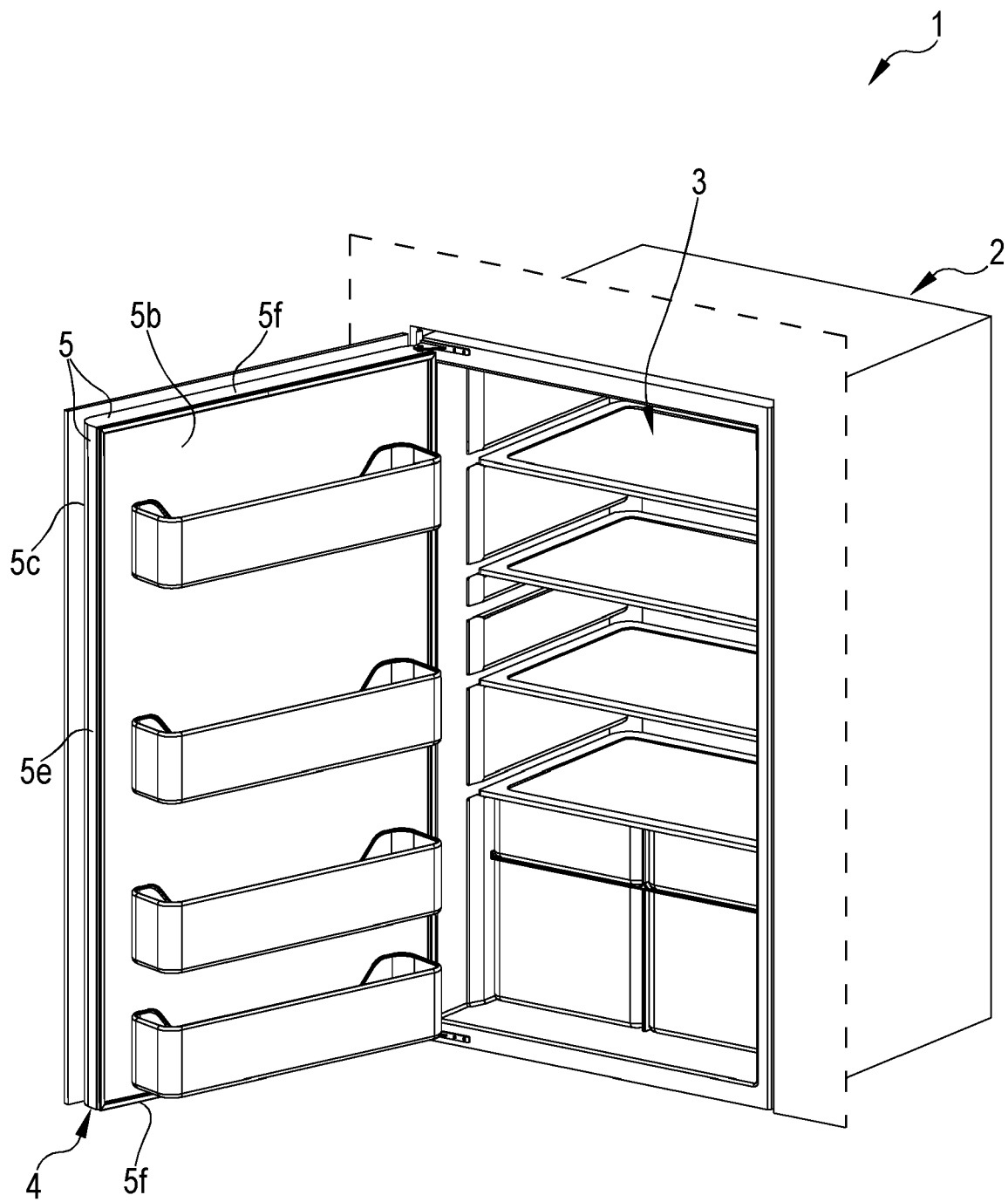


FIG.1

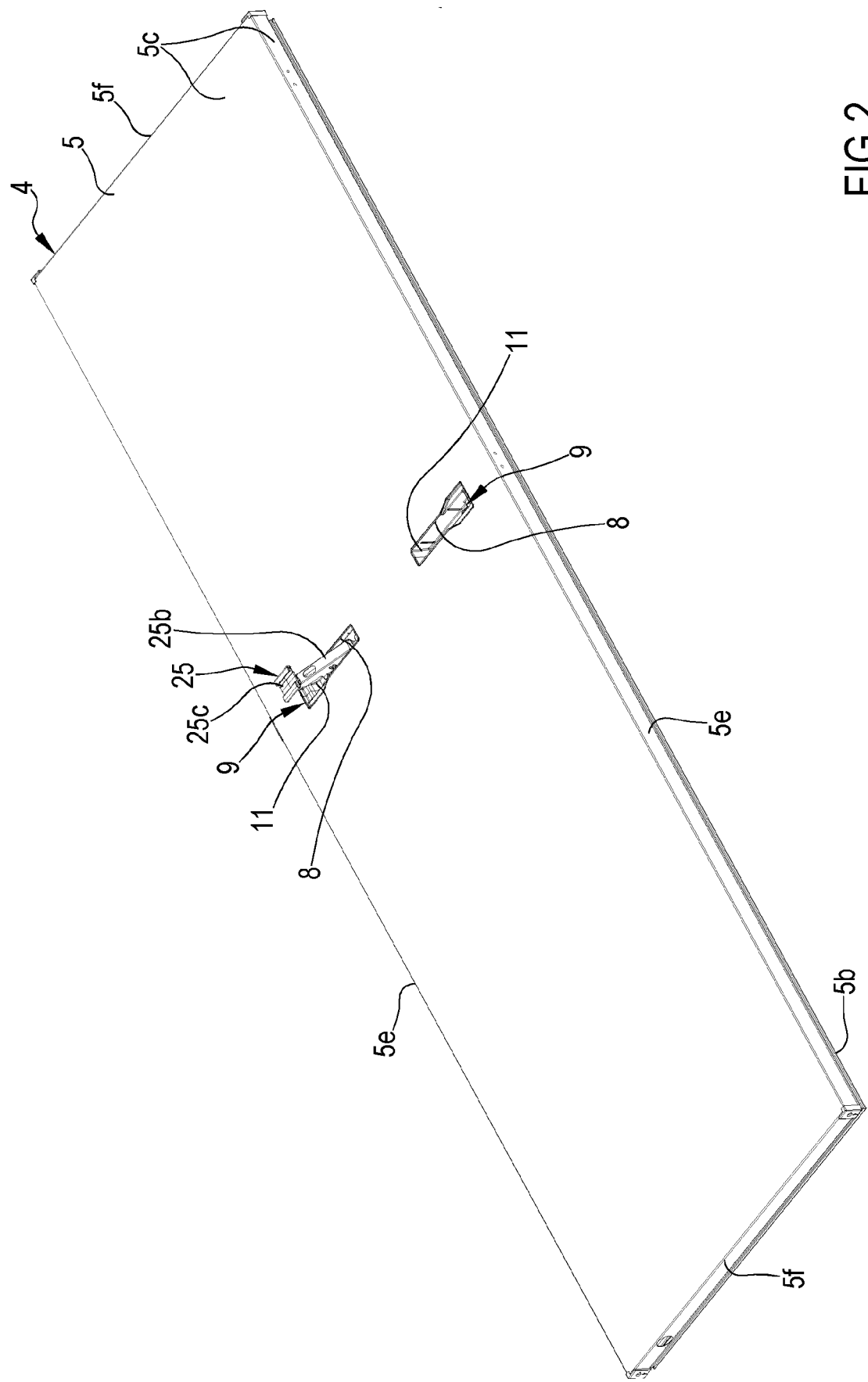


FIG.2

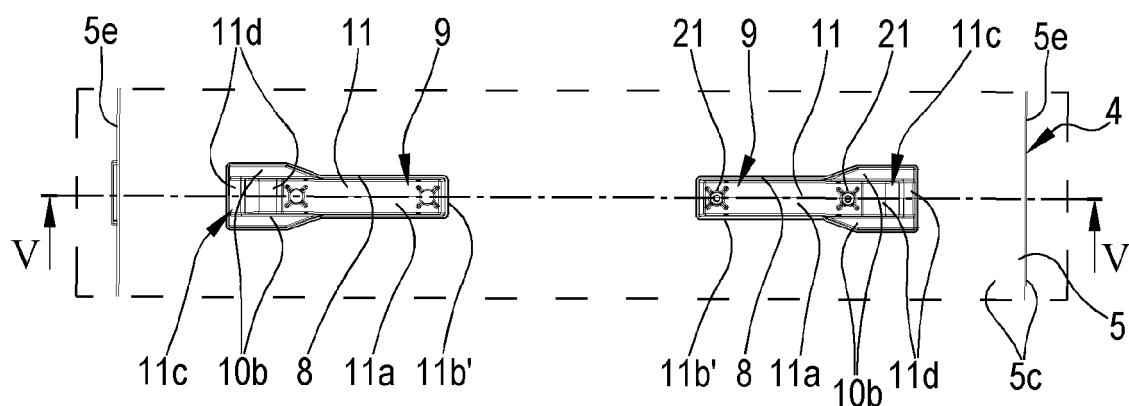


FIG. 3

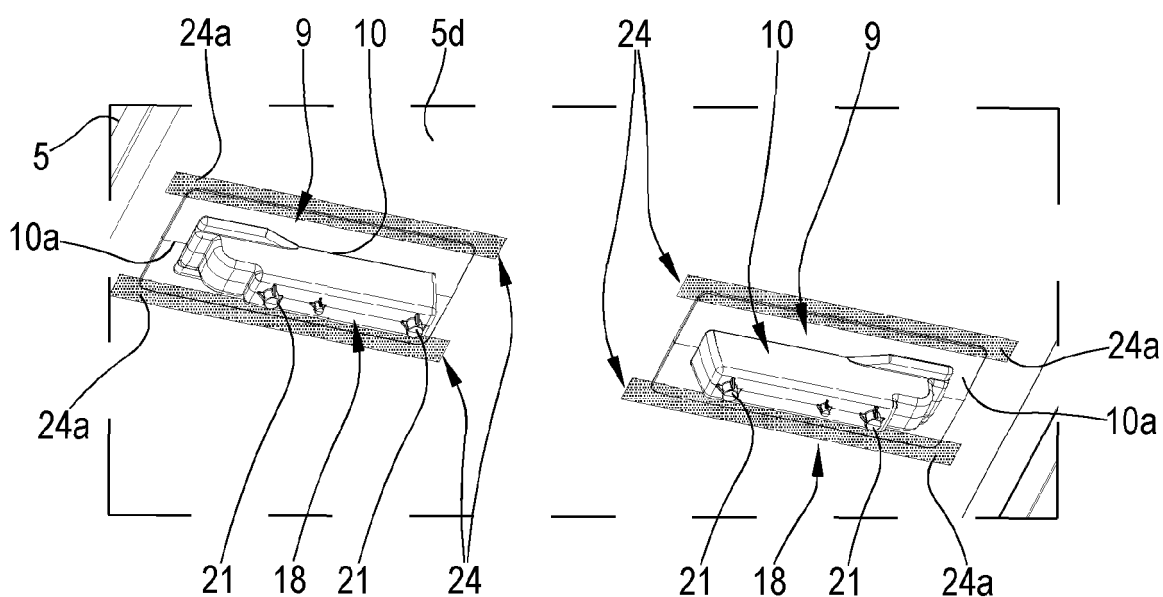


FIG. 4

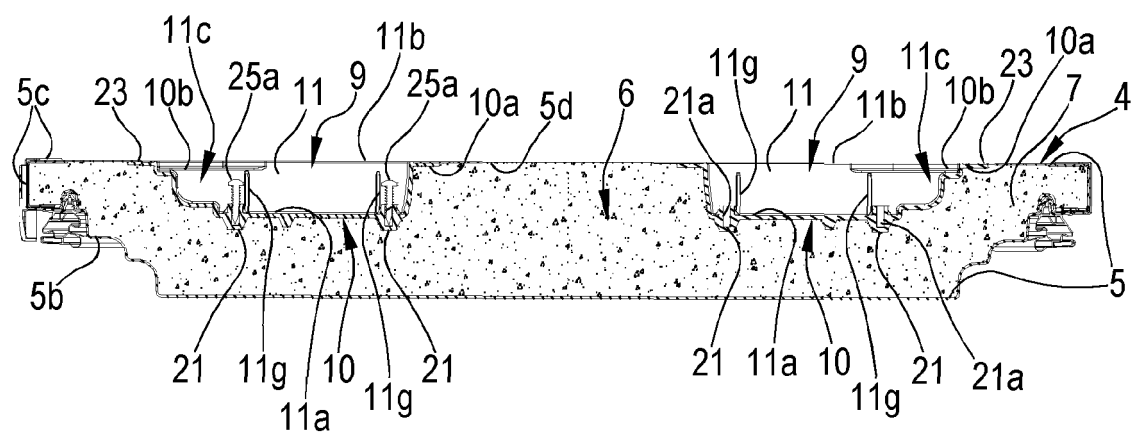
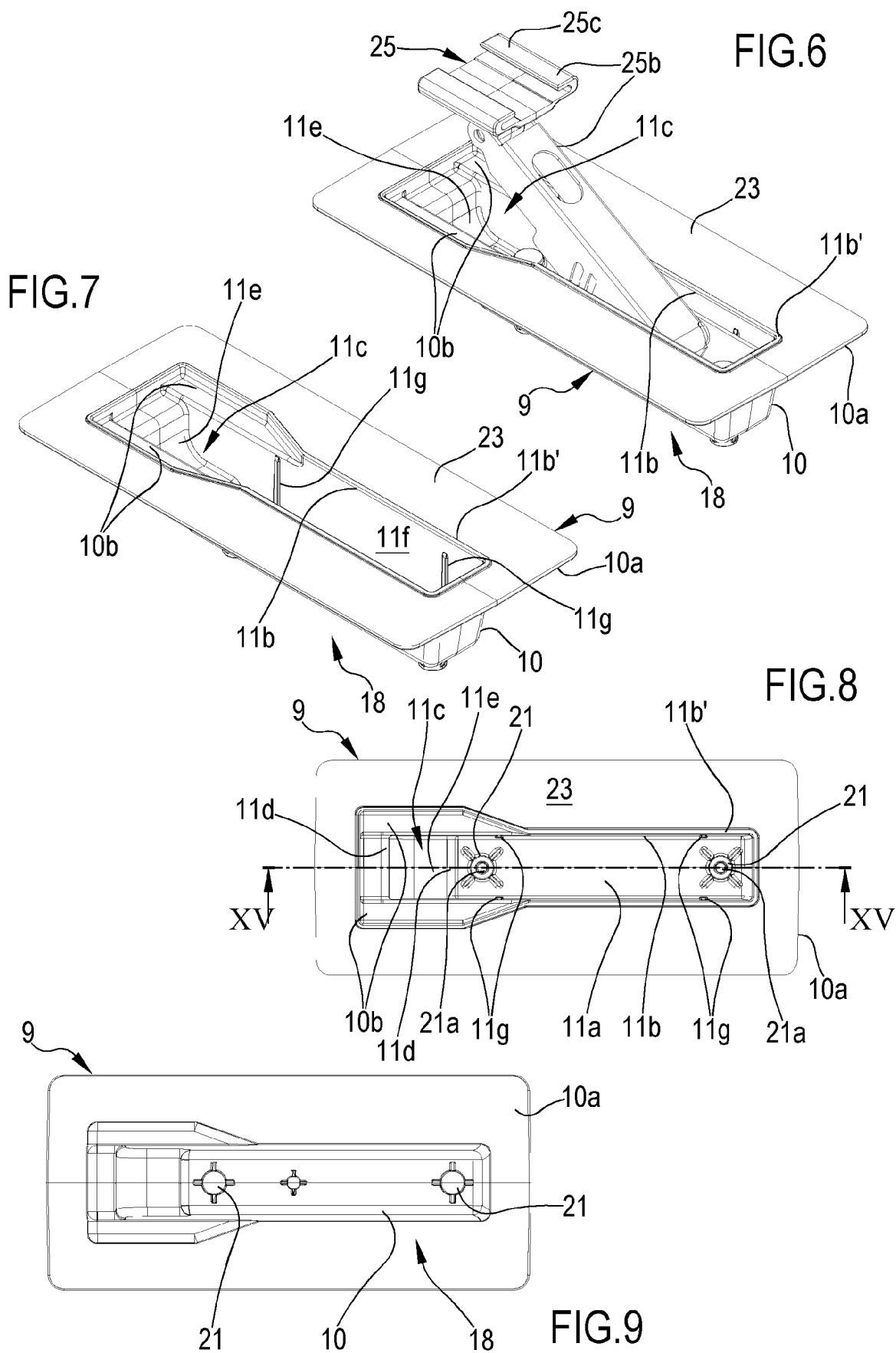


FIG. 5



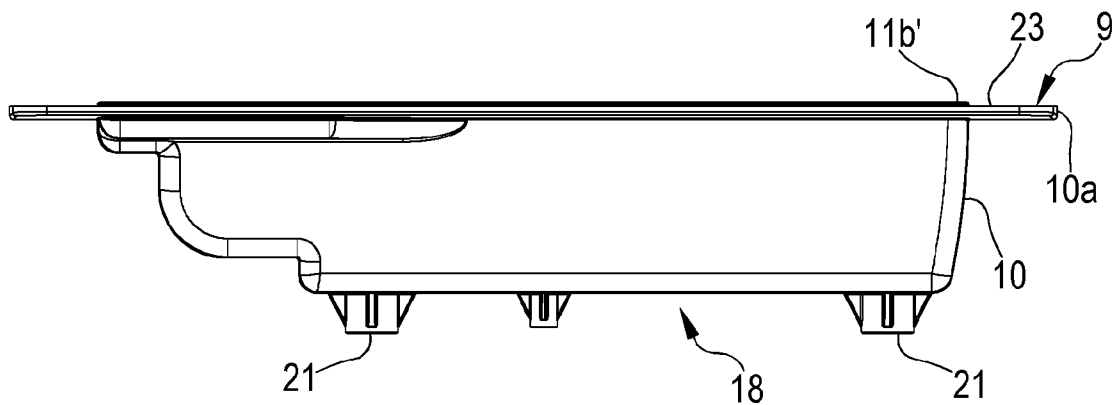


FIG. 10

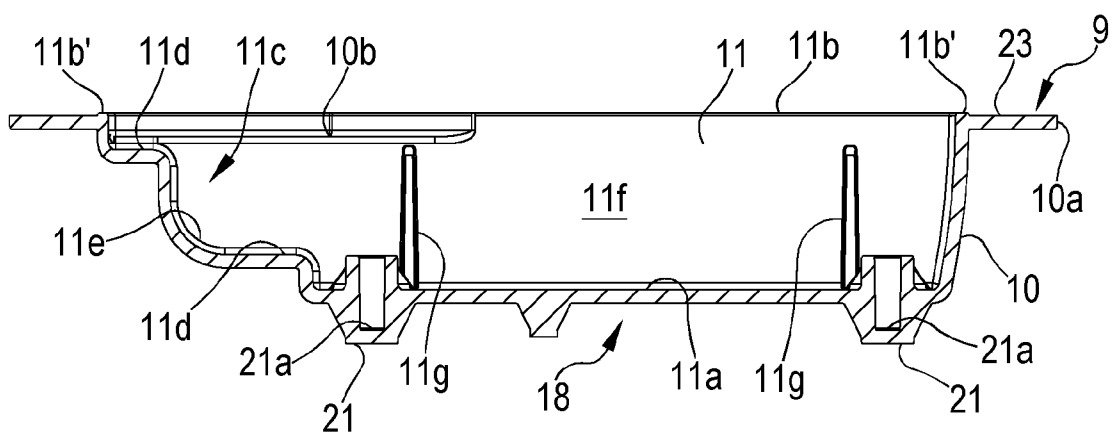


FIG. 11

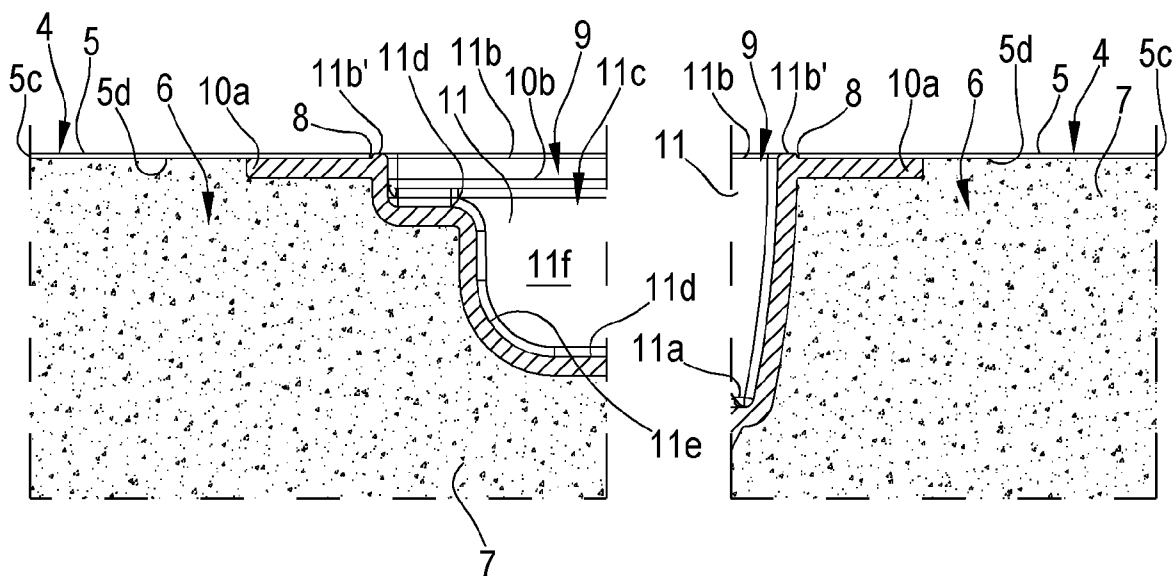


FIG. 12

FIG. 13

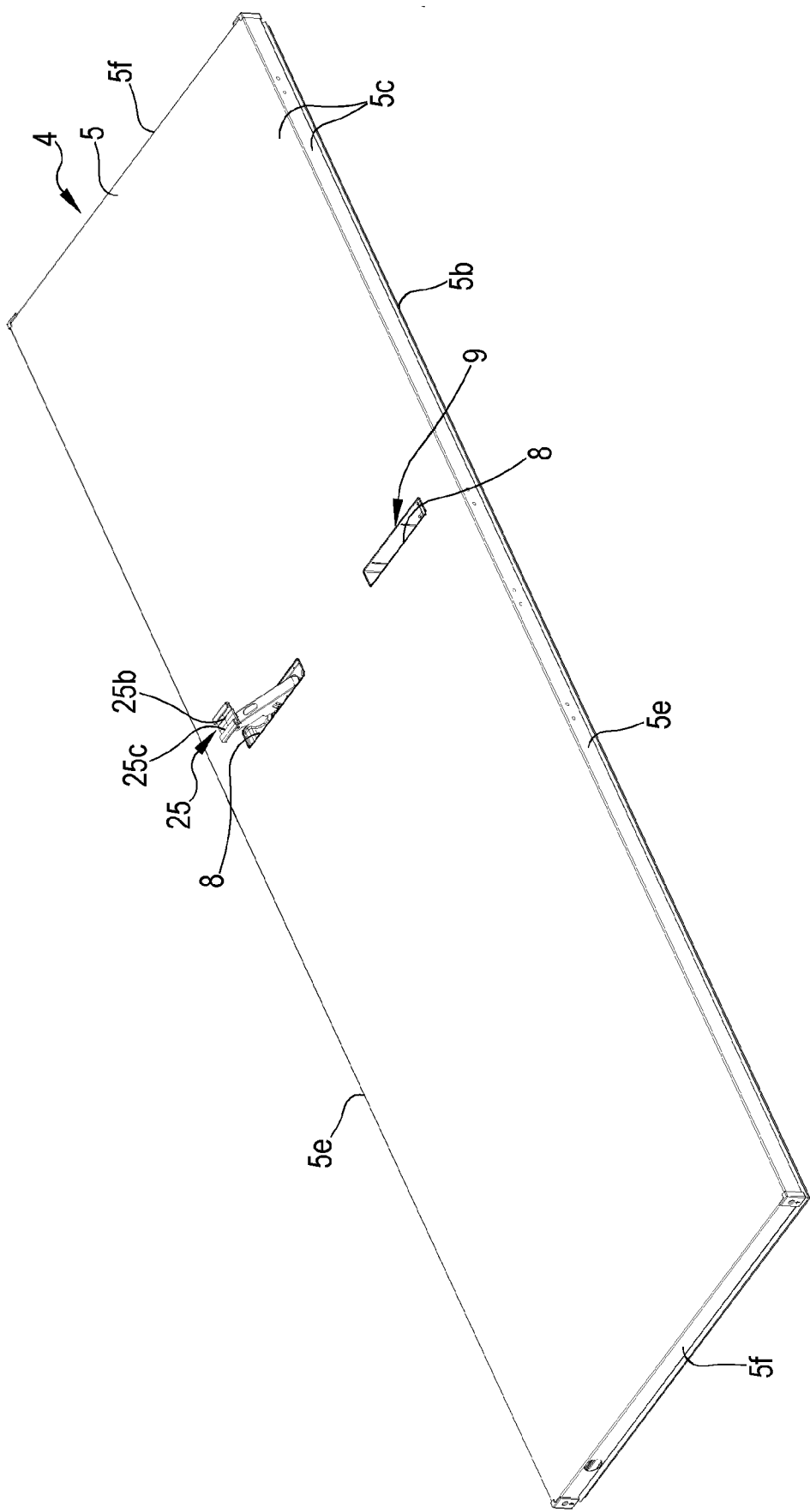


FIG.14

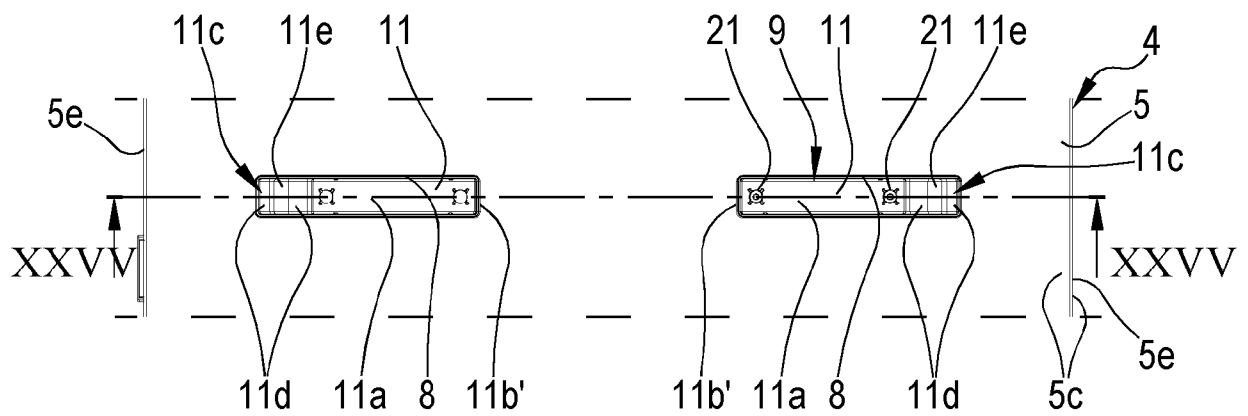


FIG. 15

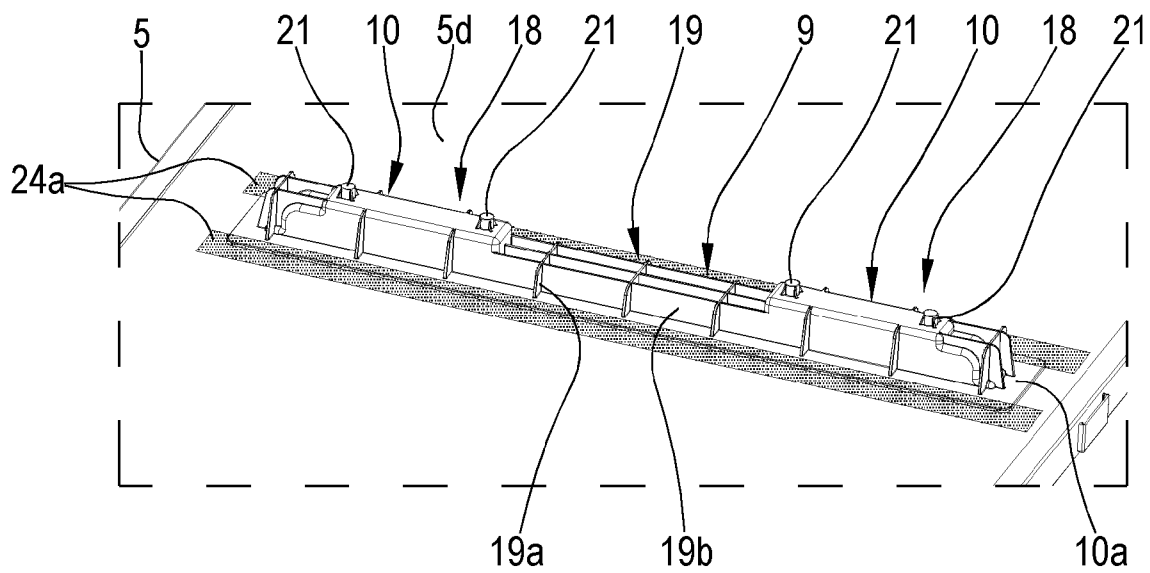


FIG. 16

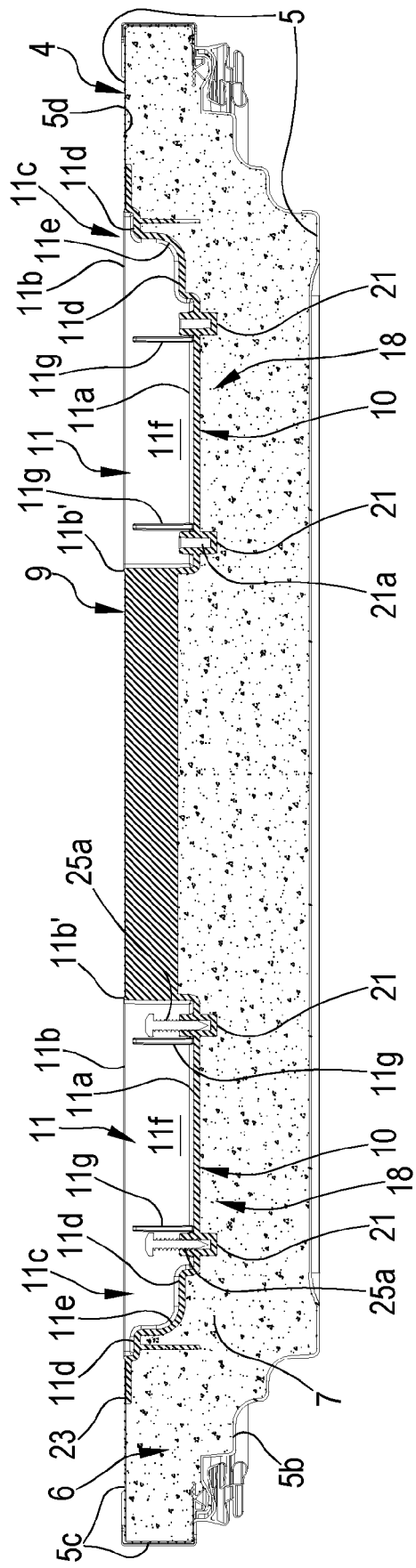


FIG.17

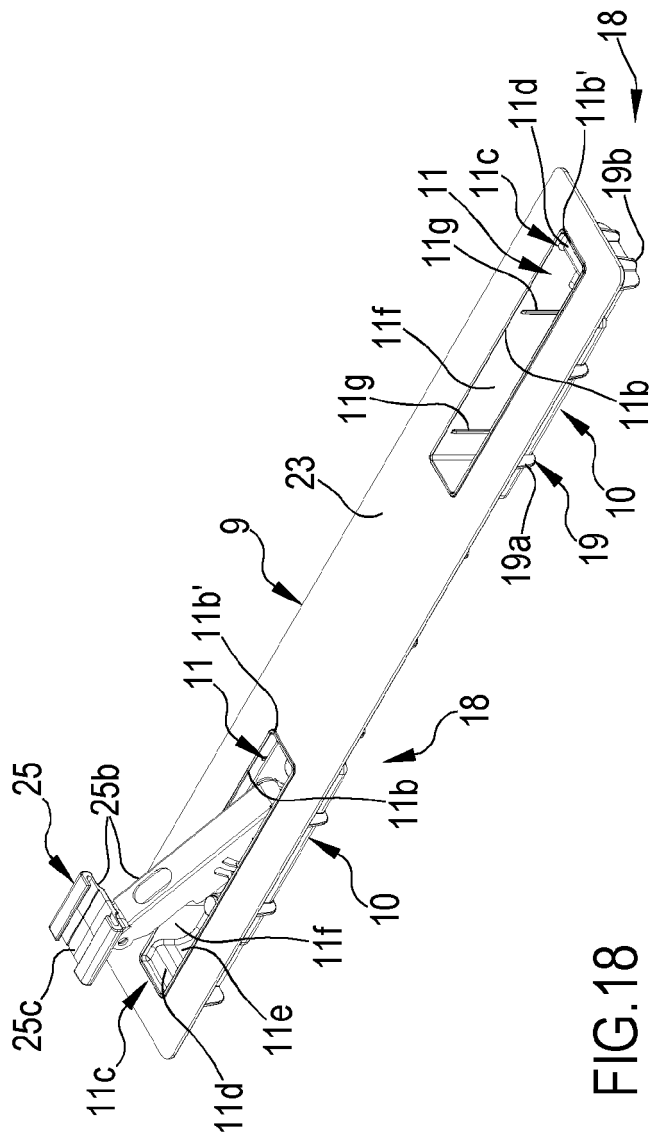


FIG.18

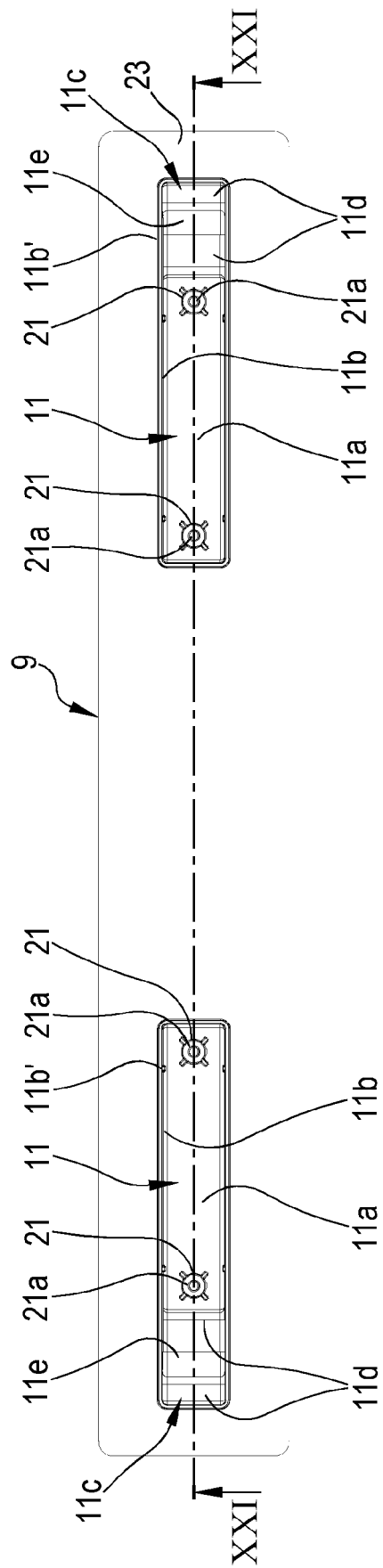


FIG.19

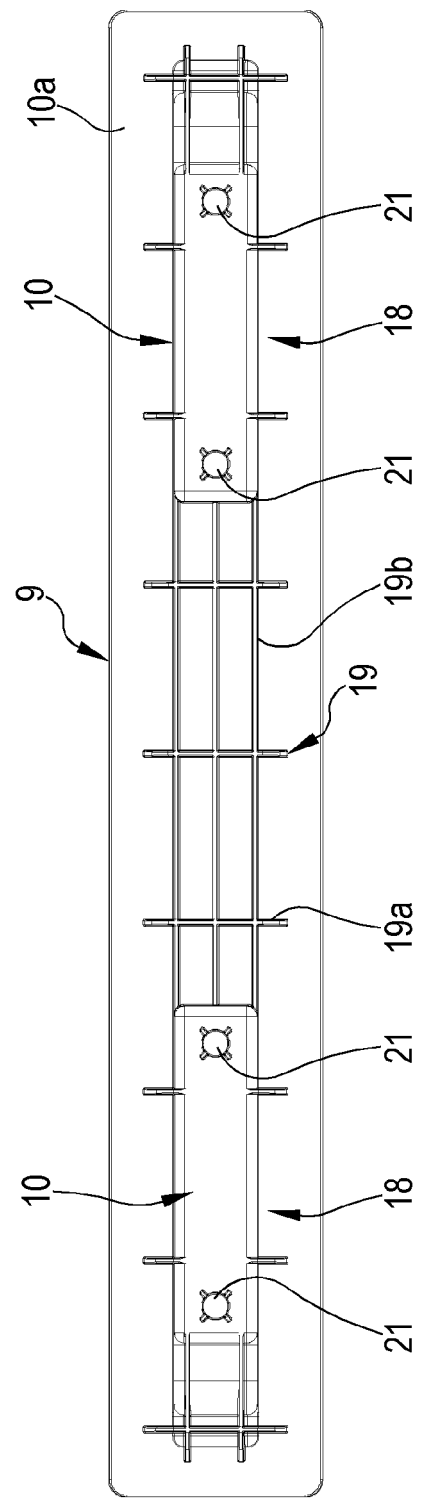


FIG.20

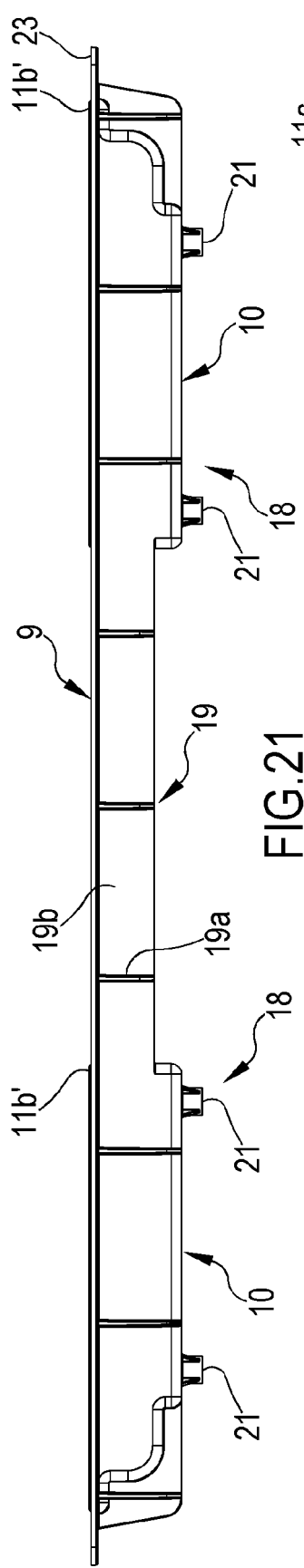


FIG. 21

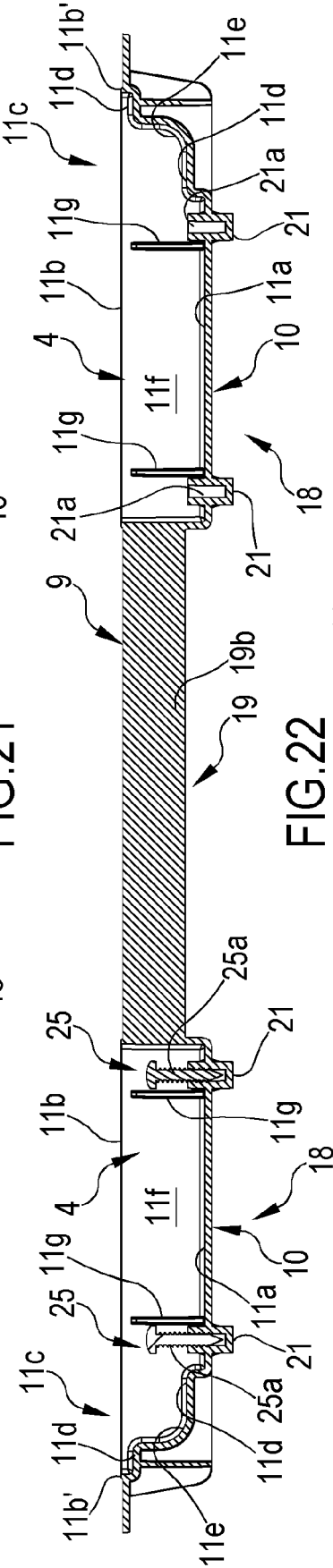


FIG. 22

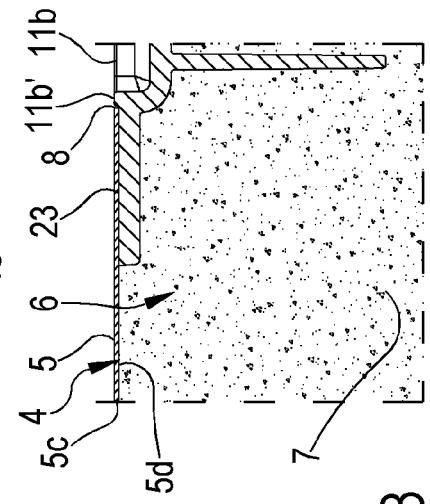


FIG. 23

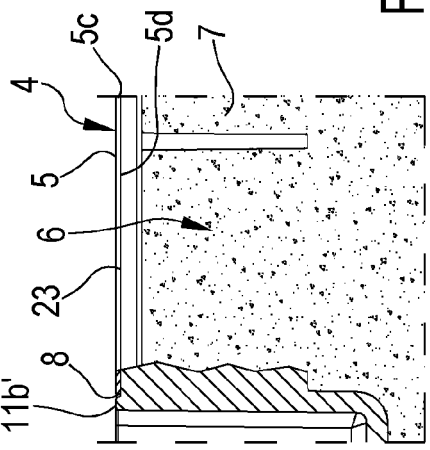


FIG. 24



EUROPEAN SEARCH REPORT

Application Number

EP 23 20 0255

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	US 11 287 174 B2 (SAMSUNG ELECTRONICS CO LTD [KR]) 29 March 2022 (2022-03-29)	1-5, 7, 8, 11-14	INV. F25D23/02
Y	* the whole document *	6, 9, 10, 15	A47L15/42 D06F39/14 E05C19/02 F25D23/10
Y	EP 3 690 173 A1 (WHIRLPOOL CO [US]) 5 August 2020 (2020-08-05) * the whole document *	6, 10	
Y	US 2023/272966 A1 (KANG DAEKIL [KR] ET AL) 31 August 2023 (2023-08-31) * the whole document *	9, 15	
			TECHNICAL FIELDS SEARCHED (IPC)
			F25D D06F A47L E05C
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		13 February 2024	Kolev, Ivelin
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

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

EP 23 20 0255

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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13-02-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 11287174 B2	29-03-2022	AU 2020258215 A1	18-02-2021
		AU 2022206717 A1	11-08-2022
		AU 2023210665 A1	24-08-2023
		CN 112534197 A	19-03-2021
		CN 112923636 A	08-06-2021
		CN 114857825 A	05-08-2022
		CN 115406160 A	29-11-2022
		EP 3775726 A1	17-02-2021
		EP 3809072 A1	21-04-2021
		EP 3809073 A1	21-04-2021
		EP 3822564 A1	19-05-2021
		KR 20200121219 A	23-10-2020
		KR 20200133308 A	27-11-2020
		KR 20200133309 A	27-11-2020
		KR 20200133694 A	30-11-2020
		KR 20210075947 A	23-06-2021
		RU 2765815 C1	03-02-2022
		RU 2022101797 A	29-03-2022
		US 2020326119 A1	15-10-2020
		US 2021071934 A1	11-03-2021
		US 2022034576 A1	03-02-2022
		US 2023384021 A1	30-11-2023
EP 3690173 A1	05-08-2020	EP 3690173 A1	05-08-2020
		US 10677512 B1	09-06-2020
US 2023272966 A1	31-08-2023	AU 2021203494 A1	16-12-2021
		AU 2023203611 A1	06-07-2023
		EP 3916323 A1	01-12-2021
		US 2021372688 A1	02-12-2021
		US 2023272966 A1	31-08-2023

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 3690173 A [0017]