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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 built-in household appliance, optionally built-in refrigerator, comprises a body (2), defining at least one compartment (3) and a door (4) movably engaged with the body (2) 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) of the door (4) has at least one through opening (8), optionally two through openings (8) located on a same face of the outer shell (5) of the door (4). The door (4) also has at least one closure element (9) which is configured to engage in the corresponding through opening (8) of the outer shell (5). The closure element (9) comprises 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 closure element (9) also has at least one peripheral edge (12) developing from the pocket structure (10) and configured to engage, according to a superimposed relationship, an outer surface (5a) of the outer shell (5) at the corresponding through opening (8) so as to prevent any leakage of the thermal insulating and filling material (7) through the corresponding through opening (8) of the outer shell (5). The closure element (9) is provided with a snap engagement feature (13) operatively arranged in correspondence of the peripheral edge (12) of the pocket structure (10) of the closure element (9) to allow the engagement of the closure element (9) with the corresponding through opening (8) of the outer shell (5) of the door (4) and to block the closure element (9) at the corresponding through opening (8) of the outer shell (5) of the door (4).

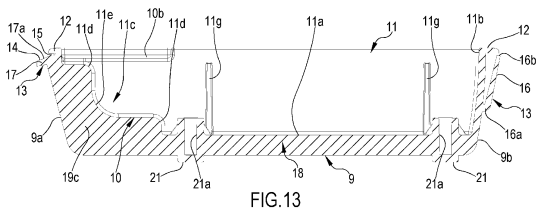

FIG.13

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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. 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.

[0002] 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.

[0003] 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. 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.

[0004] 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.

[0005] 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, at the same time, to provide a seat for receiving the engagement of an accessory mechanism or a component of the household appliance.

BACKGROUND

[0006] 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.

[0007] 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.

[0008] 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.

[0009] 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.

[0010] 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.

[0011] 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.

[0012] They are also space efficient because they save space by eliminating the need for handles that can extend outwards.

[0013] 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.

[0014] In particular, taking into account the push-to-open systems applied to the kitchen cabinet doors they can be integrated directly into the cabinets.

[0015] In accordance with other known solutions the push-to-open system 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.

[0016] More than one push-to-open systems 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.

[0017] 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.

[0018] 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.

[0019] 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.

[0020] 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

[0021] 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.

[0022] 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.

[0023] 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.

[0024] 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) and at least one closure element (9) which is configured to engage in the corresponding through opening (8) of the outer shell (5) of the door (4), wherein the closure element (9) comprises:
    - ◦ 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);
    - ◦ at least one peripheral edge (12) developing from the pocket structure (10) and configured to engage, according to a superimposed relationship, an outer surface (5a) of the outer shell (5) at the corresponding through opening (8) so to prevent any leakage of the thermal insulating and filling material (7) through the corresponding through opening (8) of the outer shell (5);
    - ◦ a snap engagement feature (13) operatively arranged in correspondence of the peripheral edge (12) of the pocket structure (10) of the closure element (9) to allow the engagement of the closure element (9) with the corresponding through opening (8) of the outer shell (5) of the door (4) and to block the closure element (9) at the corresponding through opening (8) of the outer shell (5) of the door (4).

[0025] 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 engage in the corresponding through opening (8) of the outer shell (5) of the door (4), wherein the closure element (9) comprises:
    - ◦ 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 to the bottom (11a);
    - ◦ at least one peripheral edge (12) developing from the pocket structure (10) and configured to engage, according to a superimposed relationship, an outer surface (5a) of the outer shell (5) at the corresponding through opening (8) so as to prevent any leakage of the thermal insulating and filling material (7) through the corresponding through opening (8) of the outer shell (5);
    - ◦ a snap engagement feature (13) operatively arranged in correspondence of the peripheral edge (12) of the pocket structure (10) of the closure element (9) to allow the engagement of the closure element (9) with the corresponding through opening (8) of the outer shell (5) of the door (4) and to block the closure element (9) at the corresponding through opening (8) of the outer shell (5) of the door (4).

[0026] 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 engage in 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 closing door (4) of the household appliance (1), the concavity portion (11) having a bottom (11a) and an opening (11b) opposite to the bottom (11a);
- at least one peripheral edge (12) developing from the pocket structure (10) and configured to engage, according to a superimposed relationship, an outer surface (5a) of the outer shell (5) of the closing door (4) of the household appliance (1) at the corresponding through opening (8) so as to prevent any leakage of a thermal insulating and filling material (7) provided inside the outer shell (5), across the corresponding through opening (8) of the outer shell (5);
- a snap engagement feature (13) operatively arranged in correspondence of the peripheral edge (12) of the pocket structure (10) of the closure element (9) to allow the engagement of the closure element (9) with the corresponding through opening (8) of the outer shell (5) of the door (4) and to block the closure element (9) at the corresponding through opening (8) of the outer shell (5) of the door (4).

[0027] In the following aspects details, are added with respect to the closure element (9) considered in the previous independent aspects.

[0028] Further details of the door (4) of the household appliance are also given in the following aspects.

[0029] 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).

[0030] In 2nd aspect according to anyone of the previous aspects, the snap engagement feature (13) comprises:

- an insertion portion (14) provided on a first side (9a) of the closure element (9) to allow the insertion of at least a part of the pocket structure (10) of the closure element (9) over the corresponding through opening (8) of the outer shell (5) of the door (4), the insertion portion (14) and a corresponding portion of the peripheral edge (12), defining an engagement gap (15) for the engagement of a corresponding first engagement edge (8a) of the through opening (8) of the outer shell (5) of the door (4);
- a snap flap (16) operatively engaged to a second side (9b) of the closure element (9), opposite to the first side (9a), the snap flap (16) being operable between a first condition, wherein the snap flap (16) does not allow the second side (9b) of the closure element (9) to pass through the corresponding through opening (8) of the outer shell (5) of the door (4) and a second condition, wherein the snap flap (16) allows the second side (9b) of the closure element (9) to pass through the corresponding through opening (8) of the outer shell (5) of the door (4).

[0031] In a 3rd aspect according to the previous aspect, the insertion portion (14) of the snap engagement feature (13) is spaced from the corresponding portion of the peripheral edge (12) to define the engagement gap (15) for the first engagement edge (8a) of the corresponding through opening (8).

[0032] In a 4th aspect according to anyone of the previous two aspects, the insertion portion (14) has a lip structure (17) developing outwardly from the pocket structure (10), the lip structure (17) of the insertion portion (14) of the engagement mechanism (13) having a tilting surface (17a) inclined or bent with respect to a reference plan lying on the peripheral edge (12) of the pocket structure (10) of the closure element (9), when the first side (9a) of the closure element is inserted in the corresponding through opening (8), the tilting surface (17a) allowing the closure element (9) to rotate so that the peripheral edge (12) rests on the outer surface(5a) of the outer shell (5) of the door (4).

[0033] In a 5th aspect according to the previous aspect, the tilting surface (17a) of the lip structure (17) of the insertion portion (14) moves away from the corresponding portion of the peripheral edge (12) as it moves away from the pocket structure (10) of the closure element (9).

[0034] In a 6th aspect according anyone of the previous four aspects, the insertion portion (14) has a greater thickness near the pocket structure (10) of the closure element (9).

[0035] In a 7th aspect according to anyone of the previous five aspects, the insertion portion (14) has a less thickness away from the pocket structure (10) of the closure element (9).

[0036] In an 8th aspect according to anyone of the previous six aspects, the insertion portion (14) is tapered away from the pocket structure (10) of the closure element (9), in particular on the opposite side of the pocket structure (10) of the closure element (9).

[0037] In a 9th aspect according to anyone of the previous seven aspects, the insertion portion (14) has a plurality of transverse ribs (14a) which are distributed, optionally equally spaced from each other, for reinforcing the insertion portion (14) and/or providing a sliding surface for the corresponding engagement edge (8a) of the through opening (8) of the outer shell (15) of the door (4) when the first side (9a) of the closure element (9) is inserted into such a through opening (8).

[0038] In a 10th aspect according to anyone of the previous eight aspects, the engagement gap (15) is narrower near the pocket structure (10) of the closure element (9).

[0039] In an 11th aspect according to anyone of the previous nine aspects, the engagement gap (15) is wider away from the pocket structure (10) of the closure element (9).

[0040] In a 12th aspect according to anyone of the previous ten aspects, the engagement gap (15) widens as it moves away from the pocket structure (10) of the closure element (9) to facilitate the engagement of the corresponding engagement edge (8a) of the corresponding through opening (8) of the outer shell (5) of the door.

[0041] In a 13th aspect according to anyone of the previous eleven aspects, the snap flap (16) of the snap engagement feature (13) develops from the pocket structure (10) of the closure element (9) towards a corresponding portion of the peripheral edge (12) located on the second side (9b) of the closure element (9).

[0042] In a 14th aspect according to anyone of the previous twelve aspects, the snap flap (16) of the snap engagement feature (13) has a substantially flat, optionally substantially rectangular, body.

[0043] In a 15th aspect according to the previous thirteen aspects, the body of the snap flap (16) of the snap engagement feature (13) has a connecting portion (16a) for connection to the pocket structure (10) of the closure element (9) which is substantially curved, with a convexity facing away from the pocket structure (10).

[0044] In a 16th aspect according to anyone of the previous two aspects, the body of the snap flap (16) of the snap engagement feature (13) develops along a substantially inclined direction with respect to a reference plan that lies on the peripheral edge (12) of the closure element (9).

[0045] In an aspect 16th bis according to the previous aspect, the body of the snap flap (16) of the snap engagement feature (13) diverges from the pocket structure (10) of the closure element (9) as it approaches the corresponding portion of the peripheral edge (12).

[0046] In an aspect 16th ter according to anyone of the previous two aspects, the snap flap (16) of the snap engagement feature (13) is configured:

- to allow the insertion of the second side (9b) of the closure element (9) by pushing the closure element (9) towards the through opening (8) of the outer shell (5), the pushing action of the closure element (9) causing the snap flap (16) to intercept the second engagement edge (8b) of the through opening (8) to be switched from the first condition to the second condition and to allow the passage of the pocket structure (10) of the closure element across the through opening (8);
- to maintain the closure element (9) engaged in the corresponding through opening (8) of the outer shell (5) of the door (4), preventing the pocket structure (10) from slipping out the through opening (8).

[0047] In a 17th aspect according to anyone of the previous six aspects, the snap flap (16) of the snap engagement feature (13) has a free end (16b) positioned close to the corresponding portion of the peripheral edge (12) of the closure element (9).

[0048] In a 18th aspect according to the previous aspect, in the first condition of the snap flap (16) of the snap engagement feature (13) and with the closure element (9) engaged with the corresponding through opening (8) of the outer shell (5) of the door (4), a corresponding second engagement edge (8b) of the through opening (8) is blocked between the free end (16b) of the snap flap (16) and the corresponding portion of the peripheral edge (12) of the closure element (9).

[0049] In a 19th aspect according to the previous aspect, the snap flap (16) of the snap engagement feature (13) is configured to switch from the first condition to the second condition, under the action of the second engagement edge (8b) of the corresponding through opening (8) when the second side (9b) of the closure element (9) is inserted into the through opening (8), and to switch from the second condition to the first condition when the second engagement edge (8b) of the corresponding through opening (8) does not oppose the snap flap (16) of the snap engagement feature (13).

[0050] In a 20th aspect according to anyone of the previous twenty aspects, the snap flap (16) of the snap engagement feature (13) is at least partially elastically deformable to switch between the first condition and the second condition.

[0051] In a 21st aspect according to the 15th aspects or anyone of the previous aspects from the 16th to the 20th aspect, if dependent on the aspect 15th aspect, the connecting portion (16a) of the snap flap (16) of the snap engagement feature (13) is at least partially, optionally entirely, elastically deformable, so that the snap flap can be switched between the first condition and the second condition.

[0052] In a 22nd aspect according to anyone of the previous twenty-two aspects, the entire snap flap (16) of the snap engagement feature (13) is elastically deformable to be switched between the first condition and the second condition.

[0053] In a 23rd 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 a plurality of reinforcing baffles (19).

[0054] In a 24th aspect according to the previous aspect, the plurality of reinforcing baffles (19) defines an external reinforcing skeleton (20) which at least partially, optionally completely, surrounds the convexity portion (18) of the closure element (9).

[0055] In a 25th aspect according to anyone of the two previous aspects, the plurality of reinforcing baffles (19)

comprises:

- a first type of reinforcing baffles (19a) developing substantially parallel to the peripheral edge (12) of the closure element (9) and with respect to one another;
- a second type of reinforcing baffles (19b) developing transversely, optionally perpendicularly, to the peripheral edge (12) of the closure element (9) and to the reinforcing baffles (19a) of the first type;
- at least one reinforcement baffle (19c) of a third type developing transversely, optionally perpendicularly, to the peripheral edge (12) of the closure element (9) and to the reinforcing baffles (19a, 19b) of the first and second types.

[0056] In a 26th aspect according to anyone of the previous three aspects, the reinforcing baffles (19) are crossed so as to define, on the convexity portion (18) of the pocket structure (10), a reticular structure provided with a plurality of voids (22).

[0057] In a 27th aspect according 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).

[0058] In a 28th 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.

[0059] In a 29th aspect according to anyone of the previous two aspects, each thickened portion (21) of the convexity portion (18) of the pocket structure (10) develops 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).

[0060] In a 30th aspect according to anyone of the previous three 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 (25) or another component, from the concavity portion (11) to the convexity portion (18).

[0061] In an aspect 30th bis 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, of the accessory mechanism or component (25), from the concavity portion (11) to the convexity portion (18).

[0062] In a 31st aspect according to anyone of the previous four aspects when dependent on anyone of the previous aspects from the 23rd to the 26th aspect, each thickened portion (21) is placed on a reinforcing baffle (19)

[0063] In a 32nd aspect according to anyone of the previous aspects from the 27th to the 29th when dependent on the 26th aspect, each thickened portion (21) is placed on a crossing point of two reinforcing baffles (19).

[0064] In a 33rd aspect according to anyone of the previous aspects, the concavity portion (11) of the pocket structure (10) has a shape configured to house an accessory mechanism or component (25), in particular a push-to-open mechanism, 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.

[0065] In a 34th aspect according to anyone of the previous aspects, the concavity portion (11) of the pocket structure (10) has at least one stepped side (11c).

[0066] In a 35th 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).

[0067] In an aspect 35th bis 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)

[0068] In a 36th 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 orthogonally, to the bottom (11a) of the concavity portion (11).

[0069] In a 37th 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) does not end at the opening (11b) of the concavity portion (11).

[0070] In a 38th 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 edge (12) of the pocket structure (10) of the closure element (9) developing from a peripheral portion of the frame (10a).

[0071] In a 39th aspect according to the previous aspect, the frame (10a) is provided with at least a pair of lowers (10b) located on one side of the concavity portion (11) of the pocket structure (10), the concavity portion (11) being located between the pair of lowers (10b) of the frame (10a).

[0072] In a 40th aspect according to the previous aspect when the 38th aspect depends on the 34th aspect or anyone of the aspects from 35th to 37th when depending on the 34th aspect, the pair of lowers (10b) of the frame (10a) of the pocket structure (10) being placed in corre-

spondence of the stepped side (11) of the concavity portion (11) of the pocket structure (10).

[0073] In 41st aspect according to anyone of the previous two aspects, each lower (10b) of the pair of lowers (10b) of the frame (10a) of the pocket structure (10) has a rectangular shape.

[0074] In a 42nd aspect according to anyone of the previous aspects from 39th to 40th, each lower (10b) of the pair of lowers (10b) of the frame (10a) of the pocket structure (10) has a trapezoidal shape, in particular a rectangular trapezoidal shape.

[0075] In a 43rd 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);
- a second half shell (5c), configured to remain outwardly facing when the door (4) is movably engaged with the body (2) of the of the household appliance (1), 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).

[0076] In a 44th aspect according to the previous aspects, the second half shell (5c) of the outer shell (5) of the door has two through openings (8) which are closed by two corresponding closure elements (9).

[0077] In a 45th aspect according to the previous aspect, the two through openings (8) of the second half shell (5c) of the outer shell (5) of the door (4) are positioned at the same level of the second half shell (5c).

[0078] In a 46th aspect according to anyone of the previous two aspects, the two through openings (8) of the second half shell (5c) of the outer shell (5) of the door (4) are aligned longitudinally along a direction orthogonal to two opposite sides of the second half shell (5c) and parallel to the other opposite sides.

[0079] In a 47th aspect according to anyone of the previous three aspects, each of the two through openings (8) of the second half shell (5c) of the outer shell (5) of the door (4) is positioned close to a corresponding side of the second half shell (5c).

[0080] In a 48th aspect according to anyone of the previous four aspects, each of the through openings (8) of the second half shell (5c) of the outer shell (5) of the door (4) has a substantially rectangular shape.

[0081] In a 49th aspect according to anyone of the previous five aspects, the two through openings (8) of the second half shell (5c) of the outer shell (5) of the door (4) are identical, the corresponding closure elements (9) also being identical, optionally specularly engaged in the corresponding through openings (8).

[0082] In a 50th aspect according to the previous aspect, each closure element (9) is engaged in the corresponding through opening with the stepped side (11c) of the concavity portion (11) of the pocket structure (10) facing the closest side of the second half shell (5c).

[0083] In a 51st aspect according to anyone of the previous aspects, the thermal insulating and filling material (7) housed into the inner cavity (6) defined by the outer shell (5) of the door (4) comprises a polyurethane material, optionally a foamed form, in particular a polyurethane foam.

[0084] In a 52nd aspect according to anyone of the previous aspects, the door (4) is configured to be movably engaged with the body (2) of a household appliance (1), the door (4) being movable between a closed position wherein the door (4) is configured to seal a corresponding compartment (3) of the body of the household appliance (1), and an open position wherein the compartment (3) is open and not sealed.

[0085] In an additional 53rd 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) with 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 avoid 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 inner cavity (6) of the outer shell (5) of the door (4) to receive an accessory mechanism or component (25) of the household appliance;
- 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 counteracted 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).

[0086] In a further aspect 53rd bis, independent of 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 openings (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 avoid 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 inner cavity (6) of the outer shell (5) of the door (4) to receive an accessory mechanism or component (25) of the household appliance;
- 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 counteracted by the closure element (9);
- positioning and fixing the accessory mechanism or component (25) inside the concavity portion (11) of the pocket structure (10);

[0087] In a 54th 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 performed before the step of filling the inner cavity (6) of the door (4) with the thermal insulating and filling material (7).

[0088] In a 55th 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 the closure element (9) is carried out according to the following substeps:

- inserting a first side (9a) of the closure element (9) into the corresponding at least one through opening (8) of the outer shell (5) of the door (4) so that a first engagement edge (8a) of the at least one through opening (8a) engages in an engagement gap (15) of the closure element (9) defined between an insertion portion (14) of a snap engagement feature (13) of the closure element (9) and a corresponding portion of a peripheral edge (12) of the closure element (9), the insertion portion (14) of the snap engagement feature (13) and the corresponding portion of the peripheral edge (12) being both located at the first side (9a) of the closing element (9);
- once the first engagement edge (8a) of the at least one through opening (8a) is engaged in the engagement gap (15) of the closure element (9), pushing the second side (9b) of the closure element (9) towards the corresponding at least one through opening (8) of the outer shell (5) of the door (4) to allow the corresponding peripheral edge (12) to completely seal the latter.

[0089] In a 56th aspect according to the previous aspect, the step of inserting the first side (9a) of the closure element (9) into the corresponding at least one through opening (8) of the outer shell (5) of the door (4) is carried out by inserting the first side (9a) of the closure element (9) along a direction inclined to a reference plane of the lay of the at least one through opening (8).

[0090] In a 57th aspect according to the previous aspect, the insertion direction of the insertion of the first side (9a) of the closure element (9) defines, with the reference plane of the lay of the corresponding at least through opening (8), an insertion angle comprising between 2° and 10°, optionally between 3° and 6°, in particular around 4°.

[0091] In a 58th aspect according to anyone of the three previous aspects, the step of pushing the second side (9b) of the closure element (9) towards the corresponding at least one through opening (8) of the outer shell (5) of the door (4) is carried out until a snap flap (16) of the snap engagement feature (13) of the closure element (9), operatively engaged with the second side (9b) of the latter, intercepts a second engagement edge (8b) of the at least one through opening (8) opposite the first engagement edge (8a), which pushes the snap flap (16) from a first condition, wherein the snap flap (16) does not allow the second side (9b) of the closure element (9) to pass through the corresponding through opening (8) of the outer shell (5) of the door (4), to a second condition, wherein the snap flap (16) allows the second side (9b) of the closure element (9) to pass through the corresponding through opening (8) of the outer shell (5) of the door (4), when the snap flap (16) of the snap engagement feature (13) overcomes the second engagement edge (8b) of the at least one through opening (8) with the second side (9b) of the closure element (9), such a second side (9b) of the closure element (9) is inserted into the at least one trough opening (8) where the snap flap (16) switches from the second condition to the first condition, blocking the closure element (9) on the at least one trough opening (8), sealed by the peripheral edge (12) of the closure element (9).

[0092] In a 59th aspect according to the previous aspect, the switching of the snap flap (16) of the snap engagement feature (13) between the first condition and the second condition is allowed by the elasticity of the snap flap (16) itself, which can be compressed towards the pocket structure (10) under the action of the second engagement edge (8b) of the at least one through opening (8) and elastically move away from the pocket structure (10) from the second condition to the first condition in the absence of a counteracting action of the of the second engagement edge (8b) of the at least one through opening (8).

[0093] In a 60th aspect according to anyone of the two

previous aspects, in the first condition of the snap flap (16) of the snap engagement feature (13) and with the closure element (9) engaged with the corresponding through opening (8) of the outer shell (5) of the door (4), the corresponding second engagement edge (8b) of the through opening (8) is blocked between a free end (16b) of the snap flap (16) and the corresponding portion of the peripheral edge (12) of the closure element (9).

[0094] In a 61st aspect according to anyone of the eight previous aspects, the fixing step of the accessory mechanism or component (25) within the concavity portion (11) of the pocket structure (10) is carried out by screwing the accessory mechanism or component (25) to a bottom (11a) of the concavity portion (11) of the pocket structure (10) of the closure element (9).

[0095] In a 62nd aspect according to the previous aspect, the fixing step of the accessory mechanism or component (25) is carried out by screwing the accessory mechanism or component (25) to thickened portions (21) emerging from the bottom (11a) of the concavity portion (11) of the pocket structure (10) of the closure element (9), wherein each thickened portion (21) develops through the bottom (11a) of the concavity portion (11) of the pocket structure (10) of the closure element (9), so as to protrude from a convexity portion (18) facing away from the concavity portion (11) to allow the adjustment of the fixing position of the accessory mechanism or component (25) within the concavity portion (11).

BRIEF DESCRIPTION OF THE FIGURES

[0096]

Figure 1 is a schematic view of household appliance, in particular a built-in household appliance, optionally a built-in refrigerator, according to 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 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 an interrupted transversal cross-section view of the door executed along the track IV-IV of Figure 3;

Figure 5 is a perspective view of a closure element, according to the present invention, engageable to a corresponding through opening of the door and provided with the accessory mechanism or component visible in Figure 1;

Figures 6 and 7 are perspective views of the closure element shown in Figure 5, without the accessory mechanism or component;

Figures 8 and 9 are elevation side views of the closure element shown in Figures 5 to 7, without the accessory mechanism or component;

Figures 10 and 11 are views from above and below of the closure element shown in Figures 5 to 9 without the accessory mechanism or component;

Figure 12 is front elevation view of the closure element shown in Figures 5 to 11 without the accessory mechanism or component;

Figure 13 is a longitudinal cross-section view of the closure element shown in Figures 5 to 12 without the accessory mechanism or component, carried out along the track XIII-XIII of figure 9;

Figures 14 and 15 are enlarged details of the closure element shown in figure 13.

DETAILED DESCRIPTION

[0097] 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.

[0098] 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.

[0099] 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.

[0100] 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.

[0101] 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.

[0102] Advantageously, the second half shell 5c of the

outer shell 5c of the door 4 has an outer surface 5a, corresponding to a front face of the respective door 4 provided with at least one through opening 8, the function of which will be described below.

[0103] As shown in Figures 2 and 3, 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.

[0104] 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.

[0105] According to the embodiment shown in Figures 2 and 3, the shape of each through opening 8 has a regular contour edge, which is substantially rectangular.

[0106] 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.

[0107] According to the embodiment shown in Figures 2 to 15, 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.

[0108] 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.

[0109] 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.

[0110] 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.

[0111] 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.

[0112] According to the embodiment shown in figures 2 to 15, each closure element 9 has at least one peripheral edge 12 developing from the corresponding pocket structure 10 and configured to engage, according to a superimposed relationship, the outer surface 5a of the second half shell 5c of the outer shell 5 of the door 4 at the corresponding through opening 8 so as to prevent any leakage of the thermal insulating and filling material 7 through the corresponding through opening 8 of the outer shell 5.

[0113] Furthermore, each closure element 9 has also a snap engagement feature 13 (Figures 4 to 15) operatively arranged in correspondence of the respective peripheral edge 12 of the corresponding pocket structure 10 for allowing the engagement of the closure element 9 with the corresponding through opening 8 of the second half shell 5c of the outer shell 5 of the door 4 and to block the closure element 9 at the corresponding through opening 8.

[0114] In particular, the snap engagement feature 13 comprises an insertion portion 14 provided on a first side 9a of the closure element 9 to allow the insertion of at least a part of the pocket structure 10 of the corresponding closure element 9 over the corresponding through opening 8 of the second half shell 5c of the outer shell 5 of the door 4.

[0115] The insertion portion 14 and a corresponding portion of the peripheral edge 12, defines an engagement gap 15 (Figures 12 to 14) for the engagement of a corresponding first engagement edge 8a of the corresponding through opening 8 of the outer shell 5 of the

door 4. In order to define the engagement gap 15 for the first engagement edge 8a of the corresponding through opening 8, the insertion portion 14 is spaced from the corresponding portion of the peripheral edge 12.

[0116] The engagement gap 15 defined between the insertion portion 14 of the snap engagement feature 13 and the corresponding portion of the peripheral edge 12 is narrower near the corresponding pocket structure 10 of the closure element 9 and wider away from such a pocket structure 10 of the corresponding closure element 9. In other words, the engagement gap 15 widens as it moves away from the pocket structure 10 of the corresponding closure element 9 to facilitate the engagement of the corresponding engagement edge 8a of the corresponding through opening 8 of the second half shell 5c of outer shell 5 of the door 4.

[0117] The insertion portion 14 has a lip structure 17 which develops outwardly from the corresponding pocket structure 10, namely moving away from the corresponding portion of the respective peripheral edge 12 as it moves away from the pocket structure 10 of the closure element 9. The lip structure 17 has a tilting surface 17a inclined or bent with respect to a reference plan of lie of the peripheral edge 12 of the pocket structure 10 of the corresponding closure element 9. When the first side 9a of the closure element 9 is inserted in the corresponding through opening 8 of the outer shell 5 of the door 4, the tilting surface 17a allows the corresponding closure element 9 to be slightly rotate so as a corresponding surface of the peripheral edge 12 rests on the outer surface 5a of the second half shell 5c of the outer shell 5 of the door 4.

[0118] More specifically, the insertion portion 14 has a greater thickness near the pocket structure 10 of the closure element 9 and a less thickness away from the pocket structure 10 of the closure element 9. In other words, the insertion portion 14 is tapered away from the pocket structure 10 of the corresponding closure element 9, in particular on the opposite side of the corresponding pocket structure 10.

[0119] Advantageously, the insertion portion 14 has a plurality of transverse ribs 14a which are distributed, optionally equally spaced from each other, for reinforcing the insertion portion 14 and/or providing a sliding surface for the corresponding engagement edge 8a of the through opening 8 of the second half shell 5c of the outer shell 15 of the door 4 when the first side 9a of the corresponding closure element 9 is inserted into such a through opening 8.

[0120] The snap engagement feature 13 comprises also a snap flap 16 operatively engaged to a second side 9b of the corresponding closure element 9, opposite to the first side 9a. The snap flap 16 is operable between a first condition, wherein the snap flap 16 does not allow the second side 9b of the closure element 9 to pass through the corresponding through opening 8 of the second half shell 5c of outer shell 5 of the door 4 and a second condition, wherein the snap flap 16 allows the second side 9b of the corresponding closure element 9 to pass through the corresponding through opening 8 of the second half shell 5c of outer shell 5 of the door 4.

[0121] As visible in figures 4 to 6, 9, 12, 13 and 15, the snap flap 16 of the snap engagement feature 13 develops from the pocket structure 10 of corresponding closure element 9 towards a corresponding portion of the peripheral edge 12 located on the second side 9b of the closure element 9.

[0122] In particular, the snap flap 16 of the snap engagement feature 13 has a substantially flat, optionally substantially rectangular, body having a connecting portion 16a for connection to the pocket structure 10 which is substantially curved, with a convexity facing away from the pocket structure 10.

[0123] The body of the snap flap 16 of the snap engagement feature 13 develops along a substantially inclined direction with respect to a reference plan that lies on the peripheral edge 12 of the corresponding closure element 9. In particular, the snap flap 16 diverges from the pocket structure 10 of the corresponding closure element 9 as it approaches the corresponding portion of the peripheral edge 12.

[0124] Advantageously, the snap flap 16 of the snap engagement feature 13 is configured to allow the insertion of the second side 9b of the closure element 9 by pushing the corresponding closure element 9 towards the corresponding through opening 8 of the second half shell 5c of the outer shell 5. The pushing action of the closure element 9 causes the respective snap flap 16 to intercept the second engagement edge 8b of the corresponding through opening 8 to be switched from the first condition to the second condition allowing the passage of the pocket structure 10 of the closure element across the through opening 8.

[0125] The snap flap 16 of the snap engagement feature 13 is also configured to maintain the corresponding closure element 9 engaged in the corresponding through opening 8 of the second half shell 5c of the outer shell 5 of the door 4 for preventing the pocket structure 10 from slipping out the corresponding through opening 8, during the assembly operation, especially when filling the inner cavity 6 with the thermal insulating and filling material 7. In particular, a free end 16b of the snap flap 16, positioned close to the corresponding portion of the peripheral edge 12 of the closure element 9, blocks the second engagement edge 8b of the corresponding through opening 8 between such a free end 16b and a corresponding portion of the peripheral edge 12 of the corresponding closure element 9 keeping the latter stuck in this position.

[0126] The snap flap 16 is thus configured to switch from the first condition to the second condition under the action of the second engagement edge 8b of the corresponding through opening 8 when the second side 9b of the closure element 9 is pushed to the through opening 8, and to switch from the second condition to the first condition when the second engagement edge 8b of the corresponding through opening 8 does not oppose the snap flap 16 of the snap engagement feature 13, namely

when the snap flap 16 is pressed against the corresponding pocket structure 10.

[0127] In order to allow the snap flap 16 to switch between the first and the second condition, the snap flap 16 is at least partially elastically deformable. In particular, the connecting portion 16a of the snap flap 16 or the entire snap flap 16 is elastically deformable

[0128] With reference to Figures 4 to 21 and 11 to 13, the convexity portion 18 of the pocket structure 10 of each closure element 9 has a plurality of reinforcing baffles 19, defining an external reinforcing skeleton 20 which at least partially, optionally completely, surrounds the convexity portion 18. Among the reinforcing baffles 19 of the plurality of reinforcing baffles 19 it is possible to identify: a first type of reinforcing baffles 19a developing substantially parallel to the peripheral edge 12 of the closure element 9 and with respect to one another; a second type of reinforcing baffles 19b developing transversely, optionally perpendicularly, to the peripheral edge 12 of the corresponding closure element 9 and to the reinforcing baffles 19a of the first type; at least one reinforcement baffle 19c of a third type developing transversely, optionally perpendicularly, to the peripheral edge 12 of the corresponding closure element 9 and to the reinforcing baffles 19a, 19b of the first and second types. The reinforcing baffles 19 are crossed so as to define, on the convexity portion 18 of the corresponding pocket structure 10, a reticular structure provided with a plurality of voids 22.

[0129] With regard to the embodiment shown in Figures 4 and 8 to 13, the convexity portion 18 of the each 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 5), to be fixed within the corresponding concavity portion 11 by means of corresponding threaded fasteners 25a (Figure 4). Each thickened portion 21 is located on a median plane which cuts the closure element 9 longitudinally in half, in particular on a reinforcing baffle 19, preferably the reinforcement baffle 19c of the third type, optionally on a crossing point of at least two reinforcement baffles 19, namely between the reinforcement baffle 19c of the third type and a corresponding reinforcement baffle 19b of the second type (figure 11).

[0130] 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 accessory 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.

[0131] According to the embodiment shown in Figure 2 to 7, 10, 13 and 14, 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 lie 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 3, 5 to 7 and 10.

[0132] 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 3, 5 to 7 and 10, each lower 10b of the pair of lowers 10b of each closure element 9 has a rectangular shape, but each of them can also have a trapezoidal shape or a rectangular trapezoidal shape or a substantially triangular shape.

[0133] 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.

[0134] 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.

[0135] With regard to the method of assembling of a household appliance 1, such a method 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, 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 each through opening 8 of the outer shell 5 by means of a corresponding closure element 9;
- 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 the accessory mechanism or component 25 inside the concavity portion 11 of the pocket structure 10 of the corresponding closure element 9;
- rotatively engaging the door 4 to the body 2.

[0136] 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.

[0137] 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 closure 4, wherein the outer shell 5 defines 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;
- 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 the accessory mechanism or component 25 inside the concavity portion 11 of the pocket structure 10 of the corresponding closure element 9.

[0138] Irrespective of the fact that the method of assembling a household appliance 1 or the method of assembling a door 4 is considered the following steps apply to both methods.

[0139] 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 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.

[0140] In particular, the step of closing each through opening 8 of the second half shell 5c of the outer shell 5 of the door 4 by the closure element 9 is carried out as follows:

- inserting a first side 9a of the corresponding closure element 9 into the target through opening 8 so as a first engagement edge 8a of such a through opening 8a engages in the engagement gap 15 of the closure element 9 defined between the corresponding insertion portion 14 of the snap engagement feature 13 and a corresponding portion of the peripheral edge 12 of the closure element 9;
- when the first engagement edge 8a the through opening 8a is engaged in the engagement gap 15 of the corresponding closure element 9, pushing the second side 9b of the closure element 9 towards the corresponding through opening 8 of the second half shell 5c of the outer shell 5 of the door 4 to allow the corresponding peripheral edge 12 to completely seal such a through opening 8.

[0141] In particular, the insertion of the first side 9a of each closure element 9 into the corresponding through opening 8 of the second half shell 5c of the outer shell 5 of the door 4 is carried out by inserting the first side 9a of the closure element 9 along a direction inclined to a reference plane of a lie plane of such through opening 8. The insertion direction of the first side 9a of each closure element 9 defines, with the lie plane of the corresponding through opening 8, an insertion angle comprising between 2° and 10°, optionally between 3° and 6°, in particular around 4°.

[0142] The pushing step of the second side 9b of each closure element 9 towards the corresponding through opening 8 of the second half shell 5c of the outer shell 5 of the door 4 is carried out until the snap flap 16 of the snap engagement feature 13 of the corresponding closure element 9 intercepts the second engagement edge 8b of such a through opening 8, which pushes the snap flap 16 from the first condition, wherein the snap flap 16 does not allow the second side 9b of the corresponding closure element 9 to pass through the corresponding through opening 8, to a second condition, wherein the snap flap 16 allows the second side 9b of the corresponding closure element 9 to pass through the corresponding through opening 8. When the snap flap 16 overcomes the second engagement edge 8b of the corresponding through opening 8 with its own second side 9b, the latter enters into the trough opening 8 where the snap flap 16 switches from the second condition to the first condition blocking the corresponding closure element 9 with the trough opening 8 sealed by the peripheral edge 12 of the closure element 9 itself.

[0143] The switching of the snap flap 16 of the snap engagement feature 13 of each closure element 9 between the first condition and the second condition is allowed by the elasticity such a snap flap 16, which can be compressed towards the corresponding pocket structure 10 under the action of the second engagement edge 8bof the corresponding through opening 8 and elastically move away from the corresponding pocket structure 10 from the second condition to the first condition in the absence of a counteracting action of the of the second engagement edge 8b such a through opening 8.

[0144] In the first condition of the snap flap 16o of the snap engagement feature 13 of each closure element 9 and with such a closure element 9 engaged with the corresponding through opening 8 of the second half shell 5c of the outer shell 5 of the door 4, the corresponding second engagement edge 8b of the corresponding through opening 8 is blocked between the free end 16b of the corresponding snap flap 16 and the corresponding portion of the peripheral edge 12 of the closure element 9.

[0145] The fixing step of the accessory mechanism or component 25 within the concavity portion 11 of the pocket structure 10 of the corresponding closure element

9 is carried out by screwing the accessory mechanism or component 25 to the bottom 11a of the corresponding concavity portion 11. By the use of threaded fasteners 25a of the accessory mechanism or component 25 it is possible to adjust its position with respect to the bottom 11a of the concavity portion 11 of the pocket structure 10 of the corresponding closure element 9.

ADVANTAGES

[0146] 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.

[0147] 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.

[0148] 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.

[0149] 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 built-in household appliance, optionally built-in refrigerating appliance such as a fridge or a freezer or an integrated fridge-freezer, comprises:

   - a body (2), defining at least one compartment (3); and
   - at least one 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 an 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) and at least one closure element (9) preferably made of a plastic material, the closure element (9) being configured to engage in the corresponding through opening (8) of the outer shell (5) of the door (4), in particular so as to obstruct the through opening (8), wherein the closure element (9) comprises:

     ◦ 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);
     ◦ at least one peripheral edge (12) developing from the pocket structure (10) and configured to engage, according to a superimposed relationship, an outer surface (5a) of the outer shell (5) at the corresponding through opening (8) so as to prevent or to limit leakages of the thermal insulating and/or filling material (7) through the corresponding through opening (8) of the outer shell (5), in particular during a filling, optionally pressure filling, operation of the inner cavity (6) with the thermal insulating and/or filling material (7); and
     ◦ a snap engagement feature (13) operatively arranged in correspondence of the peripheral edge (12) of the pocket structure (10) of the closure element (9) to allow the engagement of the closure element (9) with the corresponding through opening (8) of the outer shell (5) of the door (4) and to block the closure element (9) at the corresponding through opening (8) of the outer shell (5) of the door (4).

2. Household appliance (1) according to the previous claim, wherein the snap engagement feature (13) comprises:

   - an insertion portion (14) provided on a first side (9a) of the closure element (9) to allow the insertion of at least a part of the pocket structure (10) of the closure element (9) over the corresponding through opening (8) of the outer shell (5) of the door (4), the insertion portion (14) and a corresponding portion of the peripheral edge (12), defining an engagement gap (15) for the

engagement of a corresponding first engagement edge (8a) of the through opening (8) of the outer shell (5) of the door (4);

- a snap flap (16) operatively engaged to a second side (9b) of the closure element (9), opposite to the first side (9a), the snap flap (16) being operable between a first condition, wherein the snap flap (16) does not allow the second side (9b) of the closure element (9) to pass through the corresponding through opening (8) of the outer shell (5) of the door (4) and a second condition, wherein the snap flap (16) allows the second side (9b) of the closure element (9) to pass through the corresponding through opening (8) of the outer shell (5) of the door (4).

3. Household appliance (1) according to the previous claim, wherein the insertion portion (14) of the snap engagement feature (13) is spaced from the corresponding portion of the peripheral edge (12) to define the engagement gap (15) for the first engagement edge (8a) of the corresponding through opening (8), optionally the engagement gap (15) being narrower near the pocket structure (10) of the closure element (9) and wider away from the pocket structure (10) of the closure element (9), more optionally the engagement gap (15) widening as it moves away from the pocket structure (10) of the closure element (9) to facilitate the engagement of the corresponding engagement edge (8a) of the corresponding through opening (8) of the outer shell (5) of the door (4).

4. Household appliance (1) according to anyone of the two previous claims, wherein the insertion portion (14) has a lip structure (17) developing outwardly from the pocket structure (10), the lip structure (17) of the insertion portion (14) of the engagement mechanism (13) having a tilting surface (17a) inclined or bent with respect to a reference plan lying on the peripheral edge (12) of the pocket structure (10) of the closure element (9), when the first side (9a) of the closure element is inserted in the corresponding through opening (8), the tilting surface (17a) allowing the closure element (9) to rotate so that the peripheral edge (12) rests on the outer surface (5a) of the outer shell (5) of the door (4), optionally the tilting surface (17a) of the lip structure (17) of the insertion portion (14) moving away from the corresponding portion of the peripheral edge (12) as it moves away from the pocket structure (10) of the closure element (9), more optionally the insertion portion (14) having a greater thickness near the pocket structure (10) of the closure element (9) and having a less thickness away from the pocket structure (10) of the closure element (9), in particular the insertion portion (14) being tapered away from the pocket structure (10) of the closure element (9).

5. Household appliance (1) according to anyone of the three previous claims, wherein the snap flap (16) of the snap engagement feature (13) develops from the pocket structure (10) of the closure element (9) towards a corresponding portion of the peripheral edge (12) located on the second side (9b) of the closure element (9), the snap flap (16) of the snap engagement feature (13) having a substantially flat, optionally substantially rectangular, body and having a connecting portion (16a), optionally substantially curved with a convexity facing away from the pocket structure (10), for connection to the pocket structure (10) of the closure element (9), in particular the snap flap (16) of the snap engagement feature (13) developing along a substantially inclined direction with respect to a reference plan that lies on the peripheral edge (12) of the closure element (9), optionally the body of the snap flap (16) of the snap engagement feature (13) diverging from the pocket structure (10) of the closure element (9) as it approaches the corresponding portion of the peripheral edge (12).

6. Household appliance (1) according to anyone of the two previous claims, wherein the snap flap (16) of the snap engagement feature (13) is configured:

- to allow the insertion of the second side (9b) of the closure element (9) by pushing the closure element (9) towards the through opening (8) of the outer shell (5), the pushing action of the closure element (9) causing the snap flap (16) to intercept the second engagement edge (8b) of the through opening (8) to be switched from the first condition to the second condition and to allow the passage of the pocket structure (10) of the closure element across the through opening (8);
- to maintain the closure element (9) engaged in the corresponding through opening (8) of the outer shell (5) of the door (4), preventing the pocket structure (10) from slipping out the through opening (8).

7. Household appliance (1) according to anyone of the three previous claims, wherein the snap flap (16) of the snap engagement feature (13) has a free end (16b) positioned close to the corresponding portion of the peripheral edge (12) of the closure element (9), in the first condition of the snap flap (16) of the snap engagement feature (13) and with the closure element (9) engaged with the corresponding through opening (8) of the outer shell (5) of the door (4), a corresponding second engagement edge (8b) of the through opening (8) being blocked between the free end (16b) of the snap flap (16) and the corresponding portion of the peripheral edge (12) of the closure element (9).

8. Household appliance (1) according to anyone of the four previous claims, wherein the snap flap (16) of the snap engagement feature (13) is configured to switch from the first condition to the second condition, under the action of the second engagement edge (8b) of the corresponding through opening (8) when the second side (9b) of the closure element (9) is inserted into the through opening (8), and to switch from the second condition to the first condition when the second engagement edge (8b) of the corresponding through opening (8) does not oppose the snap flap (16) of the snap engagement feature (13).

9. Household appliance (1) according to anyone of the five previous claims, wherein the snap flap (16) of the snap engagement feature (13) is at least partially elastically deformable to switch between the first condition and the second condition, in particular the connecting portion (16a) of the snap flap (16) of the snap engagement feature (13) being at least partially, optionally entirely, elastically deformable, so as the snap flap can be switched between the first condition and the second condition, more in particular the entire snap flap (16) of the snap engagement feature (13) being elastically deformable to be switched between the first condition and the second condition.

10. Household appliance (1) according to anyone of the previous claims, wherein the concavity portion (11) of the 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, 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, in particular wherein the concavity portion (1) of the 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).

11. 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 substantially cylindrical, to allow an accessory mechanism or component (25) of the household appliance (1), optionally a 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), more in particular each thickened portion (21) being located on a corresponding cross point of reinforcement baffles (19) developing from and around the convexity portion (18) of the pocket structure (10) of the closure element (9).

12. Household appliance (1) according to anyone of the previous claims, wherein the outer shell (5) of the door (4) has two through openings (8) located on a same face of the outer shell (5), wherein each of the two through openings (18) is closed by a corresponding closure element (9), the two closure elements (9) being preferably specularly identical.

13. 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).

14. Door (4) for household appliances (1), in particular built-in household appliances, optionally built-in refrigerating appliances such as 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 closure elements (9) preferably made of plastic material and configured to engage the two through openings (8) of the outer shell (5) of the door (4) in particular so as to obstruct the through openings (8), wherein at least one of the closure elements (9), preferably each of the closure elements (9), comprises:

  - 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);
  - at least one peripheral edge (12) developing from the pocket structure (10) and configured to engage, according to a superimposed relationship, an outer surface (5a) of the outer shell (5) at the corresponding through opening (8) so as to prevent or to limit leakages of the thermal insulating and/or filling material (7) through the corresponding through opening (8) of the outer shell (5), in particular during a filling, optionally pressure filling, operation of the inner cavity (6) with the thermal insulating and/or filling material (7);
  - a snap engagement feature (13) operatively arranged in correspondence of the peripheral edge (12) of the pocket structure (10) of the closure element (9) to allow the engagement of the closure element (9) with the corresponding through opening (8) of the outer shell (5) of the door (4) and to block the closure element (9) at the corresponding through opening (8) of the outer shell (5) of the door (4).

15. Method for manufacturing a door (4) for household appliances (1), in particular built-in household appliances, 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 a closure element (9), wherein the outer shell (5) has at least one through opening (8) and the closure element (9) has a pocket structure (10)

with at least one concavity portion (11);
ii. assembling the inner liner to the outer shell (5), so that the inner liner and the outer shell (5) define in combination an inner cavity (6),
iii. obstructing the at least one through opening (8) of the outer shell (5) by means of the closure element (9), with at least one concavity portion (11) facing away from the inner cavity (6) of the door (4), the step of obstructing being carried out according to the following substeps:

a. inserting a first side (9a) of the closure element (9) into the corresponding at least one through opening (8) of the outer shell (5) of the door (4), so that a first engagement edge (8a) of the at least one through opening (8) engages in an engagement gap (15) of the closure element (9) defined between an insertion portion (14) of a snap engagement feature (13) of the closure element (9) and a corresponding portion of a peripheral edge (12) of the closure element (9), the insertion portion (14) of the snap engagement feature (13) and the corresponding portion of the peripheral edge (12) being both located at the first side (9a) of the closure element (9), optionally wherein after the inserting substep the peripheral edge (12) of the closure element (9) is inclined with the at least one through opening (8) by a predetermined angle, said predetermined angle being in particular between 2° and 10°, preferably between 3° and 6°, more preferably around 4°;
b. once the first engagement edge (8a) of the at least one through opening (8) is engaged in the engagement gap (15) of the closure element (9), pushing a second side (9b) of the closure element (9), opposite to the first side (9a), towards the corresponding at least one through opening (8) of the outer shell (5) of the door (4) until a snap flap (16) of the snap engagement feature (13) of the closure element (9) intercepts a second engagement edge (8b) of the at least one through opening (8) opposite the first engagement edge (8a) snapping to lock the closure element (9) in the corresponding through opening (8) optionally wherein the pushing substep involves a rotation of the closure element (9) around said first engagement edge (8a) of the at least one through opening (8) so that after the pushing substep the peripheral edge (12) of the closure element (9) is substantially parallel to the at least one through opening (8);

iv. filling, in particular by 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 filling material (7) occupying, at least partially, optionally completely, the inner cavity (6), with the closure element (9) counteracting possible thermal insulating and/or filling material (7) coming out of the at least one through opening (8) of the outer shell (5) of the door (4);
v. optionally positioning an accessory mechanism or component (25), in particular a push-to-open mechanism, inside the concavity portion (11) of the pocket structure (10), wherein the accessory mechanism or component (25) received inside the concavity portion (11) of the pocket structure (10) is preferably fixed to the pocket structure (10), in particular by means of at least one threaded fastener (25a).

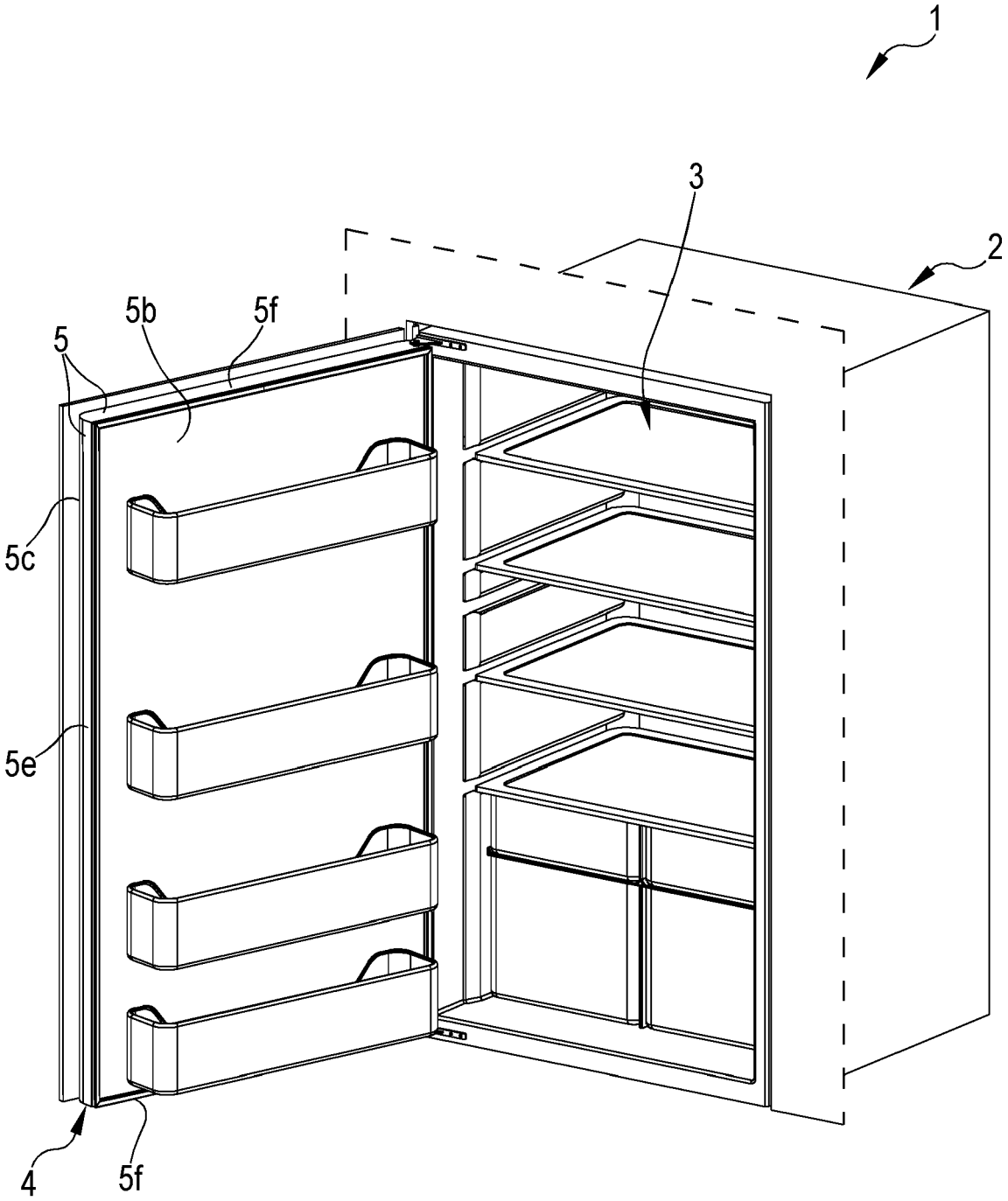

FIG.1

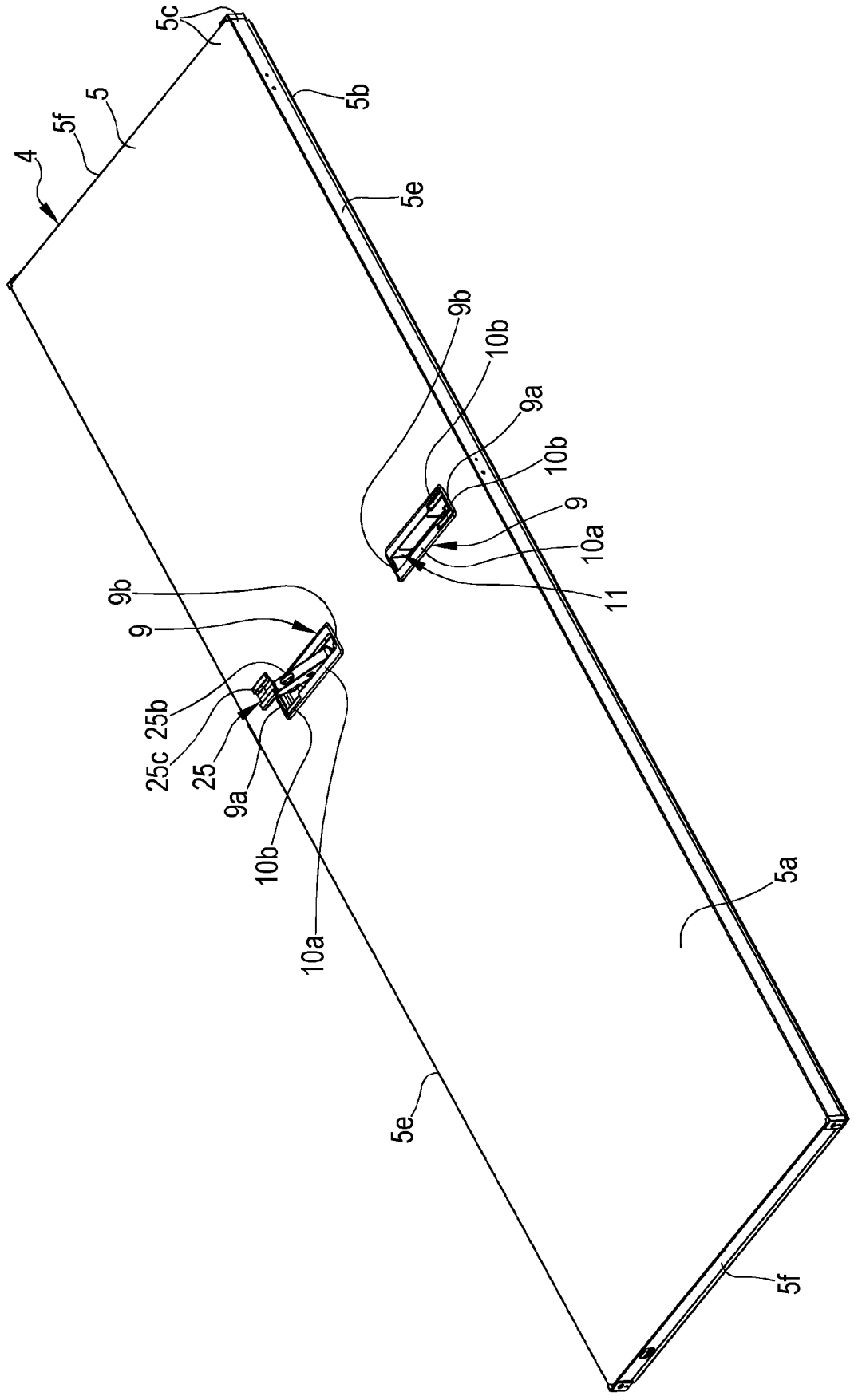
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FIG.2

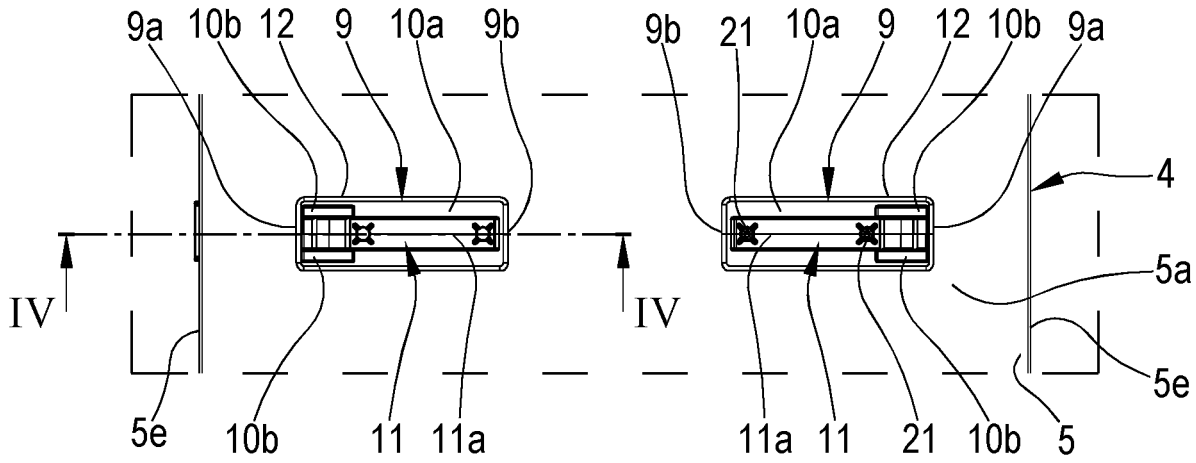
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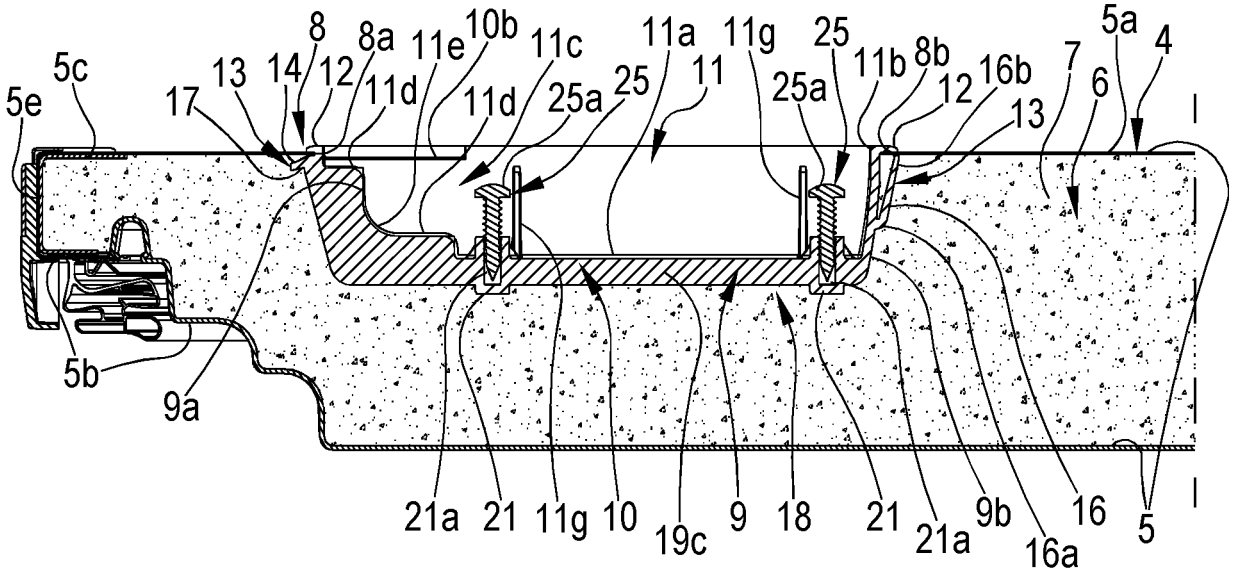
FIG.3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4
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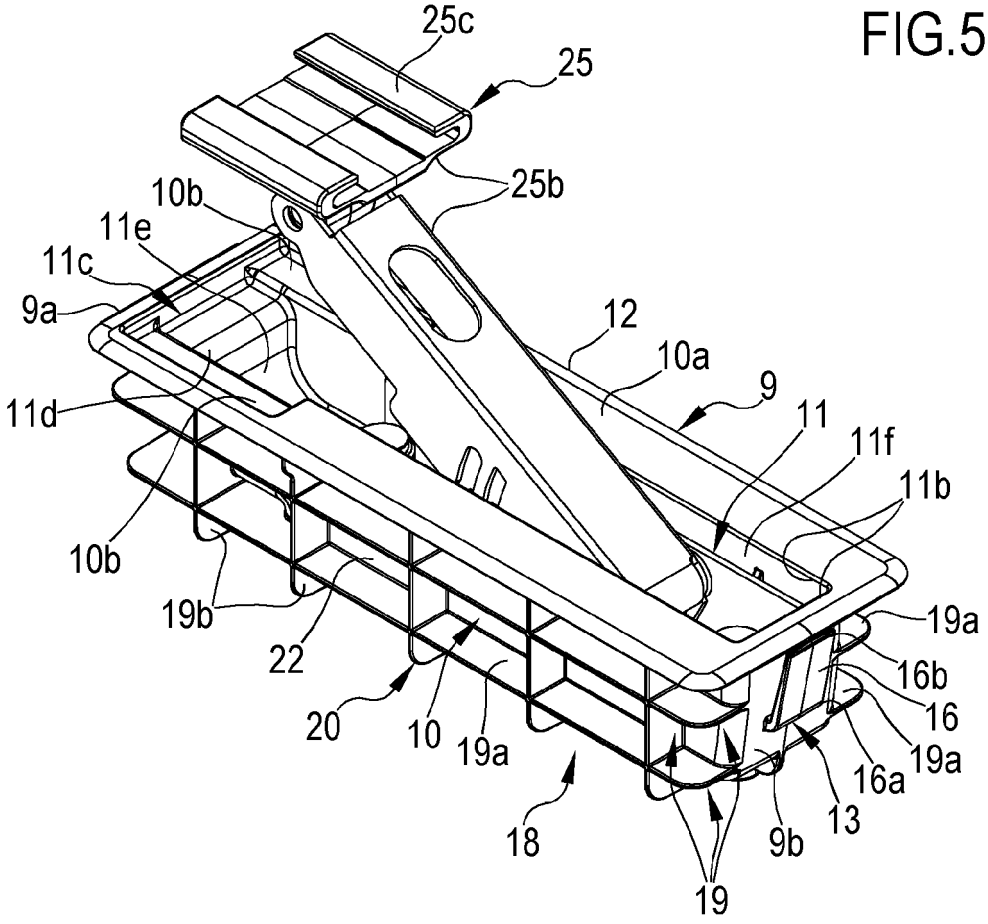
FIG.4

FIG.5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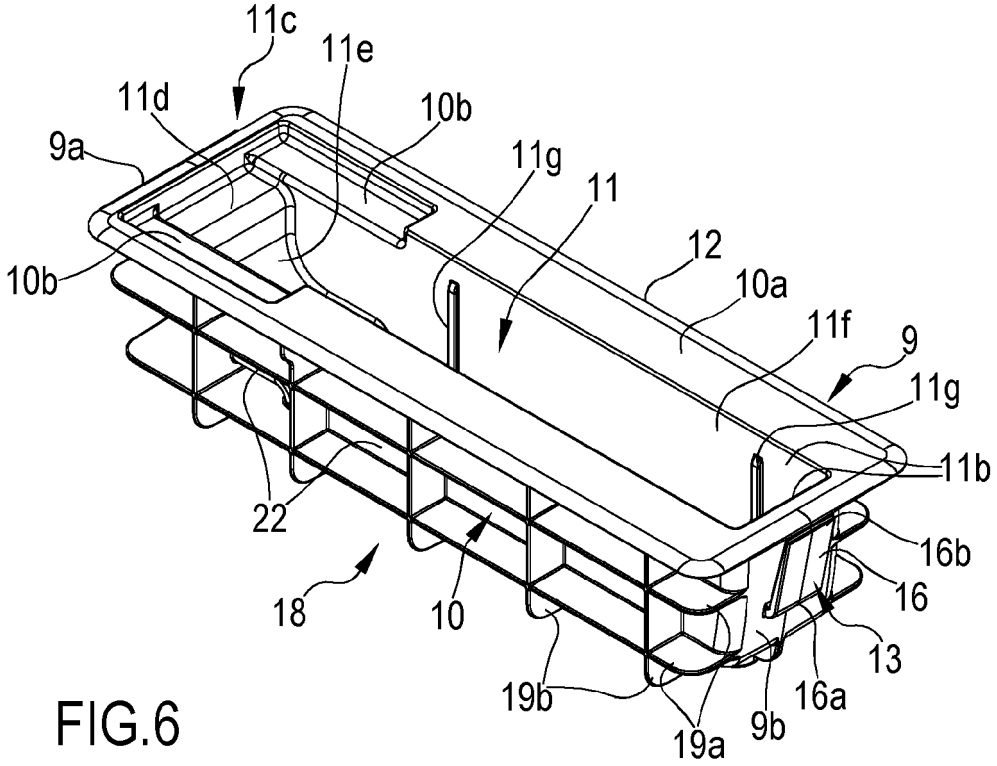
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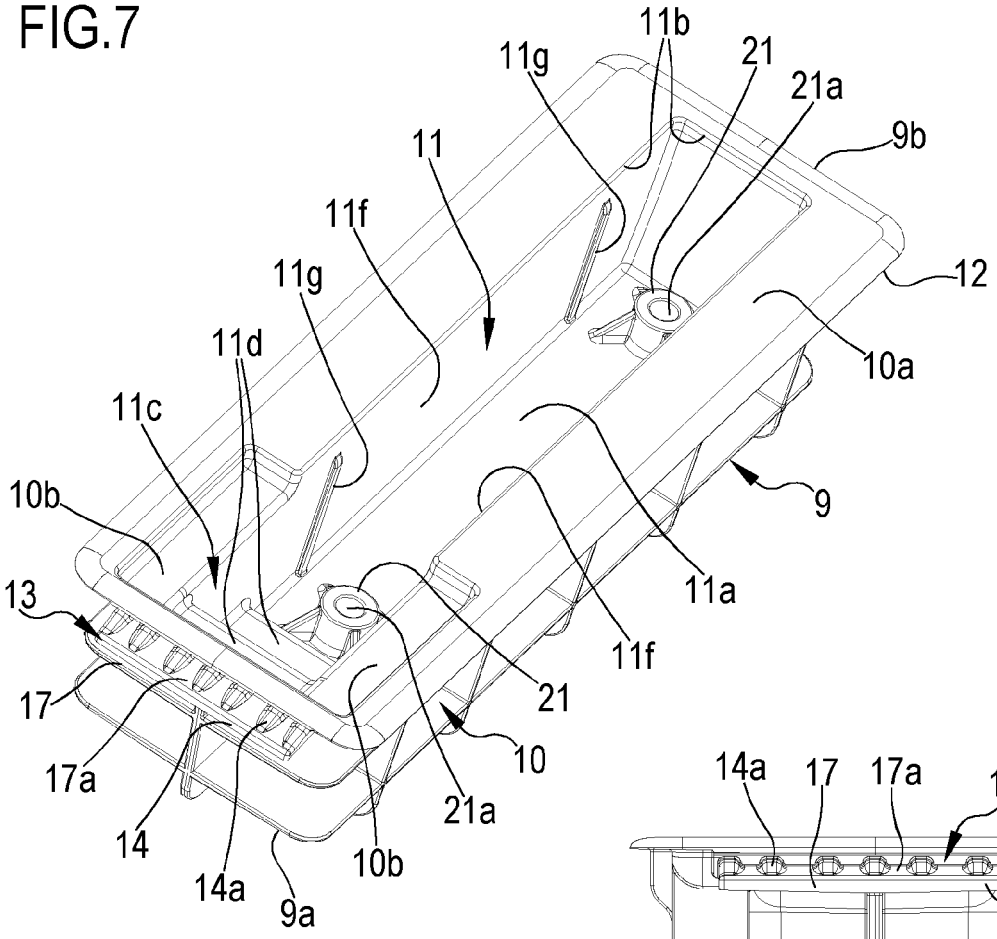
FIG.6

FIG.7



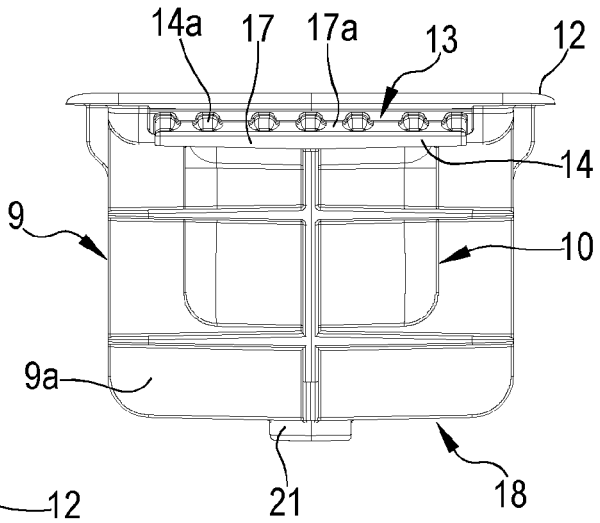


FIG.8

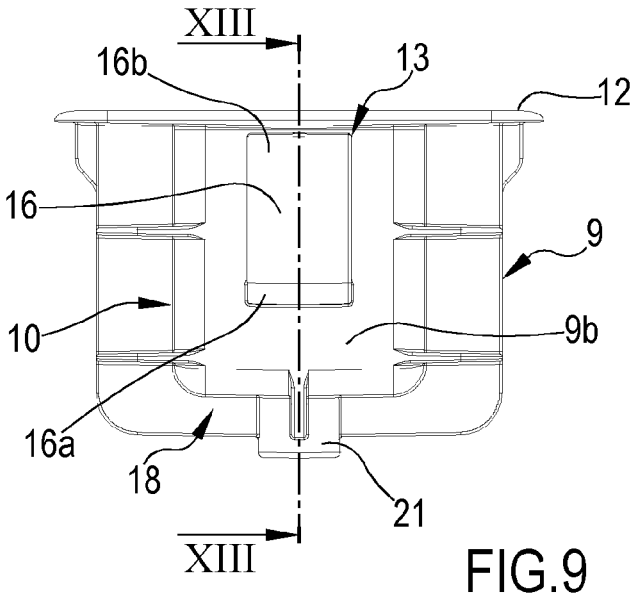
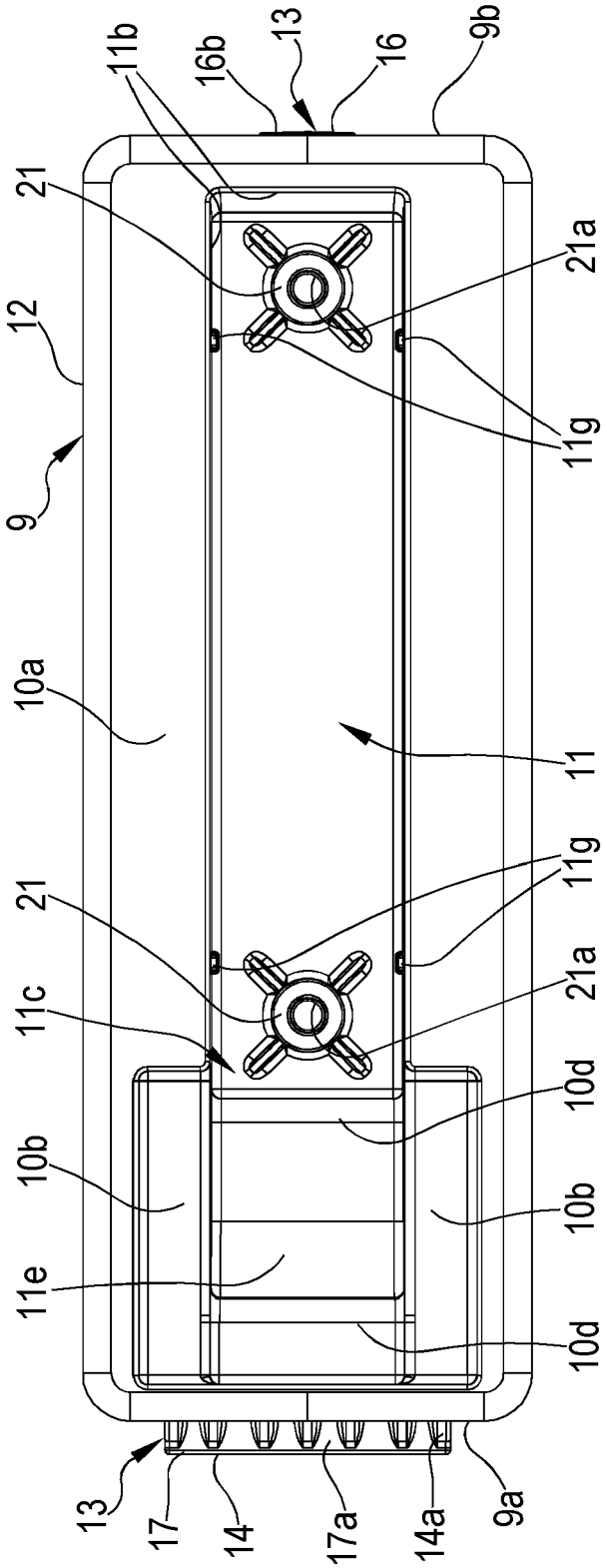


FIG.9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14
17a
14a
9a

FIG.10

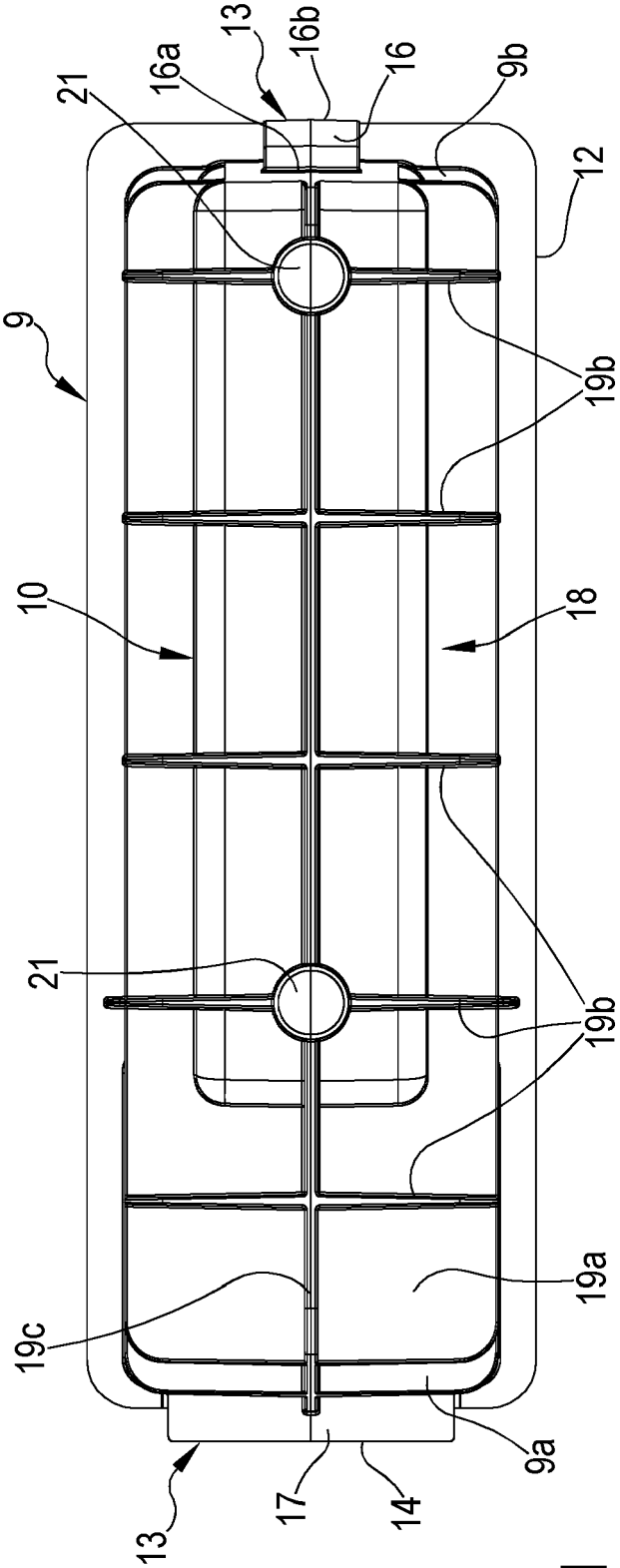
21
16a
13
16b
16
9b
12
9
19b
10
18
21
19b
19a
19c
9a
13
17
14

FIG.11

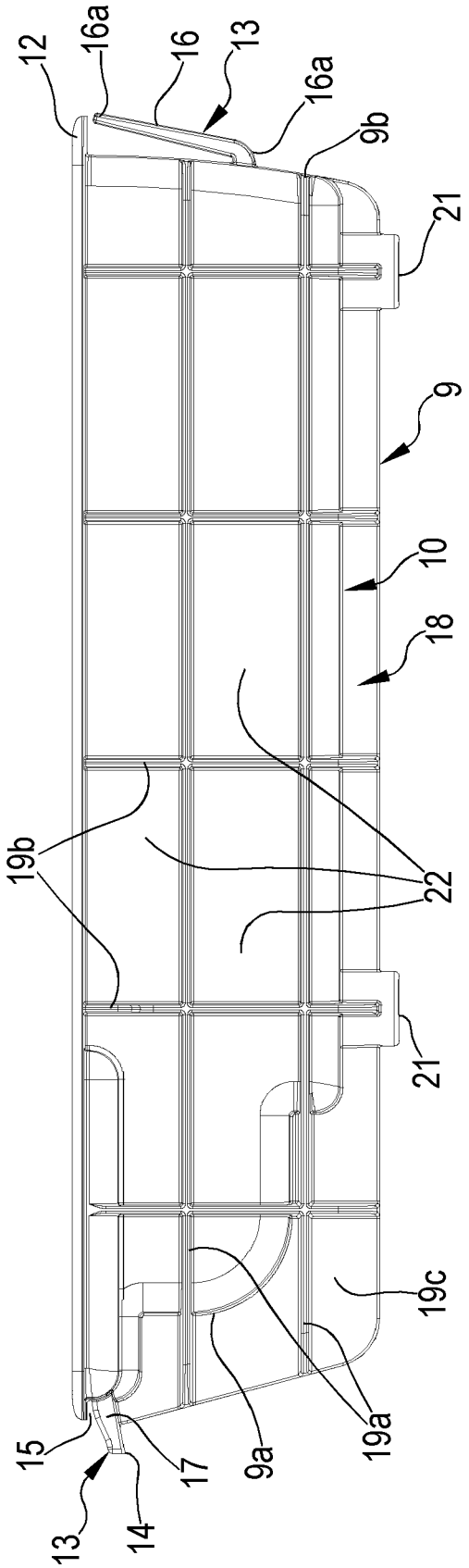
12
16a
16
13
16a
9b
21
9
10
18
19b
22
21
19c
15
13
14
17
9a
19a

FIG.12

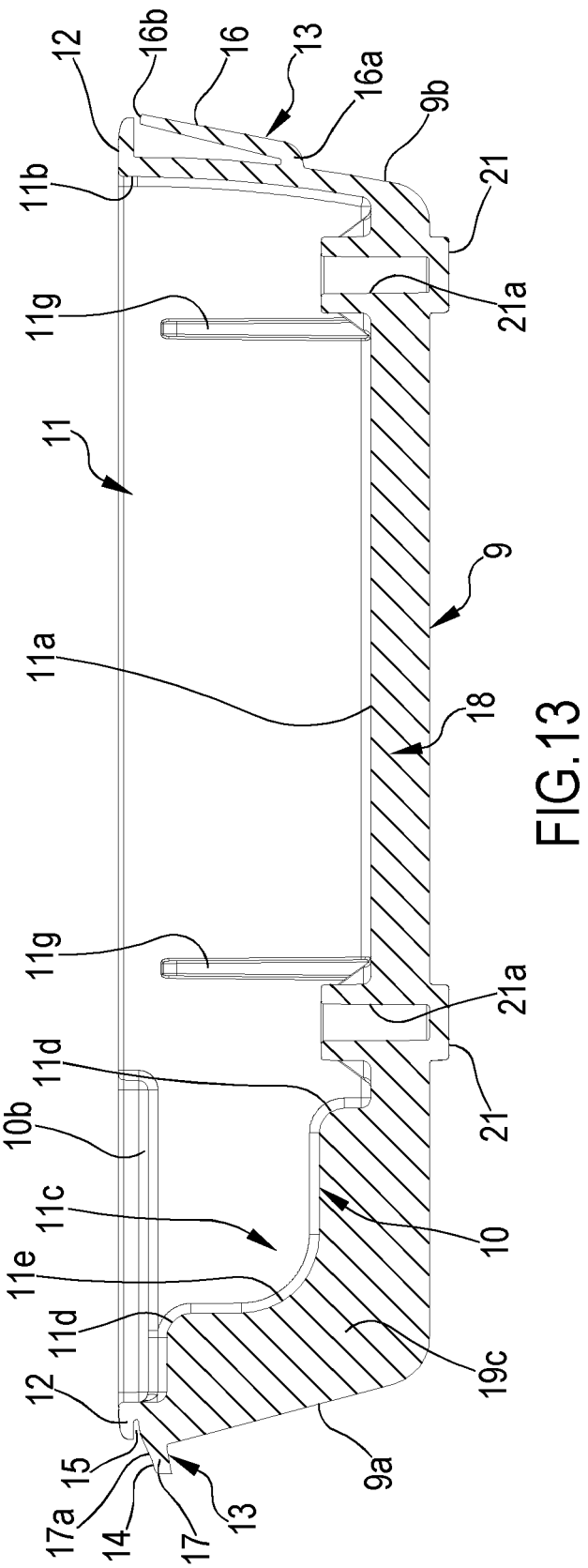
12
16b
16
13
16a
9b
11b
21
11g
21a
11
9
11a
18
11g
21a
11d
10b
21
11c
10
11e
11d
19c
12
15
17a
14
17
13
9a

FIG.13

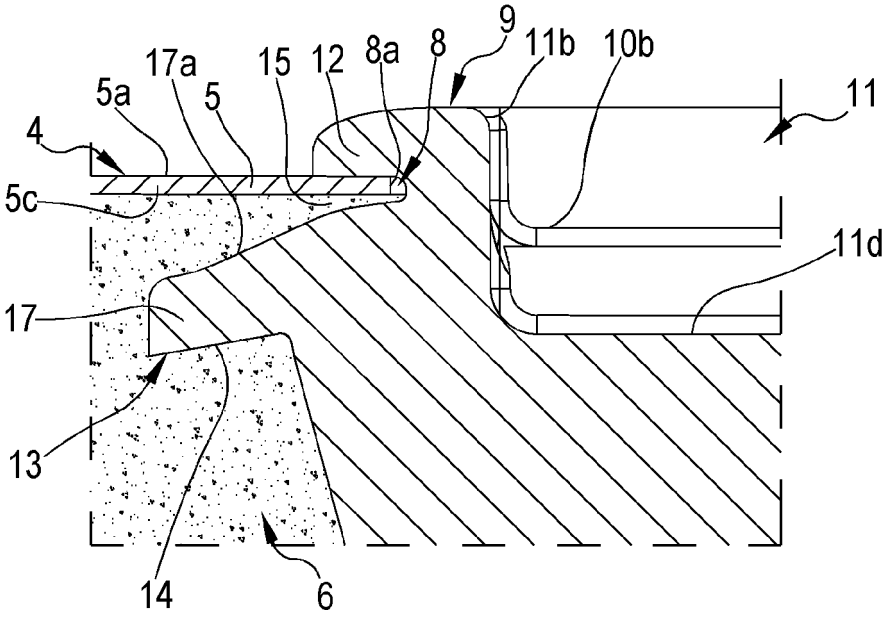
9
11b
10b
17a
15
12
8a
8
5a
5
11
4
5c
11d
17
13
14
6

FIG.14

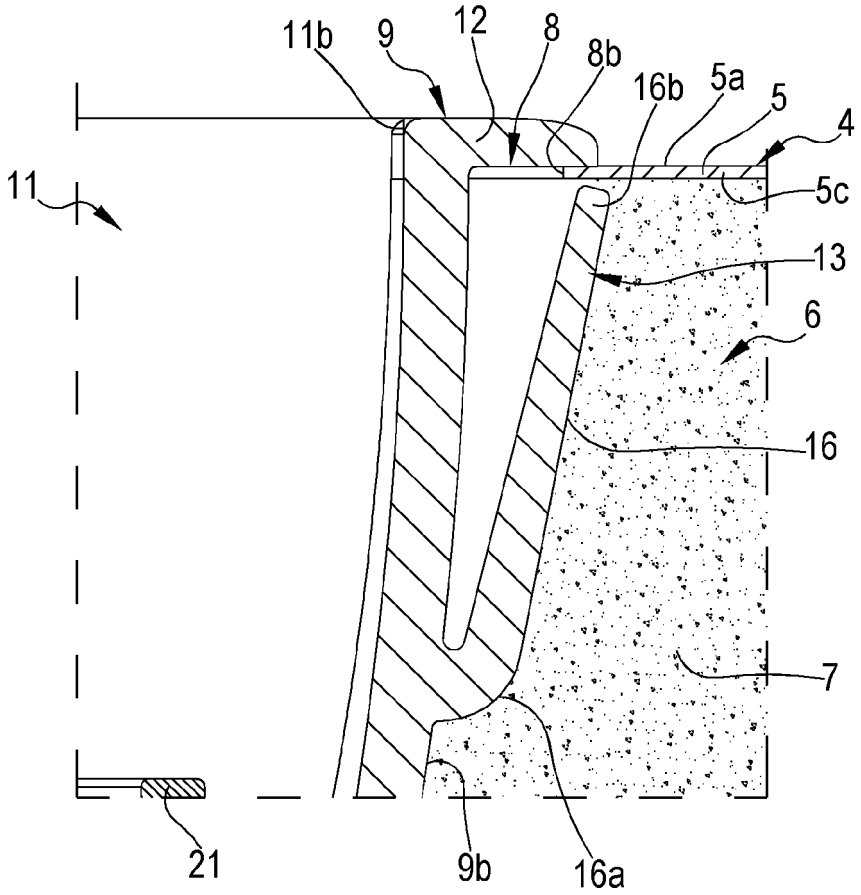
11b
9
12
8
8b
16b
5a
5
4
11
5c
13
6
16
7
21
9b
16a

FIG.15

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	13 February 2024	Kolev, Ivelin

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