December 2020

Household appliance

Christian Mohr

Description

Household appliance comprising a component group and a metal sheet or a housing

The present invention relates to household appliance, particularly a kitchen appliance, more particularly a cooking hob, specifically an induction cooking hob, comprising a component group and a metal sheet or a housing having a metal base or a metal frame according to claim 1.

Generally, household appliances are assembled from modular components, which may be individual parts, e.g. motors, heating elements, pumps, or the like, or systems or subsystems, which themselves may be an assembly of single parts, e.g. printed circuit boards like control units or user interfaces. A relevant number of said modular components is of electrical nature, which modular components have to be supplied with electrical energy and which are electrically connected with other electrical components for information and/or power transfer. In production facilities for household appliances, nowadays, there is already an advanced level of automation, which is reflected in an automated assembly of components, for example arrangeable in a housing of the household appliance. However, there are still manual assembly steps required for establishing electrical contacts, particularly by connecting plug contacts of wiring harnesses, or for a correct and backlash-free positioning of components.

It is an object of the present invention to provide a household appliance, which is constructed in a way that allows an automated assembly with backlash-free positioning of a component group on a metal sheet or in a housing of the household appliance.

The object is achieved by a household appliance comprising a component group and a metal sheet or a housing having a metal base plate or a metal frame, in which the component group comprises a printed circuit board and a frame or a casing or a holder. Said frame or casing or holder holds or is configured to hold the printed circuit board. The component group is attached or attachable to the metal sheet or to the housing. The metal sheet or the metal base plate or metal frame of the housing comprises engagement means for an engaging connection or receiving means with an opening. The engagement means or receiving means engage or are engageable in a direction at least approximately parallel to the surface of the metal sheet or to the surface of a base plate, in particular the metal base plate, of the housing. The metal sheet or the metal base plate or metal frame of the housing further comprises centering or alignment means for lateral positioning and/or movement restriction for the printed circuit board or for the frame or casing holding the printed circuit board. The frame or the casing or holder holding the printed circuit board comprises receiving means receiving the engagement means of the metal sheet or the base plate of the housing by a snap-in operation or engagement means snapping in the opening of the receiving means of the metal sheet or of the metal base plate or metal frame of the housing. The receiving means or engagement means of the frame or casing or holder are at least partially made of a flexible material, preferably a plastic material. The receiving means are adapted to receive the engagement means and/or, i. e. additionally or alternatively, the engagement means are adapted to snap in the opening of the receiving means during mounting the component group on the metal base plate or at the metal frame of the housing or on the metal sheet. Said mounting is executed essentially in a direction orthogonally to the surface of the metal sheet or the base plate

of the housing. In particular, the mounting movement is at least mainly vertically directed.

The household appliance is particularly a kitchen appliance, more particularly a cooking hob, and specifically an induction cooking hob. The frame or the casing has in particular the shape or outlines of a rectangle.

The engagement means or the receiving means of the metal sheet or the metal base plate or metal frame of the housing and/or the centering or alignment means may be formed as or may comprise at least one metallic flap or bracket. Said metallic flap or bracket is preferably manufactured by a punching and bending process step during a shaping of the metal sheet or of the metal base plate or metal frame of the housing.

The engagement means or receiving means particularly operate as centering or alignment means at least in a first movement direction and preferably at least in a first and a second movement direction. A favourable embodiment provides for centering or alignment means, which are active for movements in all directions of a three-dimensional coordinate system, and an operation of the engagement means or receiving means as such type of centering or alignment means is particularly preferred.

According to embodiments, the frame or the casing holding the printed circuit board comprises a positioning surface, which forms a first counterpart to the centering or alignment means. Said positioning surface is preferably a sidewall of the frame or the casing.

The metal sheet or the metal base plate or metal frame of the housing may comprise at least a first centering or alignment

means and a second centering or alignment means. In this case, each one of the first and second centering or alignment means forms a counterpart to two positioning surfaces arranged at or assigned to two opposite sides of the printed circuit board or of the frame or the casing holding the printed circuit board.

An advantageous embodiment of the present invention provides for an engagement means of the frame or the casing holding the printed circuit board, which comprises a snap-in hook element engaged or engageable in a, particularly rectangular, cut-out or opening in the receiving means of the metal sheet or of the metal base plate or the metal frame of the housing. Said snap-in hook element particularly comprises a flat bearing surface.

The snap-in hook element may comprise a lead-in chamfer forming an insertion aid during assembly of the printed circuit board or of the frame or the housing holding the printed circuit board at or into the metal sheet or the metal base plate or metal frame of the housing. Said assembly is in particular performed by a top down movement. The lead-in chamfer particularly forms a counterpart to an upper edge of the engagement means or the receiving means that is formed as a metallic flap or bracket.

A preferred embodiment provides that the frame or the casing holding the printed circuit board comprises at least one stop ridge, which forms a second counterpart to the centering or alignment means. Said stop ridge, which preferably comprises a first stop ridge and a second stop ridge, may be integrally moulded with the sidewall of the frame or the casing.

The centering or alignment means advantageously comprise at least one lead-in chamfer for a simplified insertion of the component group. Said lead-in chamfer is preferably assigned to the

stop ridge of the frame or of the casing holding the printed circuit board.

One embodiment, which may provide an additional or alternative solution to specific ones that have been described above, is characterized in that the engagement means or receiving means of the metal sheet or of the metal base plate or the metal frame of the housing on the one hand and at least a part of the centering or alignment means on the other hand are allocated to abutting edges of the printed circuit board or of the frame or the casing holding the printed circuit board. Preferably, both the engagement means or receiving means and the centering or alignment means are allocated to opposite sides of the printed circuit board or of the frame or casing holding the printed circuit board.

A particularly specific embodiment of the present invention provides an engagement means or the receiving means of the metal sheet or the metal base plate or metal frame of the housing, which at least partially penetrates a wall of the frame or the casing. The connection between the receiving means and the engagement means and the metal sheet or the metal base plate or metal frame of the housing are arranged, i. e. situated, on opposite sides of the wall of the frame or the casing. The connection, which may be positioned in an area in the casing not occupied by the printed circuit board or for which the printed circuit board may comprise an opening for a penetration of the components of the connection, is particularly the snapping of the engagement means in the opening of the receiving means.

More specifically, a port or slot may be arranged in the wall of the frame or casing providing an opening for the penetration of the engagement means or the receiving means. The port or slot

preferably comprises a chamfering, in particular a circumferential chamfering, on the side of the wall of the frame or the casing facing the metal sheet or the metal base or metal frame of the housing. Additionally or alternatively, the port or slot may comprise a collar-shaped elevation on the side of the wall of the frame or the casing facing the connection between the receiving means and the engagement means.

One preferred embodiment is characterized in that the engagement means or the receiving means of the metal sheet or the metal base plate or metal frame of the housing fits into the port or slot and/or into the aperture surrounded by the collar-shaped elevation by way of a play-free seat at least when the connection between the receiving means and the engagement means is established. Provision may be made that said play-free or custom-fit arrangement of the engagement means or the receiving means of the metal sheet or the metal base plate or metal frame of the housing in the port or slot and/or the aperture surrounded by the collar-shaped elevation is only taken on shortly before or at the moment of the establishment of the connection during the mounting process.

Preferably, the engagement means or the receiving means of the metal sheet or the metal base plate or metal frame of the housing is a metallic flap. Said flap especially comprises an at least approximately rectangular base portion that passes over into an at least approximately trapezoidal top portion. In order to allow an easy mounting operation and to prevent injuries during the assembling process, the upper edge of the top portion preferably comprises rounded corners.

For a more secure fastening of the component group, at least two connections, in particular snap connections, preferably a

plurality of connections, between engagement means and related receiving means may be provided. Said at least two connections are specifically arranged spaced from each other and arranged in a nonparallel alignment. By this means, shear forces can be avoided, which may particularly occur during shipment processes and which may cause damages particularly as a result of sharp edges of the metallic flap notching in the wall of the frame or the casing.

Finally, a safety element may be provided for securing the engaging connection against unintended disengagement. The safety mechanism may work in that the safety element is fixed to the frame or to the casing holding the printed circuit board. Additionally or alternatively, the safety element may be fixed to the snap-in hook element and/or to the metal base plate or metal frame of the housing. Said safety element is particularly a screw or a clip mechanism.

Novel and inventive features of the present invention are set forth in the appended claims.

The present invention will be described in further detail with reference to the drawing, in which

Fig. 1 illustrates lower components of an induction cooking hob implemented in a casing according to a first solution;

Fig. 2 is a detail view of a snap connection between casing and a power board of the induction cooking hob as indicated by II – II in Fig. 1;

Fig. 2a is a cross-sectional detail view of a modification of the snap connection according to Fig. 2 indicated by IIa – IIa in Fig. 2;

Fig. 3 is a schematic illustration of a power board of an induction cooking hob implemented in a casing according to a second solution;

Fig. 4 is a view onto a snap connection between casing and the power board from the interior of the power board 14 to the outside of the induction cooking hob according to Fig. 3;

Fig. 5 is a cross-sectional view of the snap connection as indicated by V – V in Fig. 4

Fig. 6 is a perspective exploded view of a third solution for a snap connection used for an implementation of a component group in the casing of the induction cooking hob; and

Fig. 7 is a sectional view of the snap connection of Fig. 6 after connection establishment.

Fig. 1 illustrates a perspective view onto lower components of an induction cooking hob 10, presenting a first solution of the present invention.

The induction cooking hob 10 comprises a casing 12 as well as first and second power boards 14, 14’ and a user interface 16, which are arranged in said casing 12. The casing 12 includes a bottom wall 12a, four side walls 12b and an open top side. Preferably, the casing 12 is made of metal, e. g. steel. Alternatively, the casing 12 may be made of plastics. The casing 12 is

usually covered by a panel on its top side, which may be a glass ceramic panel.

The cooking hob comprises four cooking zones, which are defined on the top side of the panel (not shown) and which can be occupied by cookware to be heated. However, even though the exemplary cooking hob discloses a number of four cooking zones, any other number of at least one may be provided. Each cooking zone is inductively heated by one induction coil (not shown) arranged beneath the panel. Said induction coils are supplied with electrical energy by the first and second power boards 14, with each power board 14 comprising switching circuits for supplying two of the four induction coils.

The user interface 16, which enables a user to enter commands into the induction cooking hob 10, is arranged on a front edge of the induction cooking hob 10 within the casing 12. The top side of the user interface 16 abuts the bottom side of the panel and allows touch control inputs for entering said commands from the top side of the panel. Moreover, the user interface 16 also comprises display elements for providing information, particularly status information, to the user.

The first and second power boards 14 are basically identically structured, but with reversed arrangement of their components. Each power board 14 specifically includes a printed circuit board 18 comprising electronic components, particularly electronic power components (not drawn in the figures). In order to avoid overheating of the power electronics, these components are attached to a cooling channel 20 and cooling air that is driven by a fan 22 passes through said cooling channel 20. The user interface 16 may include or may be connected to a control unit (not shown) controlling the power input of the power boards 14

dependent on the settings the user made via the user interface 16.

Each power board 14 is of a rectangular shape and surrounded and/or supported likewise by a rectangular frame or enclosure element 26, which is fixed to the casing 12 by means of snap connections 24. Due to its rectangular shape, the fixation of the frame or enclosure element 26 is realized by four snap connections 24, with one snap connection 24 in each of the rectangle corners, as also indicated by II in Fig. 1. Naturally, a different number of snap connections 24 may also be selected, particularly a number of six or eight in case of an increased need for a retaining force.

The perspective illustration according to Fig. 2 shows an enlarged view of the snap connection 24 indicated in Fig. 1. In general, the snap connection 24 is characterized by an interaction between a snap-in hook 28 and an interlock flap 30. On the one hand, the snap-in hook 28 is arranged at the frame or enclosure element 26. Particularly, in case of a plastic version of the frame or enclosure element 26, the snap-in hook 28 is integrally moulded on the frame or enclosure element 26. On the other hand, the interlock flap 30 is an integrally part of the bottom wall 12a of the casing 12. More specifically, the interlock flap 30 is produced during a stamping and bending process exerted on a metal sheet when manufacturing the casing 12. Said bending process ends up with an interlock flap 30 bent up by 90 degrees into the vertical direction. In that position, the interlock flap 30 is configured to receive the snap-in hook. To this end, the interlock flap 30 includes a rectangular opening 32, which provides an engagement aperture for engagement of a bolt head 34 of the snap-in hook 28. In case of a plastic version of the frame or enclosure element 26, the snap-in hook 28

is configured to elastically pivot back and forth during the snap-in process, wherein a lead-in chamfer 36 at the bolt head 34 sliding along an upper edge 38 of the interlock flap 30 facilitates said snap-in process.

The interlock flap 30 also operates as a limit stop for a horizontal movement of the frame or enclosure element 26. For this purpose, the side wall 40 of the frame or enclosure element 26 abuts a lateral surface of the interlock flap 30, the frame or enclosure element 26 thereby being prevented from moving further into this direction. In order to likewise prevent the frame or enclosure element 26 from a movement into the opposite direction, an equally designed snap connection 24 is arranged at the opposing side of the frame or enclosure element 26. Preferably, a lower edge of frame or enclosure element 26 also comprises a lead-in chamfer for facilitating a sliding along the upper edge 38 during the mounting movement.

In addition to afore-mentioned equally designed snap connection 24 at the opposing side, or alternatively thereto, for prevention of movement of the frame or enclosure element 26 into said opposite direction, i. e. the direction away from the interlock flap 30, a retainer means encompassing the interlock flap 30 on both sides, in particularly in a U-shaped way, e. g. by means of at least one insertion groove encompassing one side edge, preferably both side edges, and/or the upper edge 38 of the interlock flap 30, may be arranged.

Moreover, the snap connection 24 is also configured to prevent movements in the other coordinate direction of the horizontal plane that is defined by the bottom wall 12a of the casing 12. This is already achieved to some extent by the engaging bolt head 34, which is designed by an only marginally smaller width

compared to the width of the rectangular opening 32. That way, the freedom of movement into the direction parallel to the side wall 40 of the frame or enclosure element 26 is limited. Beyond that, each interlock flap 30 cooperates with a left and a right stop ridge 42, 42', which interact with the left and right side edges of the interlock flap such that the interlock flap 30 is inserted between the stop ridges 42, 42', preferably without clearance. The stop ridges 42, 42' are preferably integrally moulded with, and may orthogonally protrude from, the sidewall 40 of the frame or enclosure element 26. In order to further avoid assembly obstacles, the interlock flap 30 comprises chamfered edges in the corner areas of its upper edge 38 that provide additional lead-in chamfers by centering the interlock flap 30 between the stop ridges 42, 42' during the assembly process.

Finally, also a movement in vertical direction is prevented by the snap connection 24. To this end, the snap-in hook 28, in particular an upper surface of its bolt head 34, is designed in a way as to firmly support against the upper edge of the rectangular opening 32, so that no play is provided between the completely engaging snap-in hook 28 and upper edge of the rectangular opening 32.

As described before, the frame or enclosure element 26 is firmly fixed in all three dimensions by means of the snap connections 24 and related or allocated support devices.

As an alternative to the solution with the above-indicated at least one insertion groove, Fig. 2a illustrates a cross sectional view of an all-round encompassment of the interlock flap 30, which specifically prevents movement of the frame or enclosure element 26 in all three dimensions by only one of such snap connection 24. To this end, a stop bar 44 is provided as a limit

stop for the interlock flap 30 preventing its movement in the direction away from the side wall 40. That way, the above-mentioned equally designed snap connection 24 arranged at the opposing side of the frame or enclosure element 26 can be omitted. When assembled, said stop bar 44 and the side wall 40 are arranged at opposite sides of the interlock flap 30. As further illustrated in Fig. 2a, the stop bar 44 comprises a sloped lower section 46 for a facilitated insertion of the interlock flap 30 into the space between the side wall 40 and the stop bar 44. As also can be seen in Fig. 2a, an upper section of the interlock flap 30 is bent from a vertical to a sloped alignment, so that the upper edge 38 of the interlock flap 30 attaches the inner surface of the stop bar 44, what ends up in a clearance-free connection at the end of the assembling process.

Figs. 3 to 5 schematically illustrate a second solution of the present invention. According to Fig. 3, which is a top view onto an induction cooking hob 110, showing (in a similar way as Fig. 1) a power board 114 implemented in a casing 112. For the sake of simplification, a second power board, which is usually also included in the induction cooking hob 110, is omitted from illustration. However, the general structure of the induction cooking hob 110 with regard to design and implementation of the power boards 114 and further components of the induction cooking hob 110 may be the same as shown and described above with the first solution. The only or at least the major difference between first and second solutions is the design of the snap connections 24, 124 between the power board 14, 114 and the bottom wall 12a, 112a, 212a of the casing 12, 112, whereas the number and arrangement of the snap connections 124 of the second solution are the same as or similar to those ones of the first solution.

Similar to the first solution, the second solution may also provide a frame or enclosure element for surrounding and/or supporting the power board 114 of the second solution. The present example according to Figs. 4 and 5, however, manage the fixation of the power board 114 without such frame or enclosure element, rather, snap-in hooks 128 as first elements of the snap connections 124 are directly arranged at the power board 114.

As illustrated by Fig. 4 being a view onto the snap connection 124 from the interior of the power board 14 to the outside and Fig. 5 being a cross-sectional view as indicated by V – V in Fig. 4, the snap-in hooks 128 are arranged on the upper side of the power board 114 and are upturned, contrary to the first solution described above. The bolt head 134 of the second solution, however, has the same orientation as the bolt head 34 of the first solution. That way, the snap-in process is similarly executed, with the snap-in hook 28 being configured to elastically pivot back and forth during the snap-in process, wherein a lead-in chamfer 136 at the bolt head 134 sliding along an upper edge of an upper frame part 144 of the interlock flap 130 facilitates said snap-in process. At the end of the snap-in process, i. e. when the bolt head 134 of the snap-in hook 128 engages the rectangular opening 132 of the interlock flap 130, the top surface of the bolt head 134 is supported upwards against the lower edge of the upper frame part 144, thus preventing the power board 114 from moving upwards.

While the snap connections 124 limit a movement or shifting of the power board 114 in the direction against the interlock flaps 130, a movement or shifting in an orthogonal direction thereto is prevented by position flaps 146, which are positioned adjoining those side edges of the power board 114, which are abutting edges to that ones assigned to the snap connections 124.

Particularly, the position flaps 146 are also made of metal and preferably manufactured during a stamping and bending process, too.

It is to be stated that the arrangement of snap connections 124 and position flaps 146 may also be designed in converse way, i. e. the snap connections may be arranged at the short sides of the power board 114, as indicated by 146 in Fig. 3 with only one at each short side, and the position flaps may be arranged at the long sides of the power board 114, as indicated by 124 in Fig. 3 with two thereof at each long side.

Figs. 6 and 7 illustrate a third solution of a snap connection according to the present invention. As illustrated by Fig. 6, which is an exploded view of the components of the snap connection 224, in general, the snap connection 224 is characterized by an interaction between a snap-in hook 228 and an interlock flap 230. As with the embodiments according to Figs. 2 to 5, the interlock flap 230 is produced during a stamping and bending process exerted on a metal sheet when manufacturing the casing, in particular the bottom wall 212a thereof. Said bending process ends up with an interlock flap 230 bent up by 90 degrees into the vertical direction. In that position, the interlock flap 230 is configured to receive the snap-in hook 228. To this end, the interlock flap 230 includes a rectangular opening 232, which provides an engagement aperture for engagement of a bolt head 234 of the snap-in hook 228 during an assembling process of a circuit board casing 226 in the casing, notably at the bottom wall 212a of the casing. The opening 232 has a geometrical lay-out, which corresponds that one of to the bolt head 234.

At the end of the snap-in process, illustrated by Fig. 7, the snap connection 224 prevents a self-loosening of the circuit

board casing 226 from the bottom wall 212a. The snap-in operation is driven by a slight vertical inclination of the snap-in hook 228 in the unstressed state in order to provide a clamping force in the assembled state, i. e. when forced into a vertical alignment during the assembling process by the vertically aligned interlock flap 230. During said assembling process a lead-in chamfer 236 at the bolt head 234 sliding along the upper edge 238 of the interlock flap 230 facilitates said snap-in process.

The outer shape of the interlock flap 230 is characterized by a rectangular base portion 252 having a minimum height that corresponds to the contacting zone with the circuit board casing 226 in the assembled state. In upward direction the base portion 252 passes over into an at least approximately trapezoidal top portion 254. The upper edge 238 of the top portion 254, which corresponds to the upper edge 238 of the entire interlock flap 230, comprises rounded corners 256 for a simplified assembling process preventing a catching during the insertion of the interlock flap 230 in a related cutout of the circuit board casing 226. Said cutout is designed as a slot 248 in correspondence with the cross-sectional shape of the base portion 252 of the interlock flap 230. The geometrical layouts of the slot 248 and the base portion 252 are adapted to each other in a way as to minimize play of the interaction.

The slot 248 of the circuit board casing 226 is characterized by a tapered inner surface. In combination with a circumferential chamfering at the slot entry, i. e. at the bottom side of the circuit board casing 226, the insertion of the interlock flap 230 is facilitated. Moreover, in order to enable the design layout of the slot 248 with said chamfering as well as said tapered inner surface, thereby also taking into account a low thickness

of the material of the circuit board casing 226, a collar-shaped elevation 250, formed by a circumferential accumulation of plastic material around the slot 248 at the top side of the circuit board casing 226, is provided. Said collar-shaped elevation 250 also provides an increased contact surface between the base portion 252 of the metallic interlock flap 230 and inner surface of the slot 248, what particularly increases resistance of the snap connection 224, especially with respect to shear forces.

All above-described means and methods are provided in order to support both a manual and an automated assembling process. Thereby also the occurrence of tolerances and tolerance chains is notably taken into account.

Although illustrative embodiments of the present invention have been described herein with reference to the accompanying drawings, it is to be understood that the present invention is not limited to these precise embodiments, and that various other changes and modifications may be affected therein by one skilled in the art without departing from the scope or spirit of the invention. All such changes and modifications are intended to be included within the scope of the invention as defined by the appended claims.

List of reference numerals

10, 110	induction cooking hob
12, 112	casing
12a, 112a, 212a	bottom wall
12b	side walls
14, 114	power boards
16	user interface
18	printed circuit board
20	cooling channel
22	fan
24, 124, 224	snap connection
26	frame or enclosure element
28, 128, 228	snap-in hook
30, 130, 230	interlock flap
32, 132, 232	rectangular opening
34, 134, 234	bolt head
36, 136, 236	lead-in chamfer
38, 238	upper edge
40	side wall
42, 42’	left and right stop ridge
44	stop bar
46	sloped lower section
144	upper frame part
146	position flaps
226	circuit board casing
248	slot
250	collar-shaped elevation
252	base portion
254	trapezoid upper portion
256	rounded corners

Claims

1. A household appliance (10, 110), particularly a kitchen appliance, more particularly a cooking hob, specifically an induction cooking hob, comprising a component group and a metal sheet or a housing (12, 112) having a metal base plate (12a, 112a, 212a) or a metal frame, the component group
   - comprising a printed circuit board (14, 114) and a frame (26) or a casing (226) or a holder (128) holding the printed circuit board (14, 114), the frame (26) or the casing (226) in particular having the shape or outlines of a rectangle, and
   - being attached or attachable to the metal sheet or to the housing (12, 112),

   wherein the metal sheet or the metal base plate (12a, 112a, 212a) or metal frame of the housing (12, 112) comprises
   - engagement means for an engaging connection or receiving means (30, 130, 230) with an opening (32, 132, 232), the engagement means or receiving means (30, 130, 230) engaging or being engageable in a direction at least approximately parallel to the surface of the metal sheet or to the surface of a base plate, in particular the metal base plate (12a, 112a, 212a), of the housing (12, 112), and
   - centering or alignment means (42, 42’, 146) for lateral positioning and/or movement restriction for the printed circuit board (14, 114) or for the frame (26) or casing (226) holding the printed circuit board (14, 114),

   wherein the frame (26) or the casing (226) or the holder (128) holding the printed circuit board (14, 114) comprises
   - receiving means receiving the engagement means of the metal sheet or the base plate of the housing (12, 112) by a snap-in operation, or

- engagement means (28, 128, 228) snapping in the opening (32, 132, 232) of the receiving means (30, 130, 230) of the metal sheet or of the metal base plate (12a, 112a, 212a) or metal frame of the housing (12, 112),

which receiving means or engagement means (28, 128, 228) of the frame (26) or casing (226) or holder (128) are at least partially made of a flexible material, preferably a plastic material,

and wherein

- the receiving means are adapted to receive the engagement means and/or
- the engagement means (28, 128, 228) are adapted to snap in the opening (32, 132, 232) of the receiving means (30, 130, 230)

during mounting the component group on the metal base plate (12a, 112a, 212a) or at the metal frame of the housing (12, 112) or on the metal sheet, which mounting being executed essentially in a direction orthogonally to the surface of the metal sheet or the base plate of the housing (12, 112), in particular in an at least mainly vertical direction.

2. The household appliance (10, 110) according to claim 1, characterized in that

the engagement means or the receiving means (30, 130, 230) of the metal sheet or the metal base plate (12a, 112a, 212a) or metal frame of the housing (12, 112) and/or the centering or alignment means (42, 42’, 146) is or are formed as or comprise at least one metallic flap or bracket, which is or are preferably manufactured by a punching and bending process step during a shaping of the metal sheet or of the metal base plate (12a, 112a, 212a) or metal frame of the housing (12, 112).

3. The household (10, 110) appliance according to claim 1 or 2, characterized in that
the engagement means or receiving means (30, 130, 230) operate as centering or alignment means at least in a first movement direction, preferably at least in a first and a second movement direction, more preferably for movements in all directions of a three-dimensional coordinate system.

4. The household appliance (10, 110) according to anyone of the claims 1 to 3,
characterized in that
the frame (26) or the casing (226) holding the printed circuit board (14) comprises a positioning surface, which forms a first counterpart to the centering or alignment means, the positioning surface preferably being a sidewall of the frame (26) or the casing.

5. The household appliance (10, 110) according to anyone of the claims 1 to 4,
characterized in that
the engagement means of the frame (26) or the casing (226) or the holder (128) holding the printed circuit board (14, 114) comprises a snap-in hook element (28, 128, 228), particularly comprising a flat bearing surface, engaged or engageable in a, particularly rectangular, opening (32, 132, 232) in the receiving means (30, 130, 230) of the metal sheet or of the metal base plate (12a, 112a, 212a) or the metal frame of the housing (12, 112).

6. The household appliance (10, 110) according to claim 5,
characterized in that
the snap-in hook element (28, 128, 228) comprises a lead-in chamfer (36, 136, 236) forming an insertion aid during

assembly of the printed circuit board (14, 114) or of the frame (26) or the casing (226) holding the printed circuit board (14) at or into the metal sheet or the metal base plate (12a, 112a, 212a) or metal frame of the housing (12a, 112a, 212a), which assembly is in particular performed by a top down movement, the lead-in chamfer (36, 136, 236) particularly forming a counterpart to an upper edge (38, 238) of the engagement means or the receiving means (30, 130, 230) formed as metallic flap or bracket.

7. The household appliance (10, 110) according to claim 4, characterized in that
the metal sheet or the metal base plate (12a, 112a, 212a) or metal frame of the housing (12, 112) comprises at least a first centering or alignment means and a second centering or alignment means, each one of the first and second centering or alignment means forming a counterpart to two positioning surfaces (146) arranged at or assigned to two opposite sides of the printed circuit board (14) or of the frame (26) or the casing holding the printed circuit board (14).

8. The household appliance (10, 110) according to anyone of the claims 1 to 7,
characterized in that
the frame (26) or the casing holding the printed circuit board (14) comprises at least one stop ridge (42, 42’), preferably a first stop ridge (42) and a second stop ridge (42’), which forms a second counterpart to the centering or alignment means, the stop ridge (42, 42’) preferably being integrally moulded with the sidewall of the frame (26) or the casing.

9. The household appliance (10, 110) according to anyone of the claims 1 to 8,
characterized in that
the centering or alignment means comprises at least one lead-in chamfer for a simplified insertion of the component group, the lead-in chamfer preferably being assigned to the stop ridge (42, 42') of the frame (26) or of the casing holding the printed circuit board (14, 114).

10. The household appliance (110) according to claim 1 or 7,
characterized in that
the engagement means or receiving means (130) of the metal sheet or of the metal base plate (112a) or the metal frame of the housing (112) on the one hand and at least a part of the centering or alignment means (146) on the other hand are allocated to abutting edges of the printed circuit board (114) or of the frame or the casing holding the printed circuit board, preferably both the engagement means or receiving means (30) and the centering or alignment means (146) are allocated to opposite sides of the printed circuit board (114) or of the frame or of the casing holding the printed circuit board.

11. The household appliance (10, 110) according to anyone of the claims 1 to 6,
characterized in that
the engagement means or the receiving means (30, 130, 230) of the metal sheet or the metal base plate (12a, 112a, 212a) or metal frame of the housing (12, 112) at least partially penetrates a wall of the frame (26) or the casing (226), wherein the connection between the receiving means and the engagement means, in particular the snapping of the engagement means (228) in the opening (232) of the receiving means (230), and

the metal sheet or the metal base plate (12a, 112a, 212a) or metal frame of the housing (12, 112) are situated on opposite sides of the wall of the frame (26) or the casing (226).

12. The household appliance (10, 110) according to claim 11, characterized in that
a port or slot (240) is arranged in the wall of the frame (26) or casing (226) providing an opening for the penetration of the engagement means or the receiving means (30, 130, 230), the port or slot (240) preferably
- comprising a chamfering, in particular a circumferential chamfering, on the side of the wall of the frame (26) or the casing (226) facing the metal sheet or the metal base plate (12a, 112a, 212a) or metal frame of the housing (12, 112)

and/or
- comprising a collar-shaped elevation (242) on the side of the wall of the frame (26) or the casing (226) facing the connection between the receiving means (230) and the engagement means (228).

13. The household appliance (10, 110) according to claim 12, characterized in that
the engagement means or the receiving means (30, 130, 230) of the metal sheet or the metal base plate (12a, 112a, 212a) or metal frame of the housing (12, 112) fits into the port or slot (240) and/or into the aperture surrounded by the collar-shaped elevation (242) by way of a play-free seat at least when the connection between the receiving means (230) and the engagement means (228) is established.

14. The household appliance (10, 110) according to anyone of the claims 11 to 13,

characterized in that
the engagement means or the receiving means (30, 130, 230) of the metal sheet or the metal base plate (12a, 112a, 212a) or metal frame of the housing (12, 112) is a metallic flap comprising an at least approximately rectangular base portion (252) that passes over into an at least approximately trapezoidal top portion (254), the upper edge of the top portion (254) preferably comprising rounded corners (256).

15. The household appliance (10, 110) according to anyone of the claims 11 to 14,
characterized by
at least two connections, in particular snap connections (224), between an engagement means (228) and a receiving means (230), arranged spaced from each other and arranged in a nonparallel alignment.

16. The household appliance (10, 110) according to anyone of the preceding claims,
characterized in that
a safety element, in particular a screw or a clip mechanism, is provided for securing the engaging connection against unintended disengagement, in particular by a fixation of the safety element to the frame (26) or the casing holding the printed circuit board (14) and/or to the snap-in hook element (28, 128) and/or to the metal base plate (12a, 112a, 212a) or metal frame of the housing (12, 112).

Abstract

A household appliance (10, 110) comprises a component group and a metal sheet or a housing (12, 112) having a metal base plate (12a, 112a, 212a) or frame. The component group comprises a printed circuit board (PCB) (14, 114) and a frame (26) or casing (226) holding the same. The component group is attached to the metal sheet or to the housing (12, 112). The metal sheet or metal base plate (12a, 112a, 212a) or frame of the housing (12, 112) has engagement means for an engaging connection or receiving means (30, 130, 230) with an opening (32, 132, 232). The engagement means or receiving means (30, 130, 230) are engageable in a direction at least approximately parallel to the surface of the metal sheet or of a base plate of the housing (12, 112). The metal sheet or base plate (12a, 112a, 212a) or frame of the housing (12, 112) has centering or alignment means (42, 42', 146) for lateral positioning and/or movement restriction for the PCB (14, 114) or for the frame (26) or casing (226). The frame (26) or casing (226) or holder (128) has receiving means receiving the engagement means of the metal sheet or base plate of the housing (12, 112) by a snap-in operation or engagement means (28, 128, 228) snapping in the opening (32, 132, 232) of the receiving means (30, 130, 230) of the metal sheet or base plate (12a, 112a, 212a) or frame of the housing (12, 112). The receiving or the engagement means (28, 128, 228) are at least partially made of a flexible material. The receiving means are adapted to receive the engagement means or the engagement means (28, 128, 228) are adapted to snap in the opening (32, 132, 232) of the receiving means (30, 130, 230) during mounting the component group on the metal base plate (12a, 112a, 212a) or at the metal frame of the housing or on the metal sheet. Said mounting is executed essentially in a direction orthogonally to the

surface of the metal sheet or the base plate of the housing (12, 112).

Fig. 5

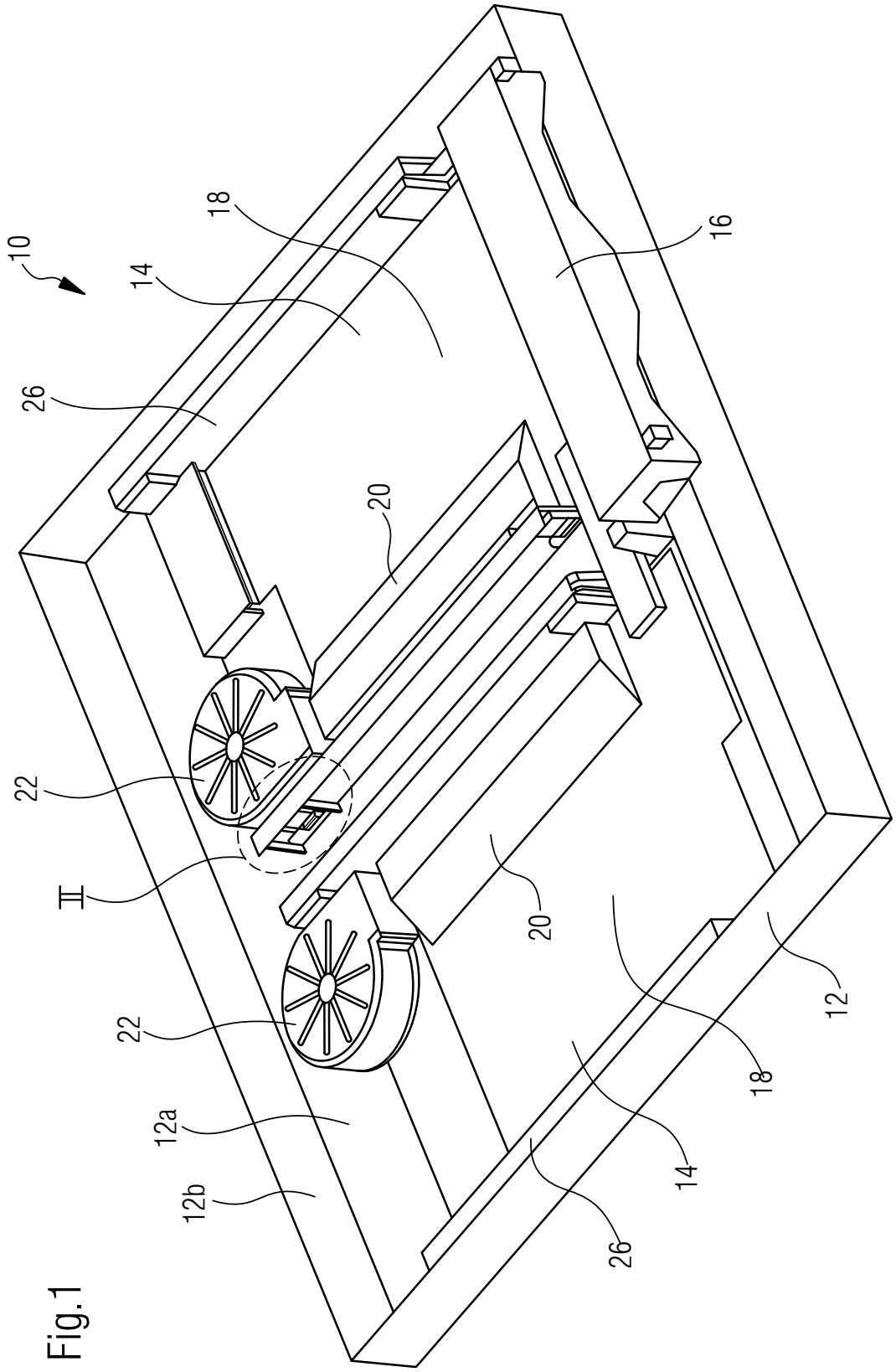


Fig.1

Fig.2

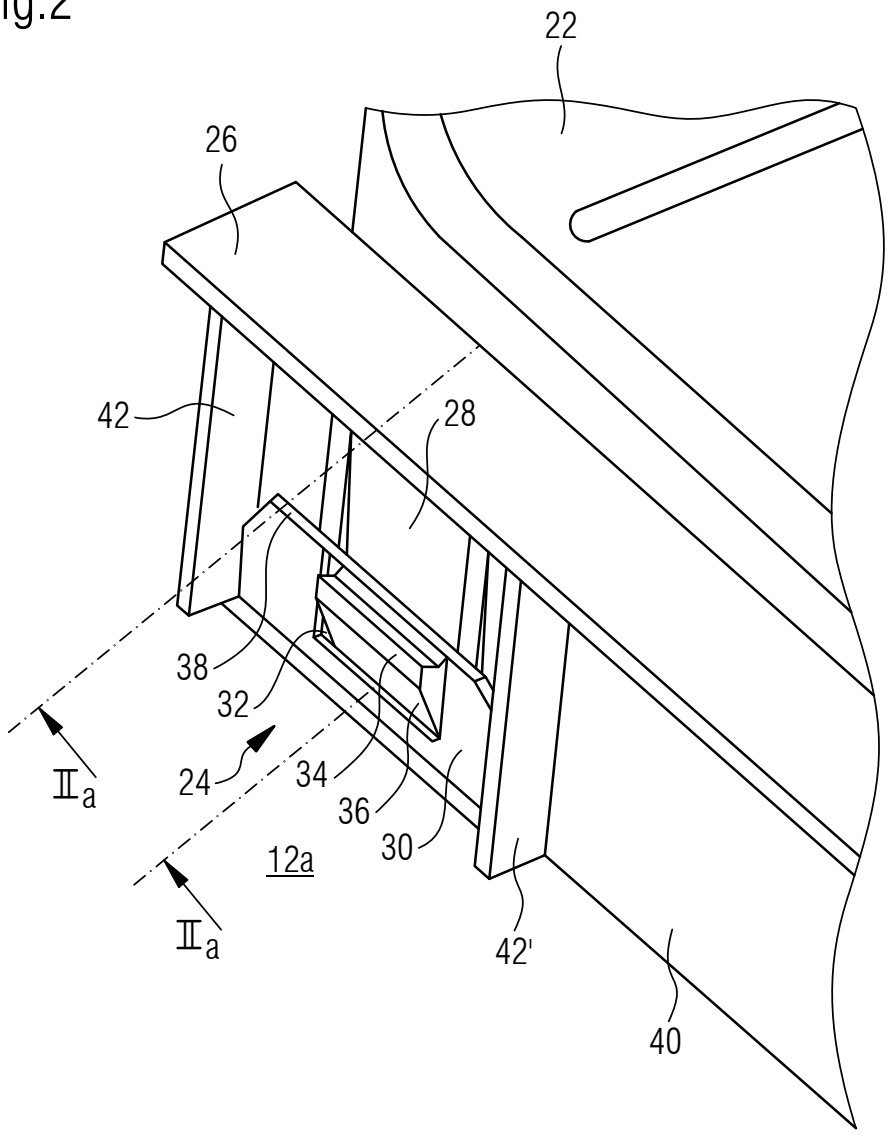

22
26
42
28
38
32
24
34
36
30
12a
IIa
IIa
42'
40

Fig.2a

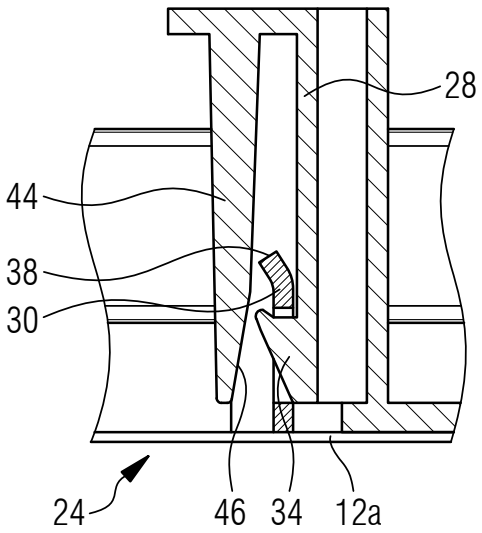

28
44
38
30
24
46
34
12a

Fig.3

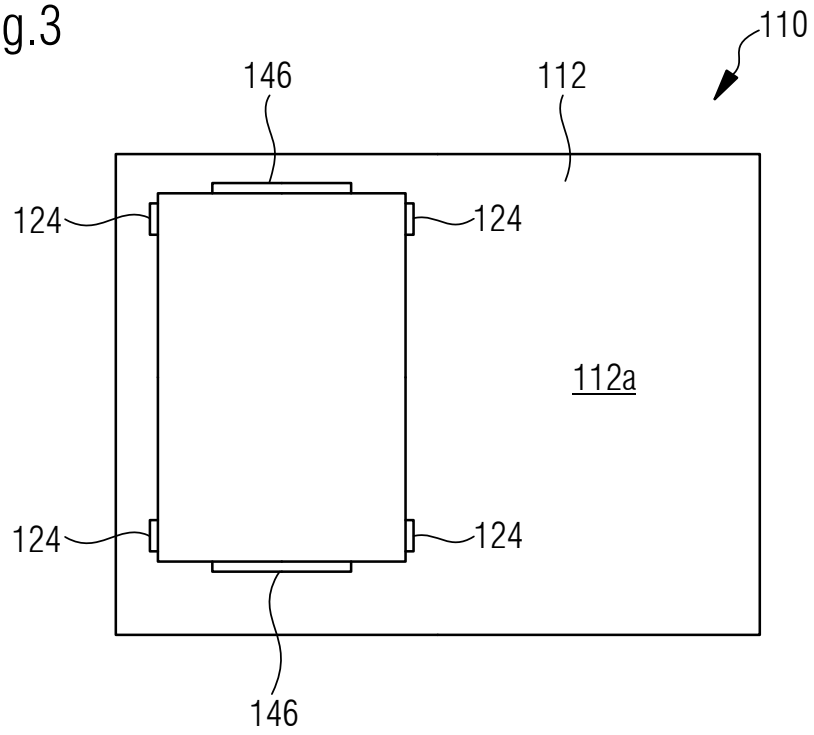


Fig.4

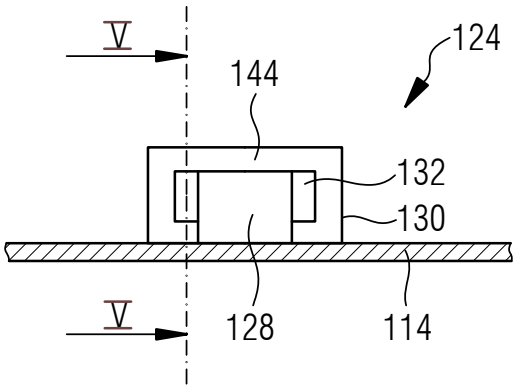


Fig.5

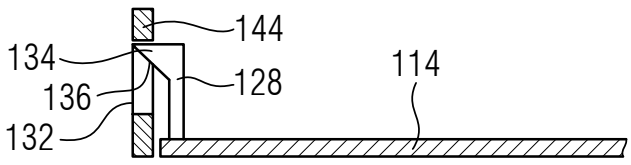


Fig.6

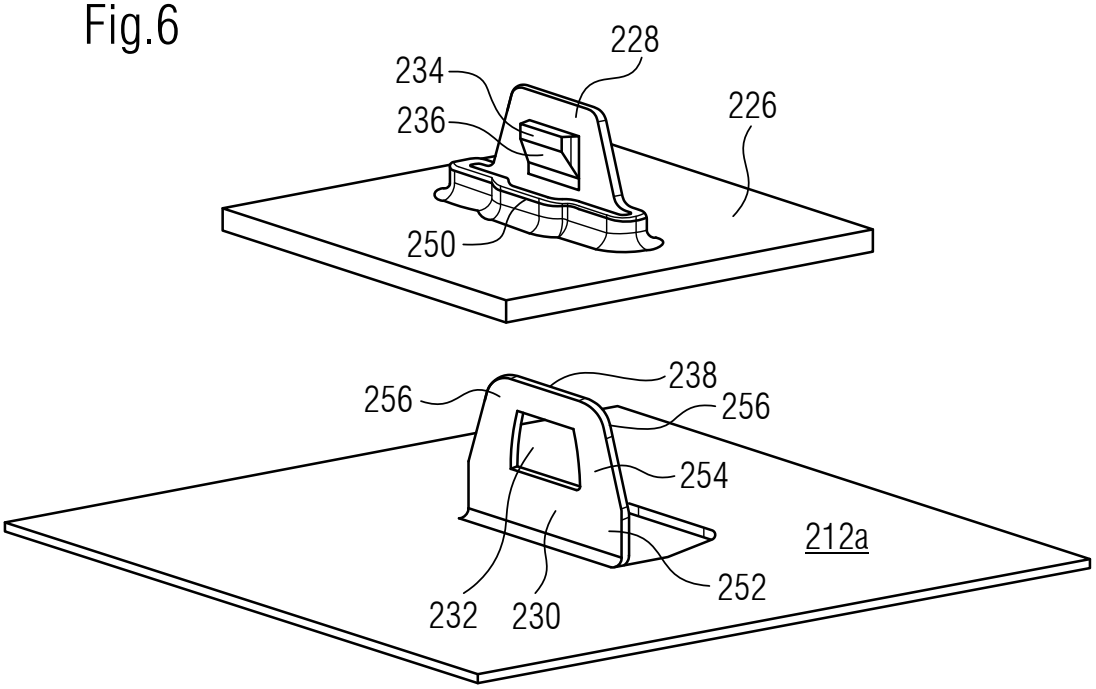
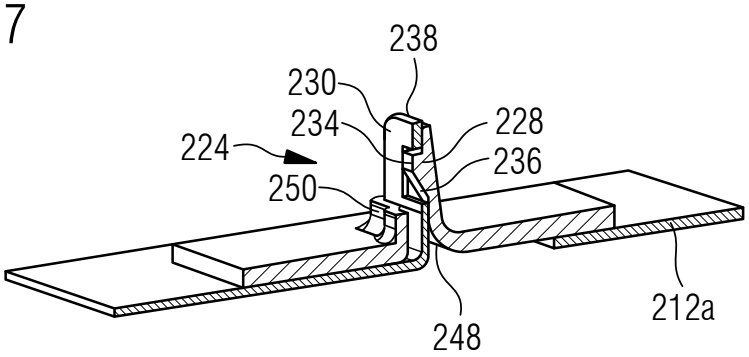

228
234
236
226
250
238
256
256
254
212a
252
232
230

Fig.7


238
230
234
228
224
236
250
212a
248