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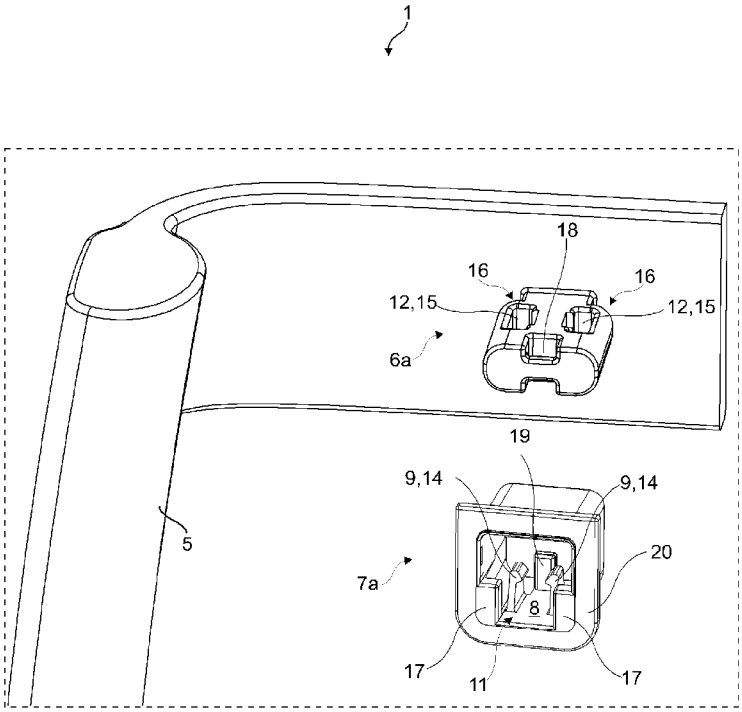
[Continued on next page]

(54) Title: IMPROVED HANDLE ASSEMBLY FOR REFRIGERATION APPLIANCE DOOR

Fig. 2



(57) Abstract: The present invention relates to a handle-assembly (1) for use in a door (2) of a refrigeration appliance. The door (2) comprises a cover plate (3) which has a through-hole (4a, 4b, 4a', 4b') for mounting a handle (5). In the handle-assembly (1) of the present invention, the handle (5) has a connector (6a, 6b) which has a snap-fit portion (12) which protrudes through a through-hole (4a, 4b, 4a', 4b') and snap-fittingly engages with a counterpart snap-fit portion (9) of a counterpart connector (7a, 7b) which is arranged inside the door (2).

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Description

IMPROVED HANDLE ASSEMBLY FOR REFRIGERATION APPLIANCE DOOR

[0001] The present invention relates to a handle-assembly for use in a door, in particular a reversible door of a refrigeration appliance such as a domestic refrigerator in which the door can be selectively mounted by a user for left-hand swing or right-hand swing. The present invention also relates to a process of manufacturing the door by using the handle-assembly.

[0002] It is common practice to provide a refrigeration appliance such as a domestic refrigerator with a reversible hinge system and a reversible handle which together allow a customer to selectively mount the pivotable door to a main body of the appliance for either left-hand or right-hand swing. When a customer purchases a domestic refrigerator, the swing direction of the door thereof may not always conform to the customer's kitchen layout. Nevertheless, the customer may change by virtue of the reversible hinge system and the reversible handle, the swing direction of the door prior to installing the refrigerator at its designated location in the kitchen such that the door opens and closes in conformity with the kitchen layout.

[0003] In such domestic refrigerators, elements like the hinges, the handle, the plugs, the covers, the washers, and the spacers are all rendered transferrable from one side of the main body to an opposite side of the main body when reversing the swing direction of the door. Thereby, the customer is enabled to easily reverse a swing direction of the door without the need of extra elements.

[0004] The customer generally removes any plugs which conceal the demountable elements of the hinge system in order to change the swing direction of the door. Subsequently, the customer demounts the reversible handle, the reversible hinges including any washers and spacers from their current position on the main body and re-mounts the same to an opposite position on the main body.

[0005] EP 1 153 557 A1 discloses a handle for a refrigerator appliance. This handle has a couple of through-holes for mounting it to the door of the refrigeration appliance by utilizing a couple of corresponding bolts.

[0006] A drawback of this type of a handle is that the screws increase the manufacturing costs including the costs for material and labor.

[0007] An objective of the present invention is to provide a handle-assembly and a door having the same which overcomes the aforementioned drawbacks of the prior art and which enables a quick and reliable installation of the handle. Another objective of the present invention is to provide a process for manufacturing the door by using the handle-assembly.

[0008] This objective have been achieved by the handle-assembly as defined in claim 1, the door as defined in claim 9, the refrigeration appliance as defined in claim 13, and the manufacturing process as defined in claim 14. Further achievements have been attained by the subject-matters respectively defined in the dependent claims.

[0009] In the handle-assembly of the present invention, the handle has a connector which has a snap-fit portion which protrudes through a through-hole in a cover pate of the door and snap-fittingly engages with a counterpart snap-fit portion of a counterpart connector arranged inside the door. The connector and counterpart connector are provided separately from each other. In the handle-assembly of the present invention the counterpart snap-fit portion is formed in a cavity of the counterpart connector which has an opening that is arranged to face the through-hole.

[0010] The present invention also provides a process of manufacturing the door by using the handle-assembly. In the manufacturing process of the present invention the counterpart connector is immobilized relative to the cover plate by injecting foam into inner space of the door such that in the cured state of the foam the opening of the cavity faces the through-hole.

[0011] In an embodiment, the handle-assembly has a pair of connectors and a pair of counterpart connectors. The connectors are integrally provided with the opposing arms of the handle, and the counterpart connectors are arranged on one of a lateral side of the door. In a version of the embodiment, the door is rendered reversible and has an additional pair of counterpart connectors which is arranged on the other lateral side of the door. Thus, the user can selectively mount the handle to one of the lateral sides. In another version this embodiment, the unused through-holes are

closed by removable plugs.

[0012] In another embodiment, the cavity has a clearance. In this embodiment, in a state where the snap-fit portion is received by the cavity, the snap-fit portion and the counterpart snap-fit portion get engaged or disengaged by manually moving the handle downwards or upwards respectively.

[0013] By the present invention, a handle-assembly has been provided which can be easily installed by using foam material. Thereby, the use of screws has been obviated and the costs for material and labor have been reduced. Due to the simplified installation of the handle, the refrigeration appliance can transported to its designated location in a state where the handle is temporally stored in a refrigeration appliance. Thus, the handle can be taken out of the refrigeration compartment and quickly mounted by a service person to the door. Thereby, the transportation becomes easier. In addition, the handle can be easily mounted on a desired lateral side of the door so as to either enable left-hand swing or right hand swing without the burden of unscrewing/screwing bolts or the like. In the door of the present invention, the counterpart connector does not protrude out of the through-hole of the cover plate, thus, a risk of damaging the same in a state where the handle is taken off during transportation has been eliminated.

[0014] Additional advantages of the handle-assembly of the present invention and the manufacturing process of the door by using the handle-assembly of the present invention will become apparent with the detailed description of the embodiments with reference to the accompanying drawings in which:

[0015] Figures 1a to 1d – are schematic views of a manufacturing process of a door by using a handle-assembly according to an embodiment of the present invention;

[0016] Figure 2 – is a schematic enlarged partial perspective view of the handle-assembly shown in Figs.1a to 1d;

[0017] Figure 3 – is a schematic top view of a handle and a connector of the handle-assembly shown in Fig. 2;

[0018] Figure 4 – is a schematic top view of a counterpart connector of the handle-assembly shown in Fig. 2;

[0019] Figure 5 – is a schematic front view of the counterpart connector shown in Fig. 2;

[0020] Figure 6 – is a schematic cross-sectional view of the handle and the connector shown in Fig. 3, taken along the line A-A;

[0021] Figure 7 – is a schematic cross-sectional view of the handle and the connector shown in Fig. 3, taken along the line B-B;

[0022] Figure 8 – is a schematic cross-sectional view of the counterpart connector shown in Fig. 4, taken along the line C-C;

[0023] Figure 9 – is a schematic cross-sectional view of the counterpart connector shown in Fig. 4, taken along the line D-D;

[0024] Figure 10 – is a schematic top view of the door shown in Figs. 1c to 1d;

[0025] Figure 11 – is a schematic enlarged view of the detail E of Fig. 10;

[0026] Figure 12 – is a schematic cross-sectional view of the handle-assembly and the cover plate shown in Fig. 11, taken along the line F-F;

[0027] Figure 13 – is a schematic cross-sectional view of the handle-assembly and the cover plate shown in Fig. 11, taken along the line G-G.

[0028] The reference signs appearing on the drawings relate to the following technical features.

1. Handle-assembly
2. Door
3. Cover plate

[0029] 4a. Through-hole

[0030] 4b. Through-hole

4a´ Through-hole

[0031] 4b´ Through-hole

[0032] 5. Handle

[0033] 6a. Connector

6b. Connector

[0034] 7a. Counterpart Connector

[0035] 7b. Counterpart Connector

[0036] 8. Cavity

[0037] 9. Counterpart snap-fit portion

[0038] 10. Inner surface

[0039] 11. Opening

[0040] 12. Snap-fit portion

[0041] 13a. Upper portion
13b. Lower portion

[0042] 14. Locking hooks

[0043] 15. Locking slots

[0044] 16. Undercut

[0045] 17. Projections

[0046] 18. Guiding channel

[0047] 19. Guiding protrusion

[0048] 20. Seat

[0049] 21. Inner space

[0050] 22. Left-lateral side

[0051] 23. Right-lateral side

[0052] The handle-assembly (1) is suitable for use in a door (2) of a refrigeration appliance (Figs. 1a, 1b, 1c, 1d and Fig. 2).

[0053] The door (2) is suitable for use in a refrigeration appliance, in particular a domestic refrigerator to enable access to an interior of a refrigeration compartment thereof. The door (2) comprises a handle-assembly (1), and a cover plate (3) which has at least one through-hole (4a, 4b, 4a´, 4b´) for mounting a handle (5) of the handle-assembly (1) (Fig. 1).

[0054] The handle-assembly (1) of the present invention comprises a handle (5) which has a connector (6a, 6b) corresponding to the through-hole (4a, 4b, 4a´, 4b´), and a counterpart connector (7a, 7b) for releasable connection with the connector (6a, 6b).

[0055] The counterpart connector (7a, 7b) is separately provided from connector (6a, 6b). The counterpart connector (7a, 7b) includes a cavity (8), and a counterpart snap-fit portion (9) which is provided inside the cavity (8). The counterpart connector (7a, 7b) abuts against an inner surface (10) of the cover plate (3) such that an opening (11) of the cavity (8) coincides with the through-hole (4a, 4b, 4a´, 4b´). The connector (6a,6b) includes a snap-fit portion (12) which protrudes through the through-hole (4a, 4b, 4a´, 4b´) into the cavity (8) of the counterpart connector (7a, 7b). The snap-fit

portion (12) and the counterpart snap-fit portion (9) are releasably engageable (Figs. 1 to 13).

[0056] In an embodiment, the cavity (8) includes an upper portion (13a) and lower portion (13b). The upper portion (13a) horizontally receives the snap-fit portion (12). The counterpart snap-fit portion (9) is formed into the lower portion (13b). In this embodiment, the snap-fit portion (12) and the counterpart snap-fit portion (9) releasably engage with each other when the snap-fit portion (12) is displaced from the upper portion (13a) to the lower portion (13b) by manually moving the handle (5) vertically downwards, and disengage from each other when the snap-fit portion (12) is displaced from the lower portion (13b) to the upper portion (13a) by manually moving the handle (5) vertically upwards (Fig. 1b, Figs. 10 to 13).

[0057] In another embodiment, the counterpart snap-fit portion (9) has two locking hooks (14) which extend vertically upwards. In this embodiment, the snap fit-portion (12) has two locking slots (15) which respectively oppose the locking hooks (14) in a state where the snap-fit portion (12) protrudes into the cavity (8) (Fig. 2). In this embodiment, locking hooks (14) and the locking slots (15) releasably engage with each other when the snap-fit portion (12) is displaced from the upper portion (13a) to the lower portion (13b) by manually moving the handle (5) vertically downwards, and disengage from each other when the snap-fit portion (12) is displaced from the lower portion (13b) to the upper portion (13a) by manually moving the handle (5) vertically upwards (Fig. 2, Figs. 10 to 13).

[0058] In another embodiment, the connector (6a, 6b) has two opposing undercuts (16). In this embodiment, the counterpart connector (7a, 7b) has two opposing projections (17). The undercuts (16) and the projections (17) respectively engage with each other when the snap-fit portion (12) is displaced from the upper portion (13a) to the lower portion (13b) by manually moving the handle (5) vertically downwards, and disengage from each other when the snap-fit portion (12) is displaced from the lower portion (13b) to the upper portion (13) by manually moving the handle (5) vertically upwards (Fig. 2, Figs.10 to 13).

[0059] In another embodiment, the connector (6a, 6b) has a guiding channel (18)

which extends in a vertical direction. In this embodiment, the counterpart connector (7a, 7b) has a guiding protrusion (19) which extends in a vertical direction. The guiding channel (18) and the guiding protrusion (19) slidably engage with each other when the snap-fit portion (12) is displaced from the upper portion (13a) to the lower portion (13b) by manually moving the handle (5) vertically downwards, and disengage from each other when the snap-fit portion (12) is displaced from the lower portion (13b) to the upper portion (13a) by manually moving the handle (5) vertically upwards (Fig. 2, Figs.10 to 13).

[0060] In another embodiment, the counterpart connector (7a, 7b) has a seat (20) which surrounds the opening (11) of the cavity (8). In this embodiment, the seat (20) circumferentially abuts against an inner surface (10) of the cover plate (3) which surrounds the through-hole (4a, 4b, 4a´, 4b´) (Fig. 2, Figs.10 to 13).

[0061] In another embodiment, the handle-assembly (1) has two connectors (6a, 6b) and two counterpart connectors (7a, 7b). In this embodiment, the two connectors (6a, 6b) are formed on opposing ends of the handle (5) in order to cooperate with the two counterpart connectors (7a, 7b) respectively via two corresponding through-holes (4a, 4b, 4a´, 4b´) which are formed into the cover plate (3) (Fig. 1).

[0062] In another embodiment, the handle-assembly (1) is selectively mountable to the door (2) for either left-hand swing or right-hand swing (Fig. 1a).

[0063] In the door (2) of the present invention, the counterpart connector (7a, 7b) is abutted against an inner surface (10) of the cover plate (3) such that an opening (11) of the cavity (8) coincides with the through-hole (4a, 4b, 4a´, 4b´). In addition, foam material has been filled into an inner space (21) of the door (2) such that the counterpart connector (7a, 7b) is immobilized relative to the cover plate (3) by the cured foam material (Fig. 1b).

[0064] In another embodiment, the door (2) comprises a reversible hinge system (not shown) for selectively mounting it to the refrigeration appliance for either left hand swing or right-hand swing.

[0065] In another embodiment, at least one through-hole (4a, 4a´, 4b, 4b´) is formed on each of a left-lateral side (22) and a right-lateral side (23) of the

cover plate (3) for selectively mounting the handle (5) to the door (2) for either left-hand swing or right-hand swing (Fig. 1a).

[0066] In another embodiment, any unused through-hole (4a, 4a´, 4b, 4b´) is closed by a plug (not shown).

[0067] The present invention also provides a refrigeration appliance (not shown) which comprises a main body which includes a refrigeration compartment for receiving articles to be refrigerated, and the door (2) for enabling access to an interior of the refrigeration compartment.

[0068] In another embodiment, the refrigeration appliance comprises a reversible hinge system (not shown) for selectively mounting the door (2) to the main body of the appliance for either left-hand or right-hand swing. In this embodiment, the door (2) has a corresponding reversible hinge system (not shown) for selectively mounting it to the main body of the appliance for either left-hand or right-hand swing.

[0069] The present invention also provides a process of manufacturing the door (2) for use in the refrigeration appliance by using the handle-assembly (1).

[0070] In the manufacturing process, first the door (2) comprising the cover plate (3) which has the through hole (4a, 4a´, 4b, 4b´) for mounting the handle (5) is provided (Fig. 1a). Then, the counterpart connector (7a, 7b) is abutted against an inner surface (10) of the cover plate (3) such that the opening (11) of the cavity (8) faces the through-hole (4a, 4a´, 4b, 4b´) (Fig. 1b). Then, foam material is poured (not shown) into an inner space (21) which is enclosed by the door (2) in order to immobilize the counterpart connector (7a, 7b) relative to the cover plate (3) as the foam material is cured.

[0071] In another embodiment, the manufacturing process comprises a step of mounting the handle (5) by connecting the connector (6a, 6b) with the counterpart connector (7a, 7b) (Fig. 1c).

[0072] By the present invention, a screwless handle-assembly (1) has been provided which reduces the costs for material and labor. Due to the quick and simple installation of the handle (5), the assemblage and transportation of the refrigeration appliance has been facilitated and rendered safer. The handle (5) can be easily mounted by a service person

in accordance with the swinging direction without the burden of time consuming assembly steps involving unscrewing/screwing of bolts.

Claims

1. A handle-assembly (1) for use in a door (2) of a refrigeration appliance, the door (2) comprising a cover plate (3) which has a through-hole (4a, 4b, 4a´, 4b´) for mounting a handle (5), the handle-assembly (1), **characterized in that**
   - a handle (5) which has a connector (6a,6b) corresponding to the through-hole (4a, 4b, 4a´, 4b´),
   - a counterpart connector (7a, 7b) for releasably connecting with the connector (6a, 6b), wherein the counterpart connector (7a, 7b) is separately provided from connector (6a,6b),
   wherein said counterpart connector (7a, 7b) includes a cavity (8) and a counterpart snap-fit portion (9) which is provided inside the cavity (8),
   wherein the counterpart connector (7a, 7b) is configured to abut against an inner surface (10) of the cover plate (3) such that an opening (11) of the cavity (8) coincides with the through-hole (4a, 4b, 4a´, 4b´),
   wherein the connector (6a,6b) includes a snap-fit portion (12) which is configured to protrude through the through-hole (4a, 4b, 4a´, 4b´) into the cavity (8) of the counterpart connector (7a,7b), and
   wherein the snap-fit portion (12) and the counterpart snap-fit portion (9) are releasably engageable.
2. The handle-assembly (1) according to claim 1, **characterized in that**
   - the cavity (8) includes an upper portion (13a) which is configured to horizontally receive the snap-fit portion (12), and a lower portion (13b) into which the counterpart snap-fit portion (9) is formed,
   wherein the snap-fit portion (12) and the counterpart snap-fit portion (9) are configured to releasably engage with each other when the snap-fit portion (12) is displaced from the upper portion (13a) to the lower portion (13b) by manually moving the handle (5) vertically downwards, and to disengage from each other when the snap-fit portion (12) is displaced from the lower portion (13b) to the upper portion (13a) by manually moving the handle (5) vertically upwards.
3. The handle-assembly (1) according to claim 2, **characterized in that**
   - the counterpart snap-fit portion (9) has two locking hooks (14) which are configured to extend vertically upwards and
   - the snap fit-portion (12) has two locking slots (15) which are configured to

respectively oppose the locking hooks (14) in a state where the snap-fit portion (12) protrudes into the cavity (8).

4. The handle-assembly (1) according to claim 2 or 3, **characterized in that**
   - the connector (6a,6b) has two opposing undercuts (16), and
   - the counterpart connector (7a, 7b) has two opposing projections (17),
   wherein the undercuts (16) and the projections (17) are configured to respectively engage with each other when the snap-fit portion (12) is displaced from the upper portion (13a) to the lower portion (13b) by manually moving the handle (5) vertically downwards, and to disengage from each other when the snap-fit portion (12) is displaced from the lower portion (13b) to the upper portion (13) by manually moving the handle (5) vertically upwards.
5. The handle-assembly (1) according to any one of claims 2 to 4, **characterized in that**
   - the connector (6a,6b) has a guiding channel (18) which is configured to extend in a vertical direction, and
   - the counterpart connector (7a,7b) has a guiding protrusion (19) which is configured to extend in a vertical direction,
   wherein the guiding channel (18) and the guiding protrusion (19) are configured to slidably engage with each other when the snap-fit portion (12) is displaced from the upper portion (13a) to the lower portion (13b) by manually moving the handle (5) vertically downwards, and to disengage from each other when the snap-fit portion (12) is displaced from the lower portion (13b) to the upper portion (13a) by manually moving the handle (5) vertically upwards.
6. The handle-assembly (1) according to any one of claims 1 to 5, **characterized in that** the counterpart connector (7a,7b) has a seat (20) which is configured to surround the opening (11) of the cavity (8), and to circumferentially abut against an inner surface (10) of the cover plate (3) which surrounds the through-hole (4a, 4b, 4a´, 4b´).
7. The handle-assembly (1) according to any one of claims 1 to 6, **characterized in that** two connectors (6a, 6b) and two counterpart connectors (7a, 7b), wherein the two connectors (6a, 6b) are formed on opposing ends of the handle (5) so as to cooperate with the two counterpart connectors (7a, 7b) respectively via two corresponding through-holes (4a, 4b, 4a´, 4b´) which are

formed into the cover plate (3).

8. The handle-assembly (1) according to any one of claims 1 to 7, **characterized in that** the handle-assembly (1) is configured to be selectively mountable to the door (2) for either left-hand swing or right-hand swing.
9. A door (2) for use in a refrigeration appliance to enable access to an interior of a refrigeration compartment, the door (2) comprising
a cover plate (3) which has a through-hole (4a, 4b, 4a´, 4b´) for mounting a handle (5),
characterized in that
- a handle-assembly (1) as defined in any one of claims 1 to 8, wherein
- the counterpart connector (7a,7b) is abutted against an inner surface (10) of the cover plate (3) such that an opening (11) of the cavity (8) coincides with the through-hole (4a, 4b, 4a´, 4b´) and
- foam material which has been filled into an inner space (21) of the door (2), wherein the counterpart connector (7a,7b) is immobilized relative to the cover plate (3) by the foam material.
10. The door (2) according to claim 9, **characterized in that** a reversible hinge system for selectively mounting the door (2) to the refrigeration appliance for either left hand swing or right-hand swing.
11. The door (2) according to claim 10, **characterized in that** at least one through-hole (4a, 4a´, 4b, 4b´) is formed on each of a left-lateral side (22) and a right-lateral side (22´) of the cover plate (3) for selectively mounting the handle (5) to the door (2) for either left hand swing or right-hand swing.
12. The door (2) according to claim 11, **characterized in that** an unused through-holes (4a, 4a´, 4b, 4b´) is closed by a plug.
13. A refrigeration appliance **characterized in that** the door (2) as defined in any one of claims 9 to 12.
14. A process of manufacturing a door (2) for use in a refrigeration appliance by using the handle-assembly (1) as defined in any one of claims 1 to 8, the method comprising the steps of:
- providing a door (2) comprising a cover plate (3) which has a through hole (4a, 4a´, 4b, 4b´) for mounting a handle (5),
- a step of abutting the counterpart connector (7a,7b) against an inner surface

(10) of the cover plate (3) such that the opening (11) of the cavity (8) faces the through-hole (4a, 4a´, 4b, 4b´) and

- pouring foam material into an inner space (21) which is enclosed by the door (2) in order to immobilize the counterpart connector (7a,7b) relative to the cover plate (3) as the foam material is cured.

15. The manufacturing process according to claim 14, **characterized by** further comprising a step of mounting the handle (5) by connecting the connector (6a, 6b) with the counterpart connector (7a, 7b).

Fig. 1a

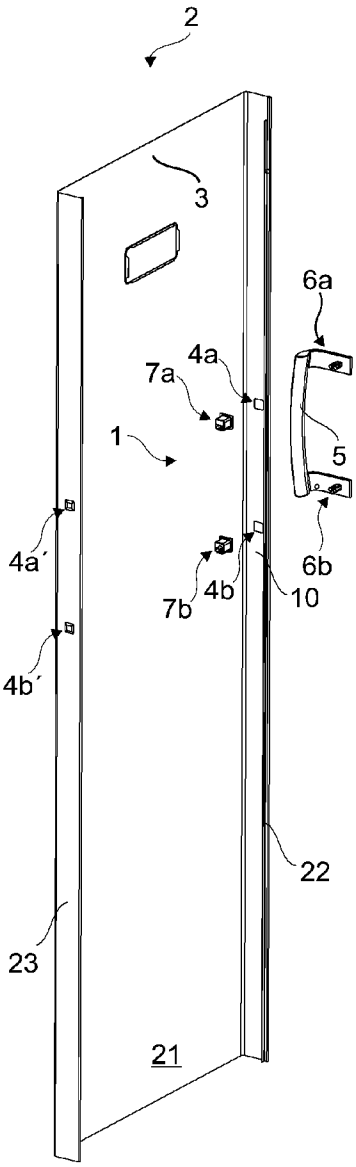


Fig. 1b

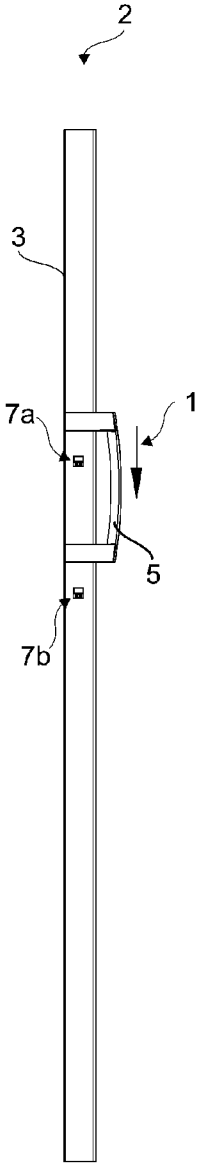


Fig. 1c

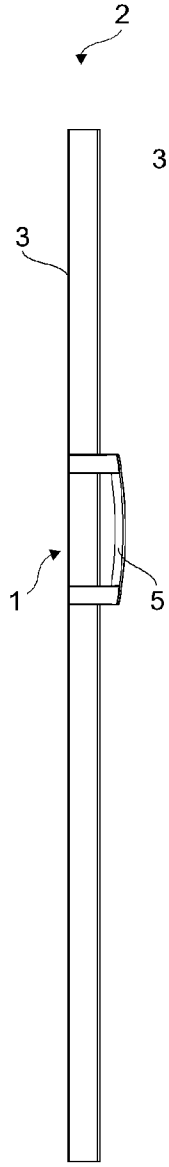


Fig. 1d

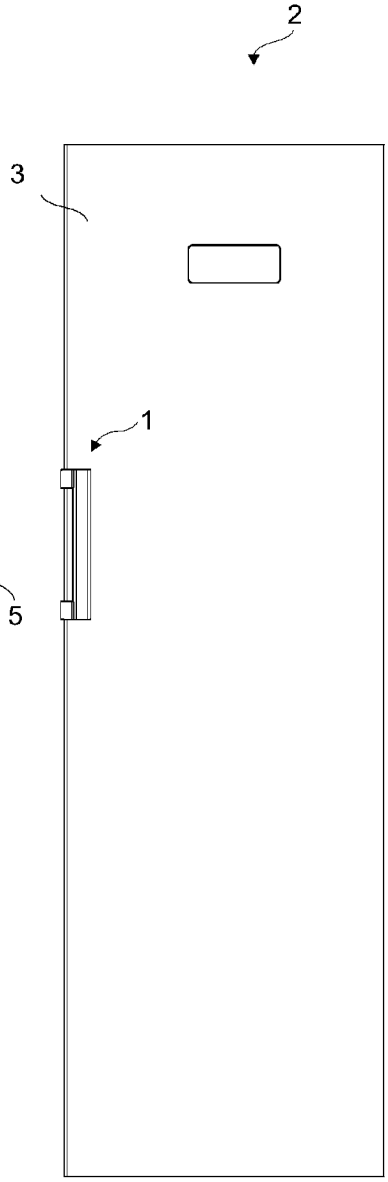


Fig. 2

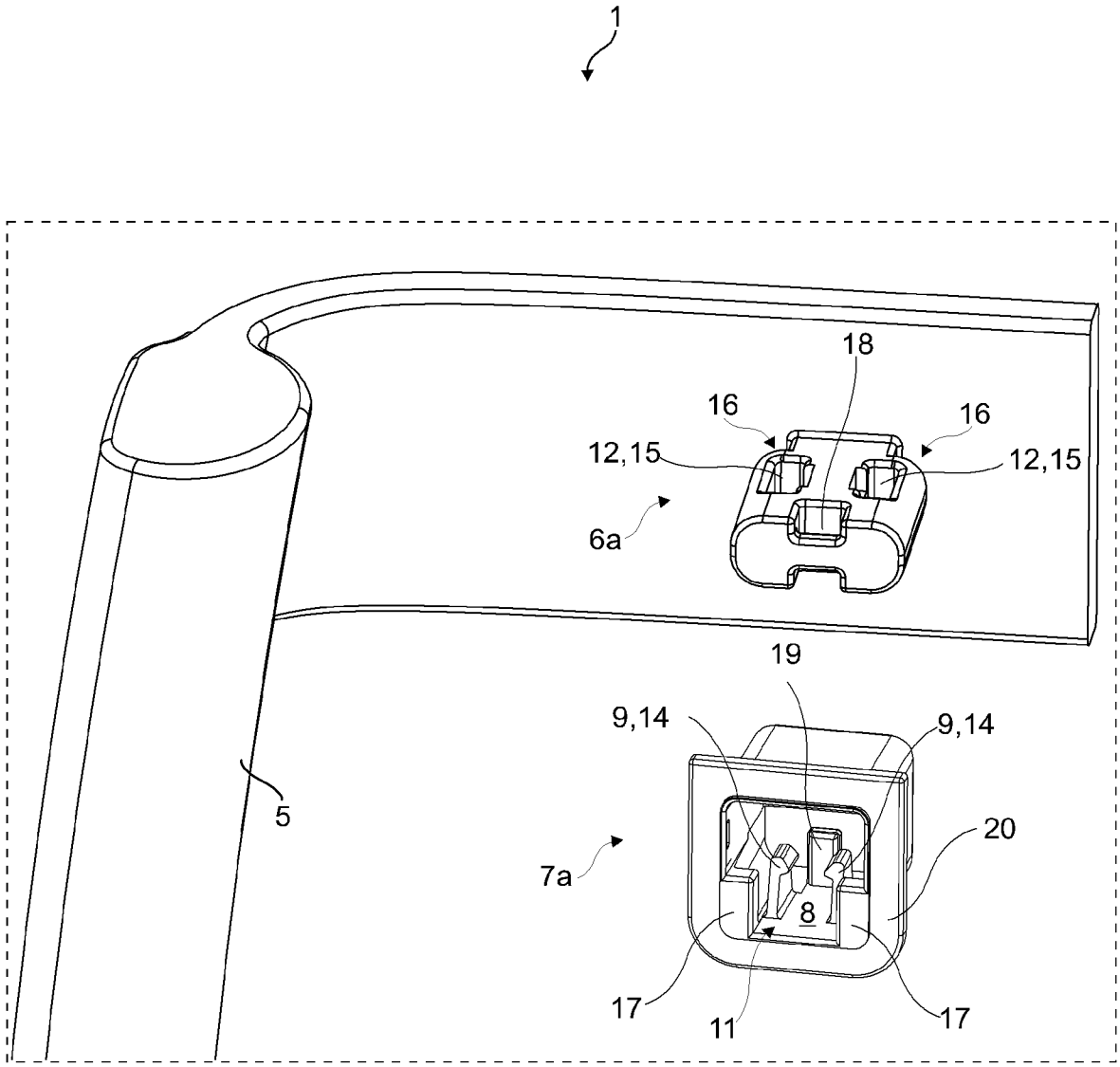


Fig. 3

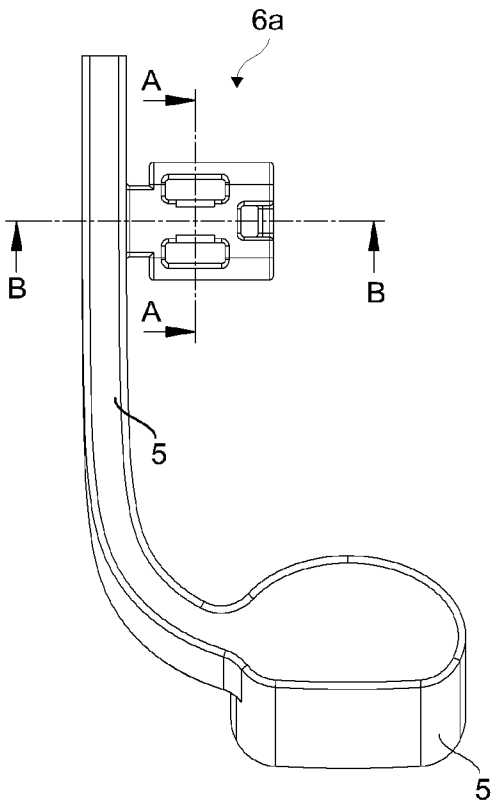


Fig. 3

Fig. 4

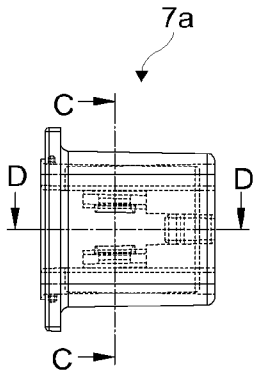
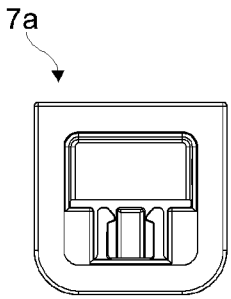


Fig. 5



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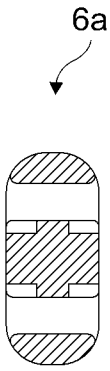
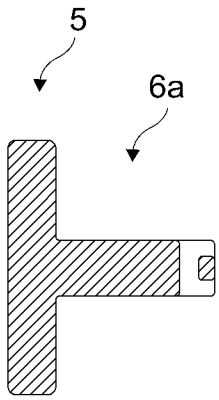


Fig. 7



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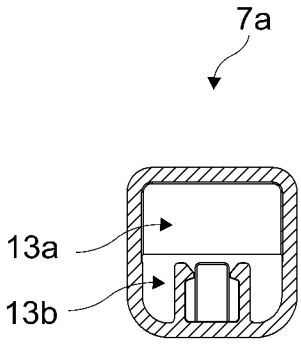


Fig. 9

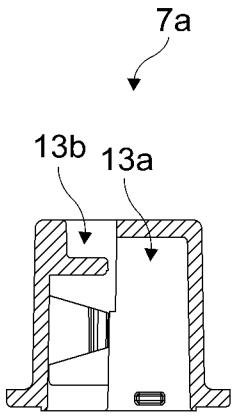


Fig. 10

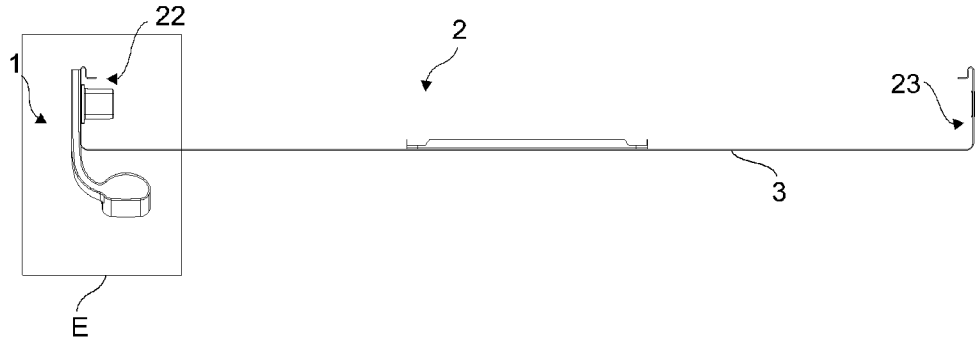


Fig. 11

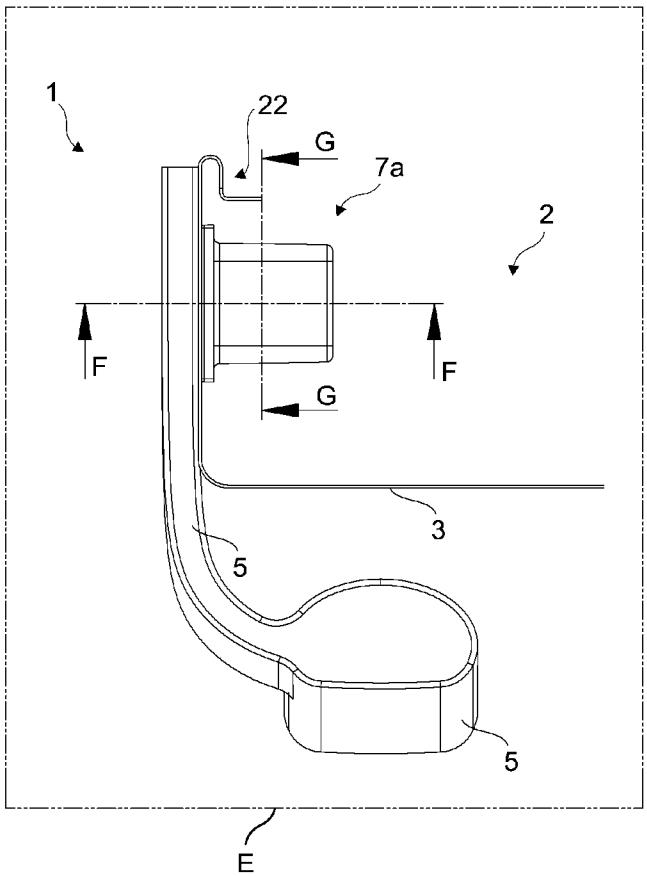


Fig. 12

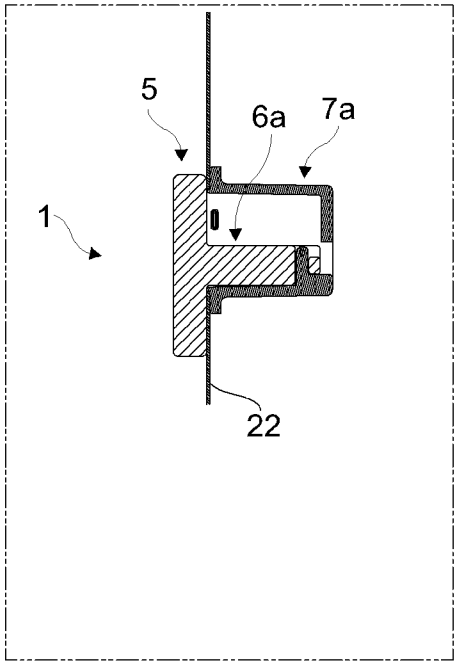
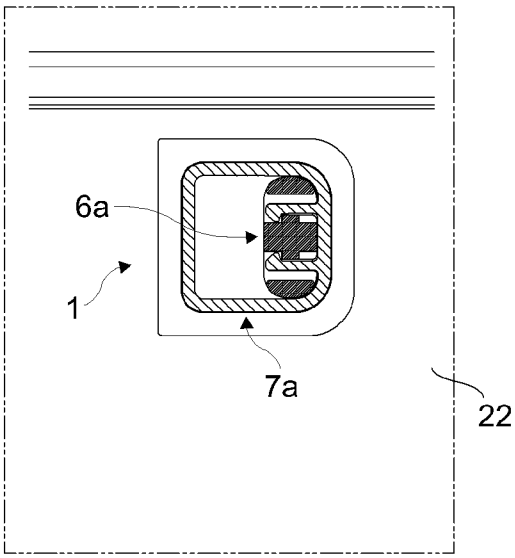


Fig. 13



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/056346

A. CLASSIFICATION OF SUBJECT MATTER
INV. F25D23/02 E05B1/00 F16B21/07
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F25D E05B F16B F25B A47B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

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Y	paragraph [0028] - paragraph [0040] claim 1 figures 2-7	8-15

Y	WO 2013/000977 A2 (ARCELIK AS [TR]; VARDAR OSMAN [TR]; KONAK BIROL [TR]; SEN FETHI [TR]) 3 January 2013 (2013-01-03) paragraph [0025] - paragraph [0032] figures 6-10	8-15

A	WO 2010/150855 A1 (NIFCO INC [JP]; SHIOMOTO TADAHIDE [JP]) 29 December 2010 (2010-12-29) abstract figures 4-7,12-15	1-7

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
21 January 2015	02/02/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Correia dos Reis, I

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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