

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.05.2023 Bulletin 2023/20

(51) International Patent Classification (IPC):
F24C 15/02 ^(2006.01) **E05B 1/00** ^(2006.01)

(21) Application number: **21208225.9**

(52) Cooperative Patent Classification (CPC):
F24C 15/024; E05B 1/0015

(22) Date of filing: **15.11.2021**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
 GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
 PL PT RO RS SE SI SK SM TR**
 Designated Extension States:
BA ME
 Designated Validation States:
KH MA MD TN

(72) Inventors:

- **IVANOVIC, Branko**
91541 Rothenburg ob der Tauber (DE)
- **BREUER, Tim**
91541 Rothenburg ob der Tauber (DE)

(74) Representative: **Electrolux Group Patents
AB Electrolux
Group Patents
S:t Göransgatan 143
105 45 Stockholm (SE)**

(71) Applicant: **Electrolux Appliances Aktiebolag**
105 45 Stockholm (SE)

(54) **HOUSEHOLD APPLIANCE DOOR**

(57) Household appliance door (40) comprising:

- at least one door front panel (12);
- at least one handle bar (46);
- at least one, in particular two or more, distance element(s) (22a,b,26a,36a), wherein at least one, in particular two or more of the distance element(s) (22a,b,26a36a) is/are configured to keep the handle bar (46) in a defined distance to the door front panel (12);
- at least one, in particular two or more, cover element(s) (24a, b) comprising a hollow profile is/are configured to partially or to fully cover the distance element(s) (22a,b,26a36a) in a state of the handle bar (46) being fully mounted to the door front panel (12); and

wherein the at least one, in particular two or more, distance element(s) (22a,b,26a36a) is/are configured to pre-fix itself and the cover element(s) (24a, b) to the handle bar (46), wherein the distance element(s) (22a,b,26a36a) is/are insertable or inserted into the at least one, in particular two or more, cover element(s) (24a, b), and wherein the distance element(s) (22a,b,26a,36a) is/are pre-fixable or pre-fixed by at least one pre-fixing element that is provided on the distance element(s) (22a,b,26a,36a) and that is configured to fixingly cooperate with another pre-fixing element provided on the handle bar (46).

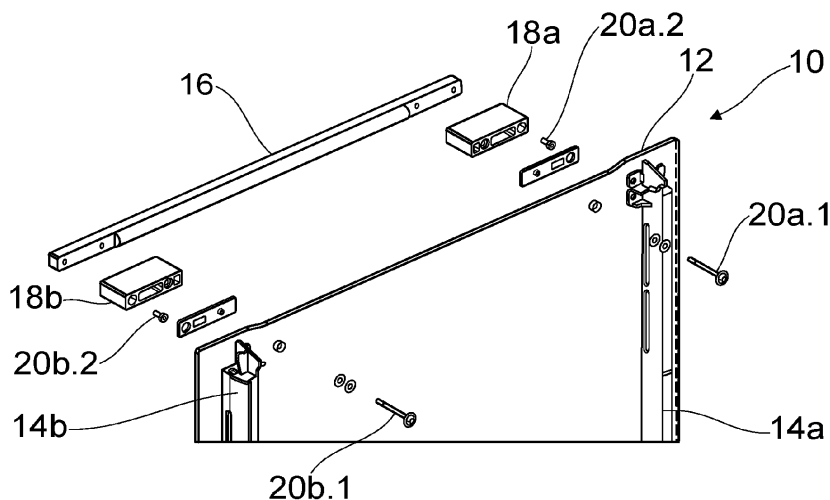


FIG. 1

Description

[0001] The present invention relates to a household appliance door and to a household appliance comprising such a door.

[0002] Door handles on doors of household appliances, in general, are parts which a user grips and pulls or pushes to open and close a door.

[0003] EP 1 898 157 B1 discloses a handle for a domestic appliance having a handle part embodied as an elongated rod and with two separate fastening part for fastening the handle part to an element of the domestic appliance at a distance. The two fastening parts have a unified surface structure formed from the same material.

[0004] DE 10 2016 206 352 A1 discloses a handle for a domestic appliance door with a handle element and handle holders arranged between the door and the handle.

[0005] DE 10 2005 042 808 A1 discloses a handle for with a fastening element for a handle rod, wherein a sleeve is arranged around the fastening element in order to improve the visual appearance of the handle.

[0006] The object of the present invention is to provide an advantageous household appliance door and an advantageous household appliance having such a door.

[0007] This object is solved by a household appliance door comprising:

- at least one door front panel;
- at least one handle bar;
- at least one, in particular two or more, distance element(s), wherein at least one, in particular two or more of the distance element(s) is/are configured to keep the handle bar in a defined distance to the door front panel;
- at least one, in particular two or more, cover element(s) comprising a hollow profile is/are configured to partially or to fully cover the distance element(s) in a state of the handle bar being fully mounted to the door front panel; and wherein the at least one, in particular two or more, distance element(s) is/are configured to pre-fix itself and the cover element(s) to the handle bar, wherein the distance element(s) is/are insertable or inserted into the at least one, in particular two or more, cover element(s), and wherein the distance element(s) is/are pre-fixable or pre-fixed by at least one pre-fixing element that is provided on the distance element(s) and that is configured to fixingly cooperate with another pre-fixing element provided on the handle bar.

[0008] Thus, a handle bar is created which can be mounted to the door front panel in a convenient way, because the distance and cover elements can be pre-fixed before the handle bar, distance and cover elements are finally attached to the door front panel.

[0009] According to an advantageous embodiment the distance element(s) comprise(s) at least one attachment

element for fixedly attaching the cover element(s) to the distance element(s) when the distance element(s) pre-fixes itself and the cover element(s) to the handle bar, in particular wherein the attachment element of the distance element(s) is a flange being dimensioned in such way in comparison to the dimensions of the hollow profile of the cover element(s) so that the cover element(s) is/are fixedly arranged between the handle bar and the flange in a pre-fixed state of the distance element(s) and the cover element(s) to the handle bar.

[0010] Further, the cover element is advantageously prefixed with the distance element on the handle bar.

[0011] In an advantageous embodiment, the distance element(s) comprise(s) at least one attachment element that is arranged between the cover element and the door front panel in a fully mounted state of the household appliance door and thereby prevents direct contact between cover element and the door front panel.

[0012] In such way, it is possible to prevent direct contact between cover element and door front panel which is particularly advantageous in cases of door front glass panels, that are protected from scratches or the like.

[0013] According to a further advantageous embodiment, at least one distance element comprises at least two pre-fixing elements arranged at a distance to each other, each of which being configured to fixingly cooperate with another of two pre-fixing elements provided on the handle bar at a distance to each other.

[0014] Two pairs of pre-fixing elements allow fixing of the distance element relative to the handle bar enable to prevent relative movement between the distance element and the handle bar when the handle bar is finally attached or screwed to the door front panel.

[0015] Further advantageously, at least one, in particular both, pre-fixing elements is/are pins, integrally formed to the at least one distance element and wherein at least one, in particular both, pre-fixing element provided on the handle bar is/are first and/or second holes and wherein the pin(s) is/are pressable or pressed into the first and/or second holes to connect the handle bar with the distance element, such that movement of the distance element relative to the handle bar is substantially prevented.

[0016] Thus, by means of a distance element having pins fitting in holes of the handle bar precise positioning and alignment of the distance element relative to the handle bar is ensured. Furthermore, the distance element is advantageously prevented from twisting relative to the handle bar during the mounting process.

[0017] According to a further advantageous embodiment, the at least one, in particular two or more, distance element(s) comprise(s) a tubular element configured to accommodate a fixation element, in particular a fixation screw, and that extends from a side of the distance element(s) configured to face or facing the door front panel to a side of the distance element(s) configured to face or facing the handle bar, in particular wherein the tubular element forms at least one prefixing element of the dis-

tance element(s) on the side of the distance element(s) configured to face or facing the handle bar and/or wherein the tubular element forms at least one position securing element of the distance element(s) on the side of the distance element(s) configured to face or facing the door front panel and being configured to cooperate with a corresponding position securing element provided by the door front panel.

[0018] Such an integrated tubular element may advantageously prevent contact between a door front panel, specifically if made of glass, and a fixation screw extending within the tubular element. Further, if the tubular element itself forms one or more position securing elements, insertion of the fixation screw is advantageously simplified by the precise positioning of the distance element relative to the handle bar and/or the door front panel.

[0019] Furthermore advantageously, the distance element(s) comprise a cable guiding opening, in particular a cable guiding tunnel, for guiding one or more cables through the distance element(s), in particular wherein the distance element(s), preferably the cable guiding tunnel, is formed in such way that one or more cables that is/are guided through the distance element(s) is/are guided from a side of the distance element(s) configured to face or facing the door front panel to a side of the distance element(s) configured to face or facing the handle bar.

[0020] Thus, a handle bar assembly is created that simplifies assembling and a guiding of wiring or cable(s) into handle bar. The distance element having a cable guiding opening or tunnel that passes through to the handle bar simplifies cable connection e.g. of a camera module or a light bar placed within the handle bar. Preassembly of the handle bar, distance elements, cover elements and cable is simplified and accelerated. The handle can be connected quicker and simpler with electrical components.

[0021] It is additionally advantageous, if the handle bar comprises an at least partially hollow cavity, the cover element(s) covering the distance element(s) comprise(s) a recess in a lateral wall thereof and the distance element(s) comprise(s) a cable guiding outlet, wherein the at least partially hollow cavity, the recess in the lateral wall of the cover element and the cable guiding outlet form a passage that is configured to guide or that guides the one or more cables towards cable connections arranged within the cavity of the handle bar.

[0022] In this way, the one or more cables can be guided from the door to the electrical elements placed within the door handle in an advantageous way.

[0023] According to an advantageous embodiment, the distance element(s) comprises at least one position securing element on the side of the distance element(s) configured to face or facing the door front panel, wherein the position securing element is configured to cooperate with a corresponding position securing element provided by the door front panel.

[0024] Thus, a precise positioning of handle bar, in par-

ticular pre-assembled with the distance and cover elements, onto the front door panel is provided,

[0025] Furthermore, it is advantageous that the position securing element provided by the door front panel is a recess, in particular wherein in a state of the handle bar being fully mounted to the door front panel, the position securing element provided by the distance element(s) and being formed as first form element protrudes into the recess in order to at least partially delimit movability of the distance element(s) relative to the door front panel.

[0026] A distance element is provided with two integrated functions, namely to provide precise positioning of the pre-assembled handle bar with cover elements, distance elements and cables, if any, and to prevent contact between the door front panel, specifically if made of glass, and the fixation screw extending through the tubular element. For this purpose, the first form element of the distance element may be formed as a rim formed by an appendix or an extension of the tubular element fitting within the recess and separating the fixation screw extending within the tubular element from the glass panel in which the recess is provided.

[0027] It may be further advantageous, if the household appliance door further comprises at least one, or two or more, door column(s), wherein the at least one door column comprises an opening configured to receive a screw passing through, wherein a screw fixing the handle bar to the door front panel extends through said opening, the recess and the tubular element and engages a thread provided in the hole forming the pre-fixing element provided on the handle bar.

[0028] Thus, such way the handle bar is connected to a structurally firm component of the household appliance door.

[0029] According to a further advantageous embodiment of the invention, the door front panel is made of glass, and/or

in that the handle bar and all cover elements of the household appliance door are made of aluminium and that the distance element(s) is/are made of a plastic material.

[0030] Thus, a handle is created with an outer appearance of a full aluminium surface is provided, wherein the distance element made of plastic material allows reduction of the necessary amount of aluminium.

[0031] Further, a household appliance is advantageous if comprising a household appliance door according to the invention. Specifically advantageous is a domestic oven comprising a household appliance door according to the invention.

[0032] The invention will be explained in further detail with reference to the accompanying drawings, in which:

Fig. 1 is a perspective exploded view of a household appliance door according to the prior art;

Fig. 2 is a perspective exploded view of a household

appliance door according to the invention comprising a distance element according to a first exemplary embodiment;

Fig. 3 is a perspective exploded view of a household appliance door according to the invention comprising a distance element according to a second exemplary embodiment;

Fig. 4 is a perspective exploded view of a household appliance door according to the invention comprising a distance element according to a third exemplary embodiment; and

Fig. 5 is a detailed perspective exploded view of a handle bar and a distance element according to the third exemplary embodiment of the invention.

[0033] Fig. 1 illustrates a household appliance door 10 according to the prior art. The door 10 comprises door columns 14a, 14b and a door front panel 12. A handle bar 16 is connected to the door front panel 12 by a screwing connection, wherein bar holders 18a, 18b are arranged between door handle 16 and door front panel 12. The door handle 16 is screwed the door front panel 12 by fixation elements such as screws 20a.1, 20b.1 extending through a hole in the door front panel 12 and through one bar holder 18a, 18b to the door front panel 12.

[0034] In the following, it shall be appreciated that the distance elements 22a, 22b, 26a, 36a according to the first, second and third embodiments can be used in each of the household appliance doors shown in Figs. 2, 3 and 4. In other words, the distance elements 22a, 22b, 26a, 36a can be interchangeably used in each of the household appliance doors shown in Figs. 2, 3 and 4.

[0035] Fig. 2 illustrates a household appliance door 10 according to the invention comprising a distance element 24a according to a first exemplary embodiment. Instead of bar holders 18a, 18b, distance elements 22a, 22b are arranged between handle bar 46 and door front panel 12 to keep the handle bar 46 at a distance to the door front panel 12.

[0036] The distance element 22a is covered by a cover element 24a, 24b, that has a hollow rectangular profile in which the distance element 22a can be inserted. After full assembly of the handle assembly and the door front panel 12, the distance elements 22a, 22b are substantially fully covered by the cover element 24a, 24b and form a uniform surface with the handle bar 46, e.g. in a case of the cover elements 24a, 24b and the handle bar 46 being made of the same material or having a surface being made of the same material, such as aluminium.

[0037] The following features are disclosed as features being common to all distance elements 22a, 22b, 26a, 36a of the different embodiments.

[0038] The distance elements 22a, 22b, 26a, 36a comprise a tubular element 50 forming a first form element 32 and a third form element 52 and a longitudinal pin

element comprising a pin as a second form element 34, wherein the longitudinal pin element extends parallel to the tubular element 50.

[0039] Tubular element 50 and longitudinal pin element are interconnected by a flange 48. Tubular element 50 and longitudinal pin element can be fittingly inserted into the hollow cover element 24a, 24b, wherein the flange 48 contacts the cover element 24. The third form element 52 may be pressed into a first hole 42 in the handle bar 46 and the second form element 34 may be pressed into a second hole 44, thus, firmly attaching the distance element 26 to the handle bar 46, wherein the cover element 24 is firmly attached between the handle bar 46 and the flange 48.

[0040] Similarly, the first form element 32 may be inserted into the recess 30, thus, positioning the handle bar 46 and the distance elements 22a, 22b, 26a, 36a precisely relative to the front door cover 12.

[0041] Fig. 3 illustrates the distance element 26a in a second exemplary embodiment. The flange 48 comprises an opening through which a cable 28 may be guided from the door front panel 12 to the handle bar 46. The handle bar 46 may have electrical and/or electronic elements which may be connected to cables 28.

[0042] Fig. 4 and 5 illustrate the distance element 36a in an third exemplary embodiment. The distance element 36 comprises a tubular cable guiding tunnel 38 formed by an enclosure in which the cables 28 are guided from the door front panel 12 directly towards an hollow cavity provided by the handle bar 46.

[0043] It should be noted that in the alternative embodiments of Fig. 3 to 5, the cover element 24a remains the same and in particular may have a contour that partially encompasses the handle bar 46. Also with respect to both exemplary embodiments, it shall be further appreciated that the form elements 34 and 52 have corresponding counter parts on the handle bar 46, even if not shown. Specifically, the handle bar 46 may comprise a first hole 42 and a second hole in which the form elements 34, 52 may be pressed to firmly attach the distance element 36a to the handle bar 46.

List of reference numerals

[0044]

10, 40	Household appliance door
12	door front panel
14a,b	door columns
16, 46	handle bar
18a,b	bar holder
20a.1, 20b.1	first screw
20b.1, 20b.2	second screw
22a,b	distance element
24a,b	cover element
26a, 36a	distance element
28	cable
30	recess

32	first form element
34	second form element
38	cable guiding tunnel
42	first hole
44	second hole
48	flange
50	tubular element
52	third form element

Claims

1. Household appliance door (40) comprising:

- at least one door front panel (12);
- at least one handle bar (46);
- at least one, in particular two or more, distance element(s) (22a,b,26a,36a), wherein at least one, in particular two or more of the distance element(s) (22a,b,26a,36a) is/are configured to keep the handle bar (46) in a defined distance to the door front panel (12);
- at least one, in particular two or more, cover element(s) (24a, b) comprising a hollow profile is/are configured to partially or to fully cover the distance element(s) (22a,b,26a,36a) in a state of the handle bar (46) being fully mounted to the door front panel (12); and

wherein the at least one, in particular two or more, distance element(s) (22a,b,26a,36a) is/are configured to pre-fix itself and the cover element(s) (24a, b) to the handle bar (46), wherein the distance element(s) (22a,b,26a,36a) is/are insertable or inserted into the at least one, in particular two or more, cover element(s) (24a, b), and wherein the distance element(s) (22a,b,26a,36a) is/are pre-fixable or pre-fixed by at least one pre-fixing element that is provided on the distance element(s) (22a,b,26a,36a) and that is configured to fixingly cooperate with another pre-fixing element provided on the handle bar (46).

2. Household appliance door (40) according to claim 1, **characterized in that** the distance element(s) (22a,b,26a,36a) comprise(s) at least one attachment element for fixedly attaching the cover element(s) (24a, b) to the distance element(s) (22a,b,26a,36a) when the distance element(s) (22a,b,26a,36a) pre-fixes itself and the cover element(s) (24a, b) to the handle bar (46), in particular wherein the attachment element of the distance element(s) (22a,b,26a,36a) is a flange (48) being dimensioned in such way in comparison to the dimensions of the hollow profile of the cover element(s) (24a, b) so that the cover element(s) (24a, b) is/are fixedly arranged between the handle bar (46) and the flange (48) in a pre-fixed state of the distance element(s) (22a,b,26a, 36a) and

the cover element(s) (24a, b) to the handle bar (46).

3. Household appliance door (40) according to any of the preceding claims, **characterized in that** the distance element(s) (22a,b,26a,36a) comprise(s) at least one attachment element that is arranged between the cover element (24a, b) and the door front panel (12) in a fully mounted state of the household appliance door (40) and thereby prevents direct contact between cover element (24a, b) and the door front panel (12) .

4. Household appliance door (40) according to any of the preceding claims, **characterized in that** at least one distance element (22a,b,26a,36a) comprises at least two pre-fixing elements arranged at a distance to each other, each of which being configured to fixingly cooperate with another of two pre-fixing elements provided on the handle bar (46) at a distance to each other.

5. Household appliance door (40) according to claim 4, **characterized in that** at least one, in particular both, pre-fixing elements is/are pins, integrally formed to the at least one distance element (22a,b, 26a,36a) and wherein at least one, in particular both, pre-fixing element provided on the handle bar (46) is/are first and/or second holes (42, 44) and wherein the pin(s) is/are pressable or pressed into the first and/or second holes (42, 44) to connect the handle bar (46) with the distance element (22a,b,26a,36a), such that movement of the distance element (22a, b,26a,36a) relative to the handle bar (46) is substantially prevented.

6. Household appliance door (40) according to any of the preceding claims, **characterized in that** the at least one, in particular two or more, distance element(s) (22a,b,26a,36a) comprise(s) a tubular element (50) configured to accommodate a fixation element, in particular a fixation screw (20a.1, 20b.1), and that extends from a side of the distance element(s) (22a,b,26a,36a) configured to face or facing the door front panel (12) to a side of the distance element(s) (22a,b,26a,36a) configured to face or facing the handle bar (46), in particular wherein the tubular element (50) forms at least one prefixing element of the distance element(s) (22a,b,26a,36a) on the side of the distance element(s) (22a,b,26a, 36a) configured to face or facing the handle bar (46) and/or wherein the tubular element (50) forms at least one position securing element of the distance element(s) (22a,b,26a,36a) on the side of the distance element(s) (22a,b,26a,36a) configured to face or facing the door front panel (12) and being configured to cooperate with a corresponding position securing element provided by the door front panel (12).

7. Household appliance door (40) according to any of the preceding claims, **characterized in that** the distance element(s) (22a,b,26a,36a) comprise(s) a cable guiding opening, in particular a cable guiding tunnel (38), for guiding one or more cables through the distance element(s) (22a,b,26a,36a), in particular wherein the distance element(s) (22a,b,26a,36a), preferably the cable guiding tunnel (38), is formed in such way that one or more cables that is/are guided through the distance element(s) (22a,b,26a,36a) is/are guided from a side of the distance element(s) (22a,b,26a,36a) configured to face or facing the door front panel (12) to a side of the distance element(s) (22a,b,26a,36a) configured to face or facing the handle bar (46).
8. Household appliance door (40) according to claim 7, **characterized in that** the handle bar (46) comprises an at least partially hollow cavity and the cover element(s) (24a,b) covering the distance element (s) (22a,b,26a,36a) comprise(s) a recess in a lateral wall thereof and the distance element (s) (22a,b,26a,36a) comprise(s) a cable guiding outlet, wherein the at least partially hollow cavity, the recess in the lateral wall of the cover element and the cable guiding outlet form a passage that is configured to guide or that guides the one or more cables towards cable connections arranged within the cavity of the handle bar (46).
9. Household appliance door (40) according to any of the preceding claims, **characterized in that** the distance element(s) (22a,b,26a,36a) comprises at least one position securing element on the side of the distance element(s) (22a,b,26a,36a) configured to face or facing the door front panel (12), wherein the position securing element is configured to cooperate with a corresponding position securing element provided by the door front panel (12).
10. Household appliance door (40) according to claim 9, characterized that the position securing element provided by the door front panel (12) is a recess (30), in particular wherein in a state of the handle bar (46) being fully mounted to the door front panel (12), the position securing element provided by the distance element(s) (22a,b,26a,36a) and being formed as first form element (32) protrudes into the recess (30) in order to at least partially delimit movability of the distance element(s) (22a,b,26a,36a) relative to the door front panel (12).
11. Household appliance door (40) according to claim 10, further comprising at least one, or two or more, door column(s) (14a,b), wherein the at least one door column comprises an opening configured to receive screw passing through, wherein a fixation element, in particular a screw (20a.1, 20b.1), fixing the handle bar (46) to the door front panel (12) extends through said opening, the recess (30) and the tubular element (50) and engages a thread provided in the hole (42) forming the pre-fixing element provided on the handle bar (46).
12. Household appliance door (40) according to any of the preceding claims, **characterized in that** the door front panel (12) is made of glass, and/or **in that** the handle bar (46) and all cover elements (24a,b) of the household appliance door (40) are made of aluminium and that the distance element(s) (22a,b,26a,36a) is/are made of a plastic material.
13. Household appliance, in particular domestic oven, comprising a household appliance door (40), in particular a domestic oven door, according to any one of the preceding claims.

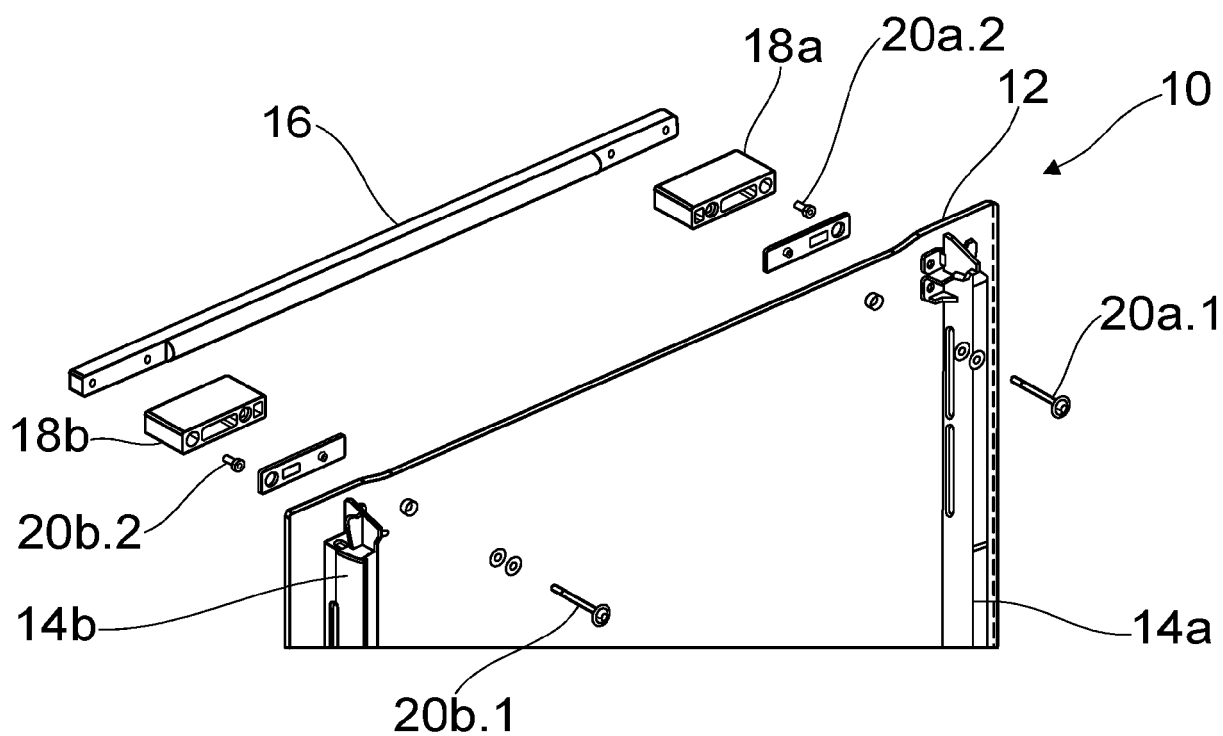


FIG. 1

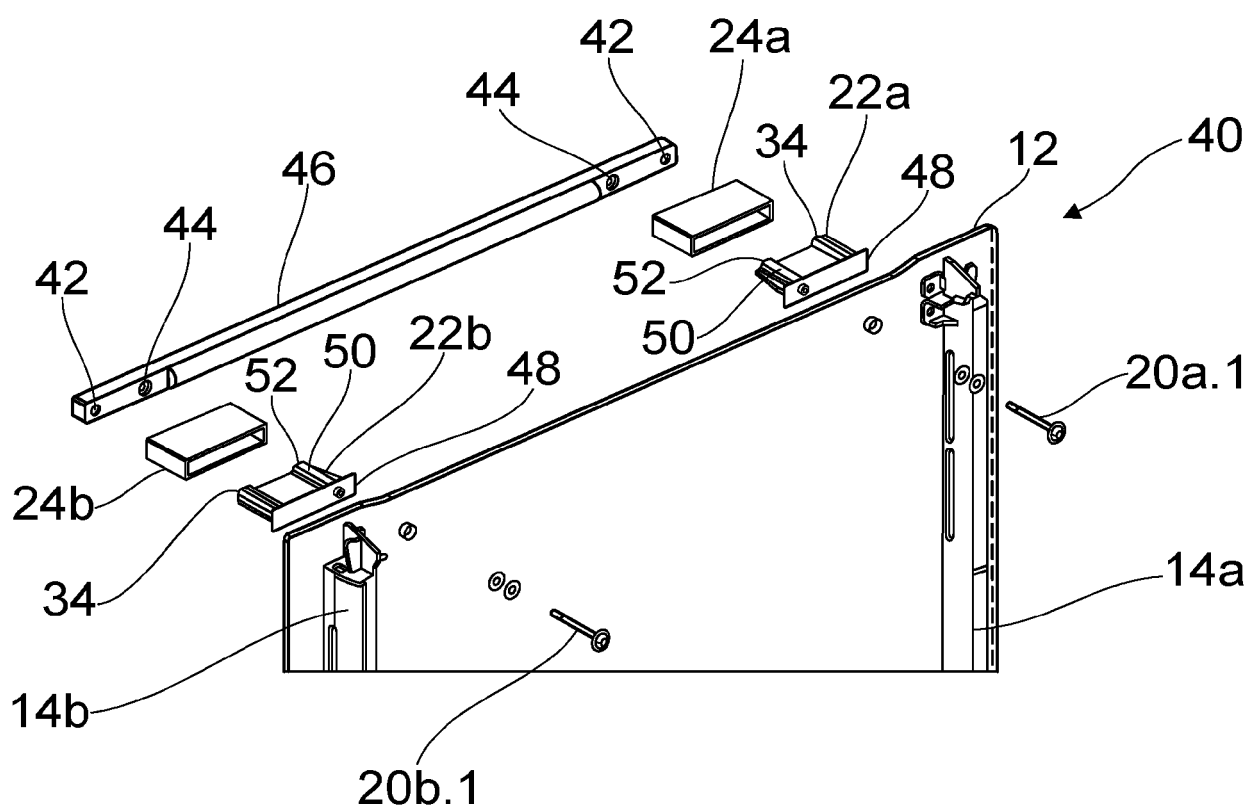


FIG. 2

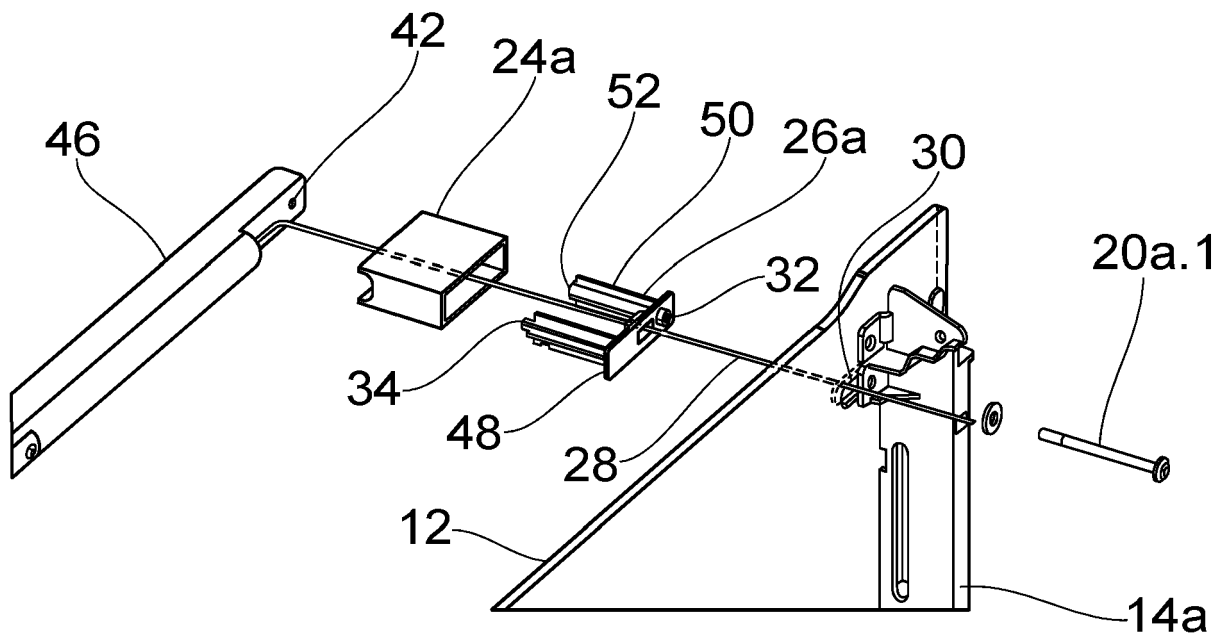


FIG.3

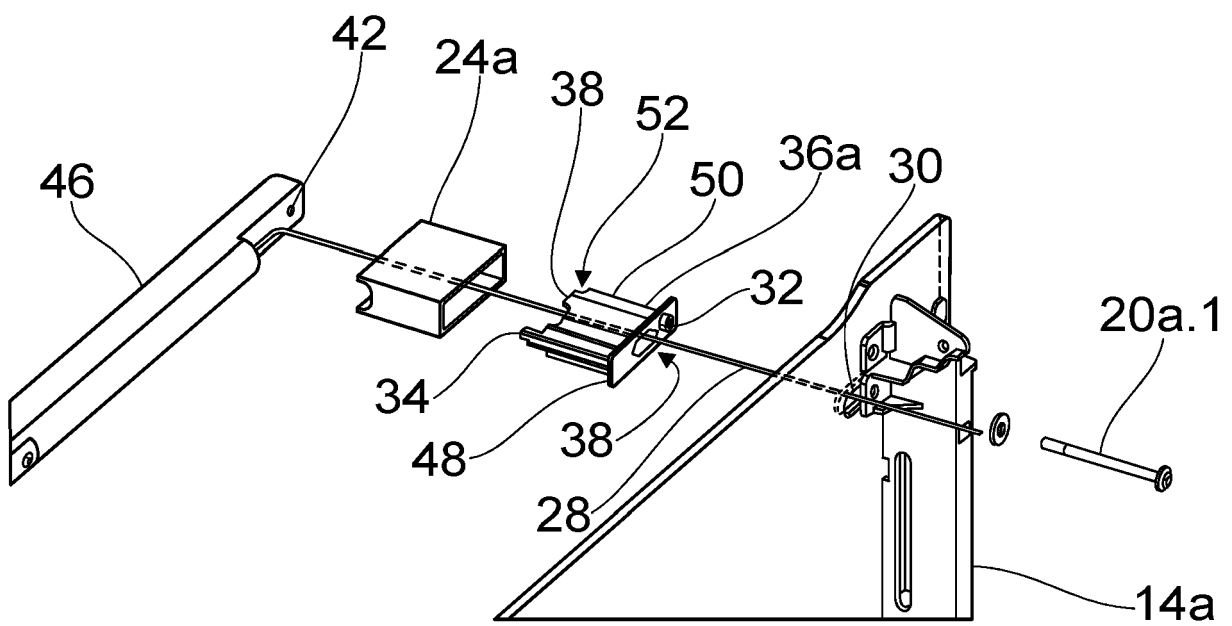


FIG.4

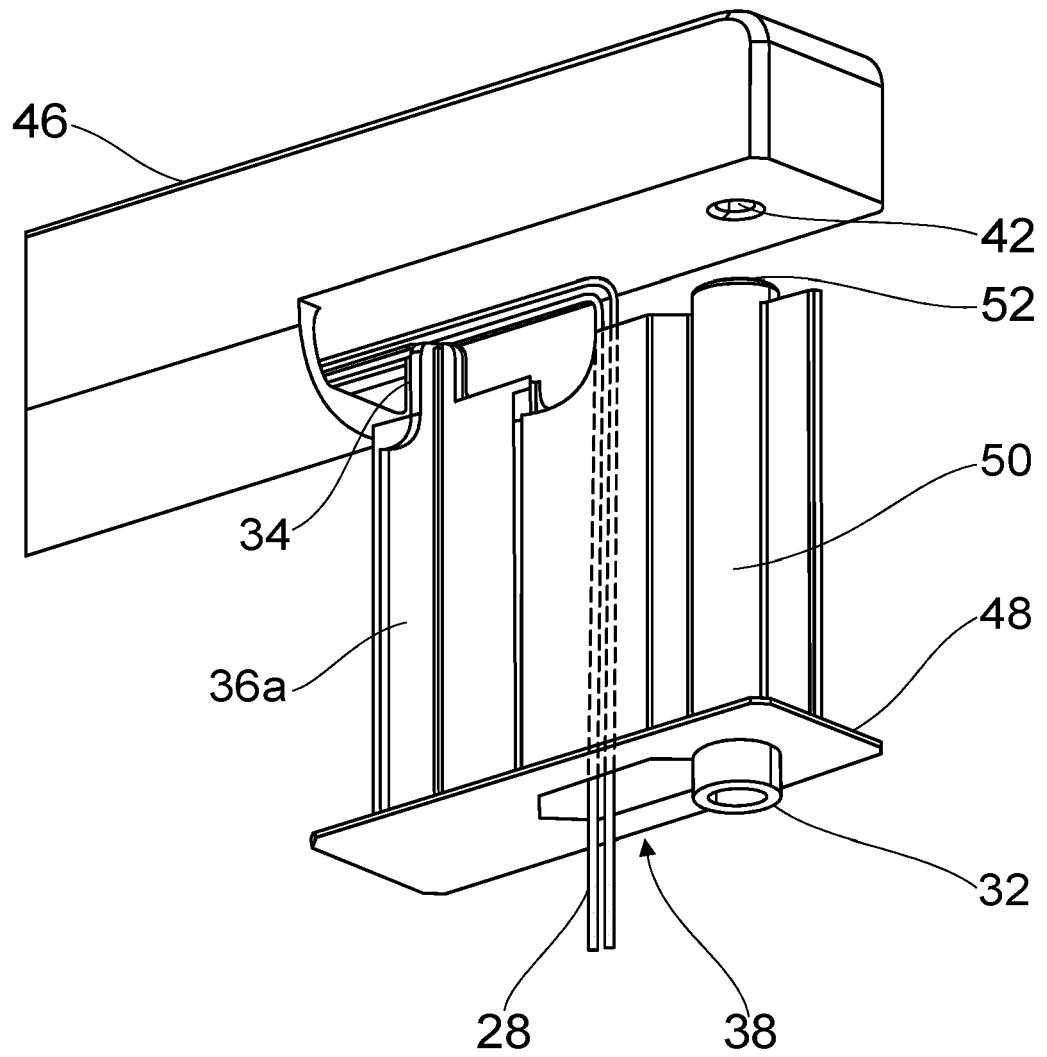


FIG.5



EUROPEAN SEARCH REPORT

Application Number

EP 21 20 8225

5

10

15

20

25

30

35

40

45

50

55

1

EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 2 798 136 A2 (ARCELIK AS [TR]; TEKIN HAKAN [TR] ET AL.) 5 November 2014 (2014-11-05)	1-13	INV. F24C15/02 E05B1/00
Y	* paragraph [0022]; claims 1,2,3; figures 1-5 *	7,8	
X	DE 20 2008 016387 U1 (GRONBACH FORSCHUNGS UND ENTWIC [AT]) 22 April 2010 (2010-04-22) * figures 1, 9, 13 *	1-5,9-13	
Y	EP 3 246 632 A1 (ELECTROLUX APPLIANCES AB [SE]) 22 November 2017 (2017-11-22) * figure 2 *	7,8	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F24C E05B
Place of search		Date of completion of the search	Examiner
The Hague		24 April 2022	Meyers, Jerry
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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

EP 21 20 8225

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

24-04-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2798136 A2	05-11-2014	EP 2798136 A2	05-11-2014
		ES 2587845 T3	27-10-2016
		WO 2013098072 A2	04-07-2013

DE 202008016387 U1	22-04-2010	NONE	

EP 3246632 A1	22-11-2017	AU 2017267085 A1	25-10-2018
		EP 3246632 A1	22-11-2017
		US 2019178503 A1	13-06-2019
		WO 2017198502 A1	23-11-2017

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 1898157 B1 [0003]
- DE 102016206352 A1 [0004]
- DE 102005042808 A1 [0005]