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(54) OVEN FOR COOKING FOOD, IN PARTICULAR A COMBINED HEAT AND MICROWAVE OVEN

(57) An oven (1) for cooking food has:
- a support structure (2);
- a muffle (4) placed inside the support structure (2) ;
- a frame (7) arranged around the muffle (4);
- a door (3) hinged around the support structure (2) and comprising an edge (8) suitable to be housed in the frame (7) and placed in contact with the frame (7);
- a tab (9) attached to the door (3);
- a hooking mechanism (M), which is mounted in the support structure (2), has a first and a second stable position, and is configured to be engaged and disengaged by the movable tab (9) and to apply a force to the tab (9) so as to pull the edge (8) of the door towards the frame (7) in the second stable position.

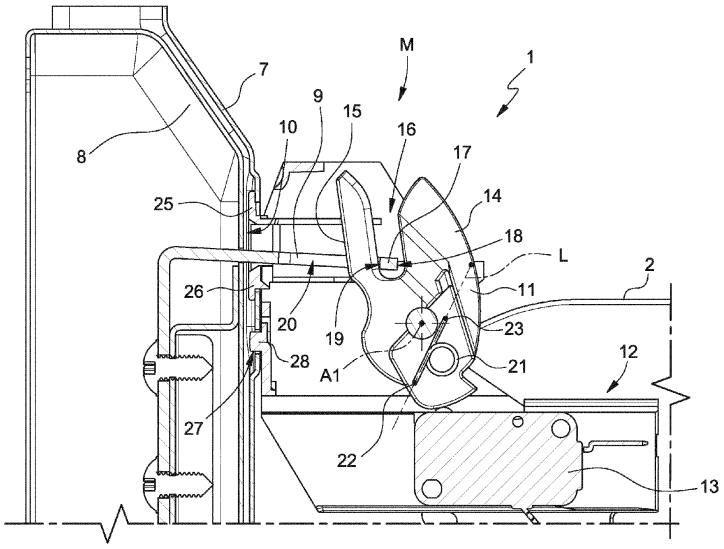

FIG. 2

EP 4 012 266 A1

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority from Italian patent application no. 102020000030263 filed on December 10, 2020.

TECHNICAL FIELD

[0002] The present invention relates to an oven for cooking food, in particular a combined heat and microwave oven.

STATE OF THE PRIOR ART

[0003] Generally, a combined oven of the type identified above comprises a support structure; a muffle; a frame arranged around the muffle; and a door, which is hinged around the support structure and comprises an edge suitable to be housed in the frame and placed in contact with the frame. Springs are generally arranged between the door and the support structure for applying a force to the door to keep it in the closed position. For obvious reasons, the aforementioned springs are arranged at the door portion close to the axis of the hinge, and for this reason, the closure moment applied to the door is given by the product of a particularly disadvantageous lever and by the force applied by the spring.

[0004] The effective closure of the oven is very important for any type of oven but is more important in the field of microwave ovens where it is necessary to prevent electromagnetic waves from escaping from the oven.

OBJECT OF THE INVENTION

[0005] The object of the present invention is to provide an oven for cooking food, which has an improved closing effectiveness.

[0006] In accordance with the object of the present invention, an oven for cooking food, in particular a combined heat and microwave oven, is provided, the oven comprising:

- a support structure;
- a muffle placed inside the support structure;
- a frame arranged around the muffle;
- a door hinged to the support structure and comprising an edge suitable to be housed in the frame and placed in contact with the frame;
- at least one tab attached to the door;
- at least one hooking mechanism, which is mounted in the support structure, has a first and a second stable position, and is configured to be engaged and disengaged by the movable tab and to apply a force to the tab so as to pull the edge of the door towards the frame in the second stable position.

[0007] In this way, it is possible to apply a closing force to the oven door in any position, i.e., not necessarily close to the door hinge axis, and preferably in the area furthest from the door hinge axis, so that the generated moment has a maximum length arm.

[0008] In particular, the door and the hooking mechanism are arranged on opposite sides with respect to the frame, which comprises a window to allow the tab supported by the door to interact with the said hooking mechanism.

[0009] In this way, it is possible to apply said force to the tab in a space between the muffle and the support structure.

[0010] In particular, the oven comprises at least one micro-switch, which is selectively operated by the hooking mechanism.

[0011] The micro-switch has the function of signalling the states of "door open" and "door closed", and in microwave ovens, of giving consent to the emission of electromagnetic waves in the "door closed" state and of inhibiting the emission of electromagnetic waves in the "door open" state.

[0012] In other words, the tab and the cam interact with each other so as to apply a force to the tab, and at the same time, operate the micro-switch in the first stable position and deactivate the micro-switch in the second stable position.

[0013] In particular, the hooking mechanism comprises a cam, which can be rotated about a given axis with respect to the support structure.

[0014] The rotatable cam is particularly suitable for operating the micro-switch and interacting with the tab.

[0015] In particular, the hooking mechanism comprises a spring, which has a first end connected at a first anchorage point to the support structure, and a second end connected at a second anchorage point to the cam, in such a way that the straight line passing through the first and second anchorage points is arranged on one side with respect to the said given axis in the first operating position and on the opposite side in the second operating position.

[0016] In this way, the spring exerts two moments of opposite signs on the cam in the respective first and second stable positions.

[0017] In particular, the cam comprises a fork comprising a first and a second arm defining a recess therebetween for housing the said tab.

[0018] In the second stable position, the recess allows insertion and extraction of the tab between the two arms.

[0019] In particular, the tab comprises an end portion, which is configured to be inserted into the recess and has a push face to push the first arm from the second stable position to the first stable position and a second pull face to pull the second arm from the first stable position to the second stable position.

[0020] The tab has the function of providing the force required to start the rotation of the cam from the first stable position to the second stable position. Once the

straight line passing through the first and second anchorage points of the spring goes beyond the given axis, then the movement of the cam is completed by the spring.

[0021] Similarly, the tab has the function of providing the force required to start the rotation of the cam from the second stable position to the first stable position. Once the straight line passing through the first and second anchorage points of the spring goes beyond the given axis, then the movement of the cam is completed by the spring.

[0022] In particular, the tab has an opening configured to house the second arm.

[0023] During the rotation from the second stable position to the first stable position, the second arm rotates about the given axis and enters the opening of the tab.

[0024] In particular, the frame comprises a stop element for the second arm in order to define a cam stop in the second stable position.

[0025] In the second stable position, the spring applies a moment to the cam about the given axis, but the rotation of the cam is prevented by the cam stop, i.e., by the second arm resting on the stop element.

[0026] Similarly, in the first stable position, the spring applies a moment to the cam about the given axis, but the rotation of the cam is prevented by the cam stop, i.e., by the door resting against the frame.

[0027] In particular, the hooking mechanism comprises a box, which is mounted integral with the support structure and is configured to support the said cam in rotation and anchor one end of the spring.

[0028] In this way, the installation of the cam is facilitated by the preliminary assembly of the cam and the spring in the box.

[0029] It is understood that the spring and the micro-switches are also preliminarily mounted in the box to facilitate the subsequent assembly thereof.

[0030] In particular, the oven comprises two hooking mechanisms arranged near two side walls of the support structure and two tabs mounted on the door, each configured to cooperate with the respective hooking mechanisms.

[0031] This allows a symmetrical application of the forces to the door for the benefit of the effectiveness of the closing of the door itself.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] Further features and advantages of the present invention will be apparent from the following description of a non-limiting embodiment thereof, with reference to the figures of the accompanying drawings, wherein:

- Figure 1 is a sectional view, with parts removed for clarity, of an oven for cooking food and constructed in accordance with the present invention; and
- Figures 2 and 3 are sectional views, with parts removed for clarity and in enlarged scale, of a detail of the oven in Figure 1 in two different operating phases.

PREFERRED EMBODIMENT OF THE INVENTION

[0033] In Figure 1, reference number 1 indicates an oven for cooking food. The oven 1 comprises a support structure 2; a door 3 hinged to the support structure 2; and a muffle 4, which is housed in the support structure 2 and defines, together with the door 3, a cooking chamber 5.

[0034] The oven 1 essentially has the shape of a solid body, the outer surface of which is defined by the support structure 2 and the door 3, which is hinged about a hinge axis A and is kept in the closed position by two springs 6 (only one of which is shown in Figure 1) connected to the support structure and the door 3 near the hinge axis A.

[0035] In a variant, not shown, the springs are arranged inside the door but operate according to the same principle as the springs arranged inside the oven.

[0036] With reference to Figure 2, the oven 1 comprises a frame 7 arranged around the muffle 4 and connected to the support structure, whereas the door 3 comprises an edge 8 suitable to be housed in the frame 7 and arranged in contact with the frame 7; and two tabs 9 integral with the edge 8 and configured to be arranged beyond the frame 7 through an opening 10 of the frame 7. Generally, the frame 7 also comprises a gasket G.

[0037] The oven 1 comprises two hooking mechanisms M, each configured to assume a first stable position (Figure 2) and a second stable position (Figure 3). Each hooking mechanism M is configured to be engaged and disengaged by the respective tab 9 in the second stable position (Figure 3) and to apply a force to the tab so as to pull the edge 8 of the door 3 towards the frame 7 in the first stable position (Figure 2) so as to compress the gasket, not shown, of the frame 7.

[0038] The mechanisms M are mounted integral with the support structure 2 on opposite side walls of the support structure 2.

[0039] In a variant, the oven comprises a single hooking mechanism and a single tab.

[0040] Each hooking mechanism M comprises a cam 11, which can be rotated between the first and the second stable position, and a box 12, which is mounted integral with the support structure 2 and rotatably supports the cam 11. The box 12 supports two micro-switches 13, which are selectively operated by the rotation of the cam 11 and are configured to emit signals related to the "door open" and "door closed" states. Only one micro-switch is shown in the attached figures.

[0041] The cam 11 is mounted so that it can rotate about an axis A1 with respect to the box 12, and therefore with respect to the support structure 2.

[0042] The cam 11 has a portion configured to interact with the micro-switches 13 and an opposite portion configured to interact with the tab 9 and comprising a fork, which has a first and a second arm 14 and 15 defining a recess 16 therebetween for housing a part of the tab 9.

[0043] The tab 9 comprises an end portion 17 configured to be housed in the recess 16 and having a first face 18 for pushing the first arm 14 from the second stable position (Figure 3) to the first stable position (Figure 2), and a second face for pulling the second arm 15 from the first stable position (Figure 2) to the second stable position (Figure 3).

[0044] In practice, the tab 9 has an opening 20 configured to house the second arm 15.

[0045] Each mechanism M comprises a spring 21, which has a first end connected at a first point 22 bound to the box 12, and hence to the support structure 2, and a second end connected at a point 23 to the cam 11, in such a way that the straight line L passing through the points 22 and 23 is arranged on one side with respect to the said given axis A1 in the first operating position (Figure 2) and on the opposite side in the second operating position (Figure 3). In the illustrated case, the spring 21 is a coil spring, with the axis of the coil parallel to the given axis A1 of rotation of the cam 11.

[0046] In practice, the box 12 supports the microswitch 13, the cam 11 and the spring 23, and together they form a preassembled assembly which is subsequently mounted on the support structure 2.

[0047] With reference to Figure 3, the box 12 has an element 24 for defining a stop for the second arm 15 in the second stable position and which counteracts the action of the spring 21.

[0048] The box 12 is mounted directly onto the frame 7 and fixed to the frame 7. In this case, the box 12 comprises two hooks 25 and 26, which are inserted through the window 10 and hook onto opposite edges of the window 10. The frame 7 further comprises an opening 27, which allows the insertion of a pin 28 integral with the box 12.

[0049] Lastly, it is clear that modifications and variations may be made to the oven described herein without departing from the scope of protection of the appended claims.

Claims

1. An oven for cooking food, in particular a combined heat and microwave oven, the oven (1) comprising:

   - a support structure (2);
   - a muffle (4) placed inside the support structure (2) ;
   - a frame (7) arranged around the muffle (4);
   - a door (3) hinged to the support structure (2) and comprising an edge (8) suitable to be housed in the frame (7) and placed in contact with the frame (7);
   - at least one tab (9) attached to the door (3);
   - at least one hooking mechanism (M), which is mounted in the support structure (2), has a first and a second stable position, and is configured to be engaged and disengaged by the movable tab (9) and to apply a force to the tab (9) so as to pull the edge (8) of the door (3) towards the frame (7) in the second stable position.

2. The oven as claimed in Claim 1, wherein the door (3) and the hooking mechanism (M) are arranged on opposite sides with respect to the frame (7), which comprises a window (10) to allow the tab (9) supported by the door (3) to interact with the said hooking mechanism (M).

3. The oven as claimed in Claim 1 or 2 and comprising at least one micro-switch (13), which is selectively operated by the hooking mechanism (M).

4. The oven as claimed in any of the foregoing Claims, wherein the hooking mechanism (M) comprises a cam (11), which can be rotated about a given axis (A1) with respect to the support structure (2).

5. The oven as claimed in Claim 4, wherein the hooking mechanism (M) comprises a spring (21), which has a first end connected at a first anchorage point (22) to the support structure (2) and a second end connected at a second anchorage point (23) to the cam (11) in such a way that the straight line (L) passing through the first and second anchorage points (22, 23) is arranged on one side with respect to the said given axis (A1) in the first operating position and on the opposite side in the second operating position.

6. The oven as claimed in Claim 4 or 5, wherein the cam (11) comprises a fork comprising a first and a second arm (14; 15) defining a recess (16) therebetween for housing the tab (9).

7. The oven as claimed in Claim 6, wherein the tab (9) comprises an end portion (17), which is configured to be inserted into the recess (16) and has a push face (18) to push the first arm (14) from the second stable position to the first stable position and a second pull face (19) to pull the second arm (15) from the first stable position to the second stable position.

8. The oven as claimed in Claim 6 or 7, wherein the tab (9) has an opening (20) configured to house the second arm (15) .

9. The oven as claimed in any one of the Claims 6 to 8, wherein the frame (7) comprises a stop element (24) for the second arm (15) in order to define a cam stop (11) in the second stable position.

10. The oven as claimed in any of the Claims 5 to 9, wherein the hooking mechanism (M) comprises a box (12), which is mounted integral with the support structure (2) and is configured to support the said

cam (11) in rotation and anchor one end of the spring (21).

11. The oven as claimed in any one of the foregoing Claims, and comprising two hooking mechanisms (M) arranged near two side walls of the support structure (2) and two tabs (9) mounted on the door (3), each configured to cooperate with the respective hooking mechanisms (M).

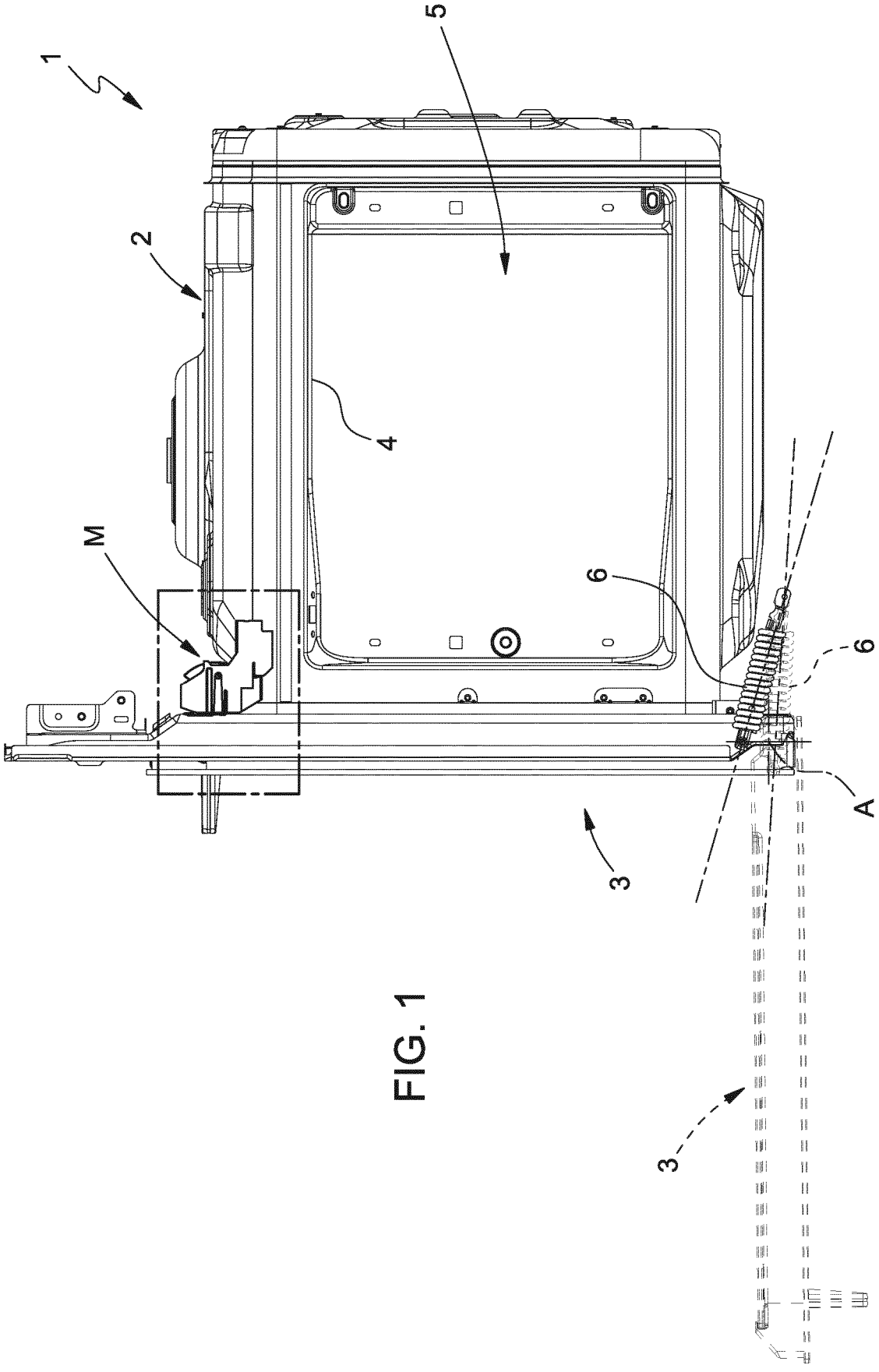

FIG. 1

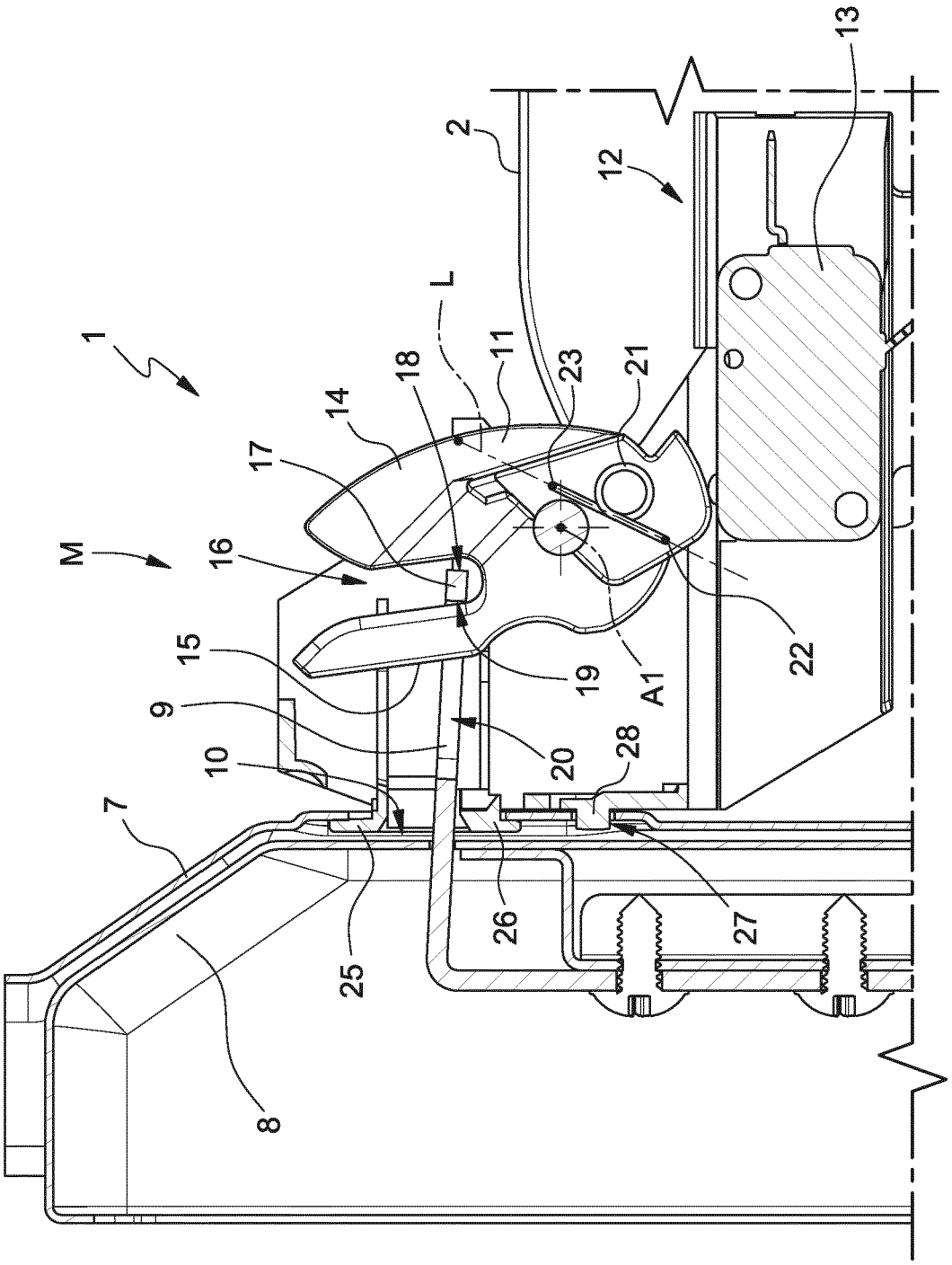

FIG. 2

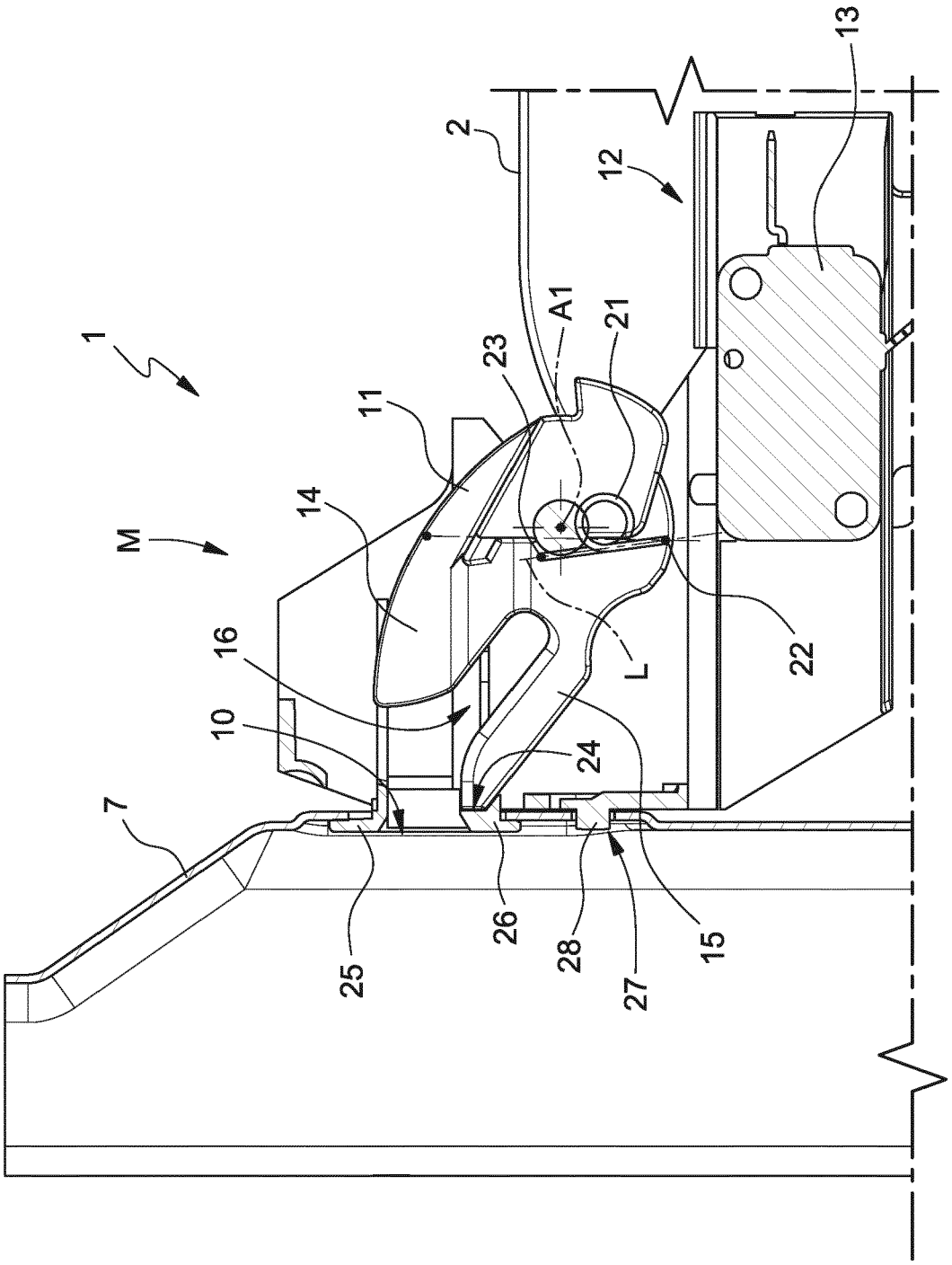

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 21 21 3532

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2019/178001 A1 (ESTERLE CHRISTOPHER D [US] ET AL) 13 June 2019 (2019-06-13) * paragraphs [0001], [0005], [0006], [0020], [0026], [0035], [0042]; figures 1,3,4,5 *	1-11	INV. F24C15/02 H05B6/64 E05C19/02 E05B15/04 E05B47/00
X	WO 2014/056203 A1 (MIDEA GROUP CO LTD [CN] ET AL.) 17 April 2014 (2014-04-17) * figures 1,3,10-12 *	1-11	
X	US 3 462 584 A (GUY WILLIAM R) 19 August 1969 (1969-08-19) * figures 1-3 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

F24C
H05B
E05C
E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 April 2022	Verdoodt, Luk

CATEGORY OF CITED DOCUMENTS

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2019178001 A1	13-06-2019	NONE	
WO 2014056203 A1	17-04-2014	CN 104812981 A	29-07-2015
		JP 6068656 B2	25-01-2017
		JP 2016500802 A	14-01-2016
		WO 2014056203 A1	17-04-2014
US 3462584 A	19-08-1969	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT 102020000030263 **[0001]**