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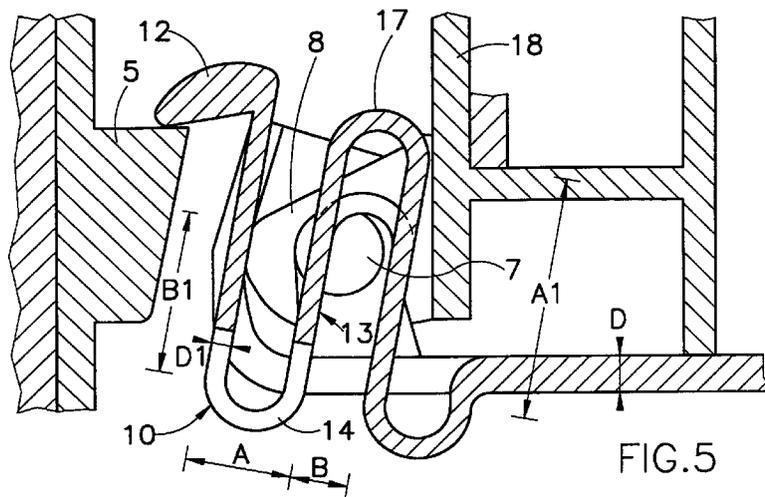
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(54) Locking device for a door of a compartment of a household appliance, particularly for the freezing compartment door of a refrigerator

(57) A locking device for a door of a compartment of a household appliance, comprising a handle (6) and an elastically deformable bolt (10) provided with a hook (12) suitable for cooperating with a harpoon (5) provided on one edge (4) of said compartment (1) to keep said door closed, the handle and the bolt being integrally made of an elastically deformable material. Said handle is hinged to said door so as to be orientable in a

first angular position in which said hook leans out of one edge of the door for engaging with said harpoon and in a second angular position in which said hook is withdrawn as to the edge of the door for disengaging from said harpoon. Said bolt further comprises elastic biasing means (13) that tend to keep the handle in said first position.



## Description

The present invention relates to a locking device for a door of a compartment of a household appliance, particularly to a locking device for the freezing compartment door of a refrigerator.

In refrigerators having a freezing compartment a door is provided for closing said compartment. The door is provided with a locking device which cooperates with an harpoon provided on one edge of the freezing compartment opening, and with an handle placed on the front of the door.

In a known type of device, that can be defined as a "pull-type device", the locking device comprises an elastically flexible bolt having a hook suitable for engaging the harpoon to keep the door locked in a close position. The bolt and the handle are formed as an integral body, and the bolt engagement or disengagement with the harpoon is exclusively left to the elastic bending ability of the bolt hook.

A device of this kind presents the disadvantage that to close the door it is necessary to exert a certain pressure on the door itself, in order to guarantee the bolt hook bending so as to snap-engaging the harpoon; therefore, if the pressure exerted on the door is not enough, the door remains unintentionally open, with the predictable bad consequences.

Another disadvantage of this kind of device consists in that it is not able to compensate for the dimensional variations caused by the manufacturing tolerances, that are inevitably present if one considers that both the compartment and the door are typically formed by moulded plastic material, and by the thermal expansion caused by temperature variations.

In view of the state of the art described, an object of the present invention is to provide a locking device which is not affected by said disadvantages.

According to the present invention, that object is achieved by means of a locking device for a door of a compartment of a household appliance, comprising a handle and an elastically deformable bolt with a hook suitable for cooperating with a harpoon provided on one edge of said compartment to keep said door closed, the handle and the bolt being integrally made of an elastically deformable material, characterized in that said handle is hinged to said door so as to be orientable in a first angular position in which said hook leans out of one edge of the door for engaging with said harpoon and in a second angular position in which said hook is withdrawn as to the edge of the door for disengaging from said harpoon, and in that said bolt further comprises elastic biasing means that tend to keep the handle in said first position.

Thanks to the present invention, a locking device is provided which, even if comprising an handle and a bolt forming an integral body as in the case of the known devices previously described, does not present the disadvantages of said devices: actually, being the handle

hinged to the door, the hook provided on the bolt can be withdrawn to allow for opening and closing the door, and the presence of the elastic biasing means guarantees in any case that once the handle is released, this is automatically brought back in the hook leaning out position, in order to be able to engage with the harpoon provided on the edge of the door.

The features and advantages of the present invention will be made apparent by the following detailed description of an embodiment thereof, described by way of non-limiting example in the annexed drawings, wherein:

Fig. 1 shows in perspective view a refrigerator freezing compartment with a door having a locking device according to the invention;

Fig. 2 shows in top-plan view the door handle of Fig. 1;

Fig. 3 is a sectional view, along a horizontal plane marked with line III-III of Fig. 2, of the door and refrigerator compartment assembly with the door closing the compartment;

Fig. 4 is similar to Fig. 3, but refers to an opening position of the door; and

Fig. 5 is an enlarged sectional view of the door and compartment assembly, along a horizontal plane marked with line V-V in Fig. 2, with the door closing the compartment.

Referring to the drawings, in Fig. 1 a freezing compartment 1 of a refrigerator 2 is shown in perspective view, with the respective door 3 in an half-closed position. The door 3 is hinged on one side thereof to refrigerator 2. A harpoon 5 is fixed by mounted on one edge 4 of the opening of the compartment 1.

In front of the door 3, substantially in correspondance of side opposite to the side hinged to the refrigerator, a handle 6 is mounted on, viewable enlarged scale in Fig. 2, formed of moulded plastic material. The handle 6 is hinged to door 3 by two rod pins 7 leaning out from the under side of the handle itself, those rod pins being fulcrated on respective bearings 8 (viewable in Fig. 3-5) extending from a side wall 18 of the door 3 and integral therewith; thus, the handle 6 can rotate on vertical axis as to door 3, and therefore it is angularly orientable as to the door itself.

As also viewable in Fig. 3-4, the door 3 comprises a gasket 9 to guarantee sealing, when closed.

On the middle part of the front side 15 of the handle 6 a bolt 10 is formed integrally with the handle itself and obtained by moulding. The bolt 10 consists of a portion of the handle 6 partially detached on three sides from the remaining part of the handle by two cuts 11 transversal to the handle rotating axis, and shaped to present some corrugations, so that said handle portion has in transversal section substantially the shape of a serpentine, with three loops substantially perpendicular to the door surface (Fig. 3-4). The bolt is shaped to form, at his

end, a longitudinal hook 12 extending for the bolt 10 for the entire length thereof and leaning out of the edge of door 3 in rest condition, in order to be able to engage the harpoon 5. The bolt corrugated shape together with the elastic deformation properties of the material of which the handle 6 is made of, allow the bolt elastic deformation.

The central portion 13 of the bolt 10 is also detached from the lateral parts 16 and from the hook 12 of the bolt itself by an "U" cut 14; corresponding to said central part 13 of the bolt 10, the corrugation of the material making up the handle 6 is more marked, so that the central loop 17 extends up to touch the wall 18 of the door 3, which acts as an abutment (Fig.5); in this way, the central part 13 of the bolt 10 acts as an elastic member biasing the handle 6 in a rest position in which the handle is substantially aligned to the front surface of door 3.

During the use, to close door 3 it is necessary to grip the handle 6, to rotate it for moving it away from the front surface of door 3 so as the hook 12 of the bolt 10 recedes as much as not to interfere with the harpoon 5, to draw the door 3 near to the compartment 1 opening edge, then to release the handle 6, which is automatically brought back in rest position by the elastic force exerted by the central portion 13 of the bolt 10; in this way, the hook 12 engages in abutment with the harpoon 5, and guarantees the door 3 being kept closed. The particular shape of bolt 10, together with the elastic properties of the material of which it is made up, guarantee the hook 12 engagement with the harpoon 5 even against the push exerted by the gasket 9.

However it is also possible to close door 3 in a simpler way, although not entirely correct, drawing door 3 near to the compartment 1 opening edge, and then exerting a certain pressure on the door itself substantially at his end provided with handle 6, without rotating the handle itself; in this way, thanks to the bolt 10 particular corrugated shape which allows for the elastic deformation, the hook 12 can bend so as to recede while passing in correspondence of the harpoon 5, and then extend again so as to engage with the harpoon 5 and guarantee the door being closed.

To open the door, it is necessary to grip and rotate the handle 6, overcoming the elastic reaction of the central portion 13 of the bolt 10; in this way, the hook 12 recedes and disengages itself from the harpoon 5, and it is possible to open the door.

By way of example only, some data are given regarding the handle-bolt integral block dimensioning that proved suitable to reach the desired object. The characteristic dimensions are shown in Fig.5 with A, A1, B, B1, D, D1. The dimensions value depends on the elastic characteristics of the plastic material used to form the handle 6. For example, using ABS, with an handle thickness D of about 1,5 mm the dimension B value can be of about 3 mm (value which is also ideal for the moulding operation); the thickness D1 of the mate-

rial corresponding to the bolt 10 is preferably equal to about a half of thickness D, that is 0,75 mm.; the dimension A is about twice as much dimension B. Regarding dimensions A1 and B1, it has been verified that for having a good elastic reaction by the hook 12 against the harpoon 5, and at the same time enough rotating angle of the handle 6, preferably dimension A1 must be about twice as much dimension B1. The values just provided can vary depending on the used plastic material: for example, using PVC (which is softer than ABS), dimension B can be greater, by example 4 mm.

### Claims

1. Locking device for a door of a compartment of a household appliance, comprising a handle (6) and an elastically deformable bolt (10) with a hook (12) suitable for cooperating with a harpoon (5) provided on one edge (4) of said compartment (1) to keep said door closed, the handle and the bolt being integrally made of an elastically deformable material, characterized in that said handle is hinged to said door so as to be orientable in a first angular position in which said hook leans out of one edge of the door for engaging with said harpoon and in a second angular position in which said hook is withdrawn as to the edge of the door for disengaging from said harpoon, and in that said bolt further comprises elastic biasing means (13) for keeping the handle in said first position.
2. Locking device according to claim 1, characterized in that said bolt (10) is made up of a portion of the handle (6) shaped to have a corrugated surface.
3. Locking device according to claim 2, characterized in that said hook (12) comprises a final appendix of the handle (6) portion making up the bolt (10).
4. Locking device according to claim 3, characterized in that said elastic biasing means (13) are made up of a portion of the bolt (10) also having a corrugated surface so as to form a spring, a loop (17) of said corrugated surface leaning against an abutment wall (18) of said door (3).
5. Locking device according to claim 4, characterized in that said bolt portion making up the elastic biasing means (13) is detached on three sides from the bolt (10).

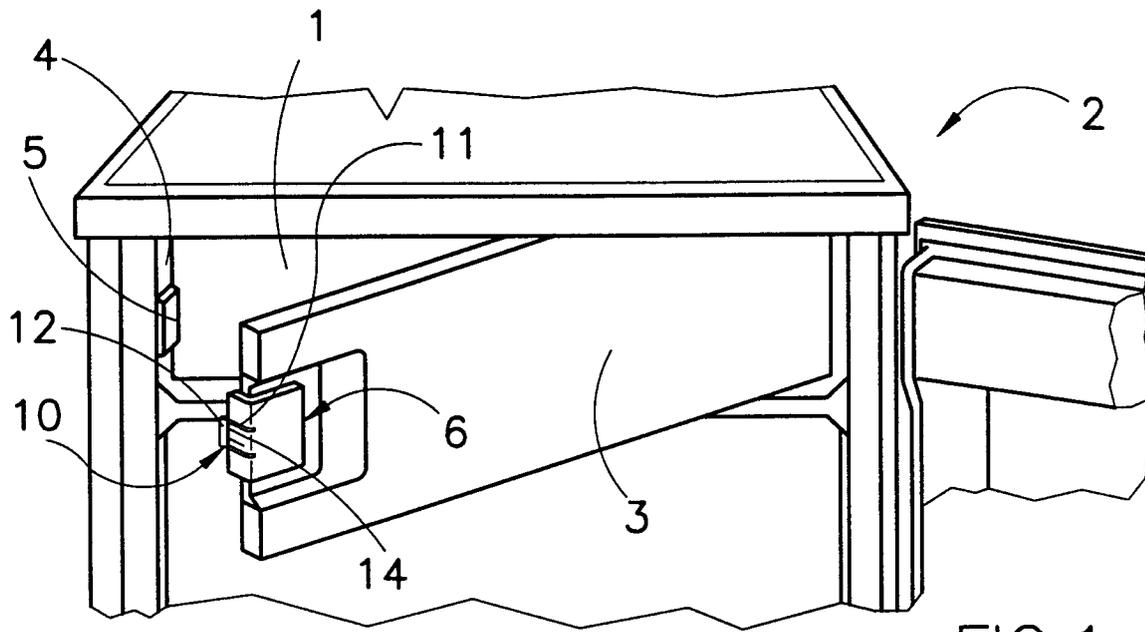


FIG. 1

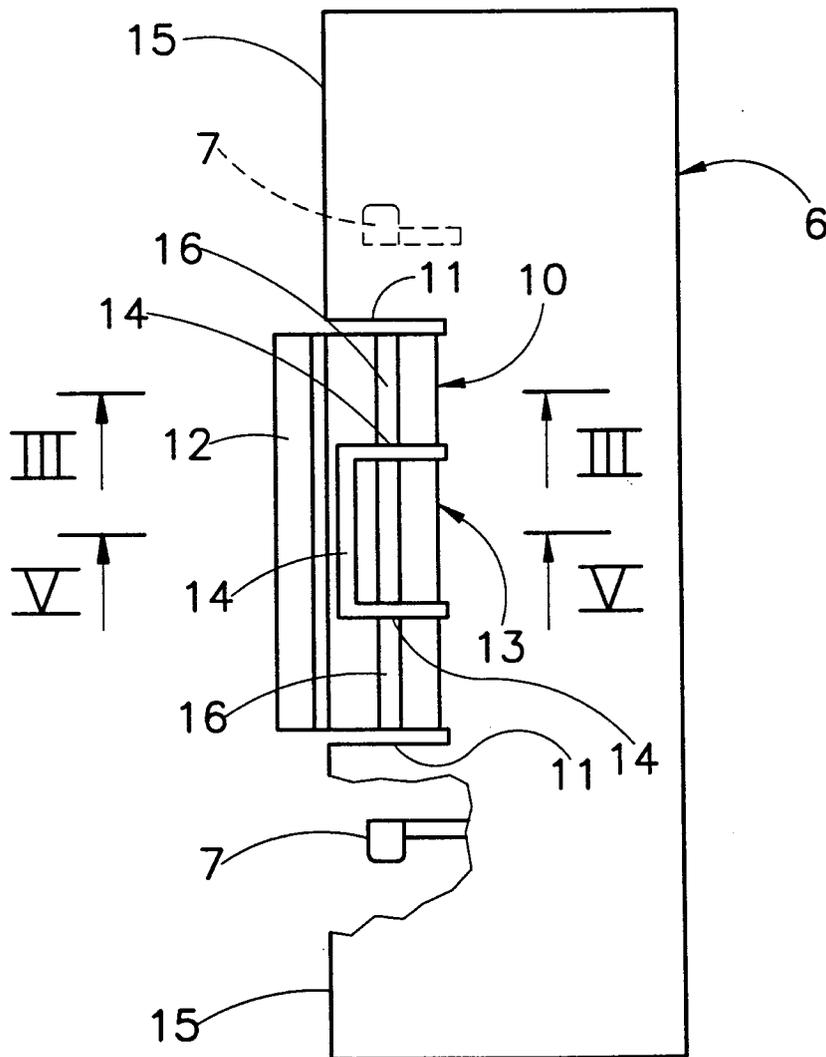
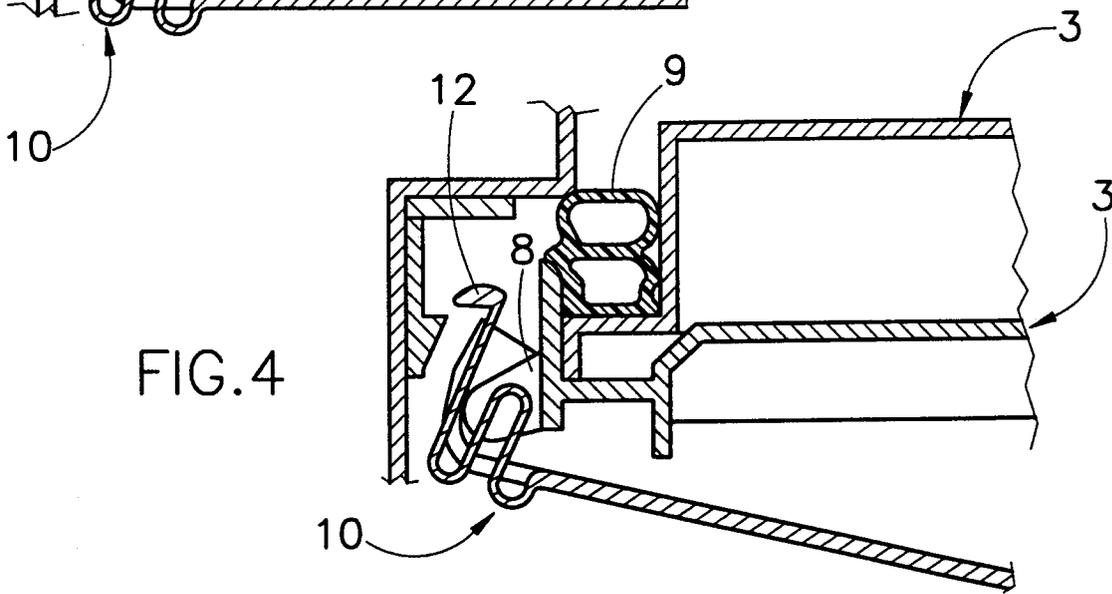
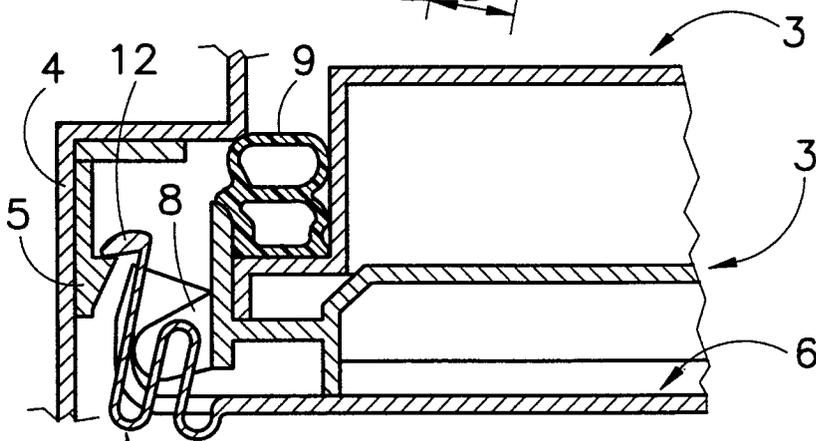
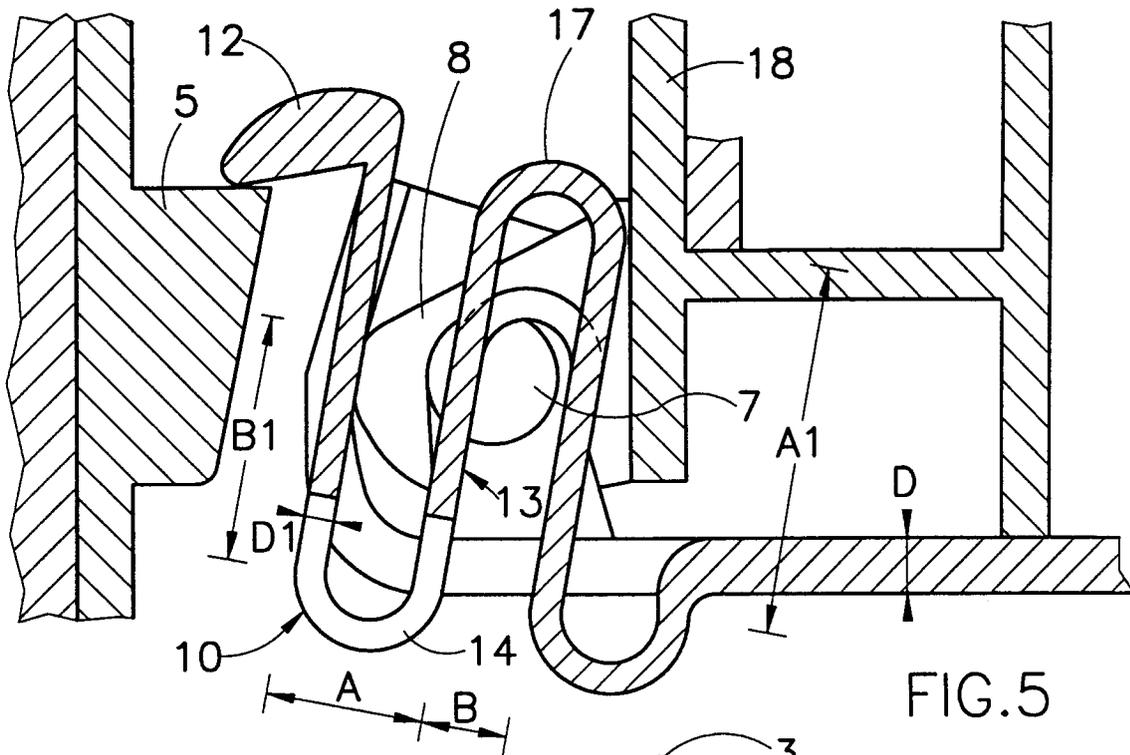


FIG. 2





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EUROPEAN SEARCH REPORT

Application Number  
EP 97 20 2424

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	GB 2 129 046 A (J. W. ARNOLD (MOULDMAKERS) LTD.) 10 May 1984	1,3,5	E05B65/00 E05C19/06 E05C3/30
Y	* the whole document * ---	4	
X	US 4 492 396 A (SIEMENS-ALLIS, INC.) 8 January 1985	1,3,5	
A	* the whole document * ---	4	
Y	FR 2 367 176 A (BOSCH-SIEMENS HAUSGERÄTE G.M.B.H.) 5 May 1978	4	
A	* the whole document * -----	5	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E05B E05C
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
MUNICH		4 December 1997	Vacca, R
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