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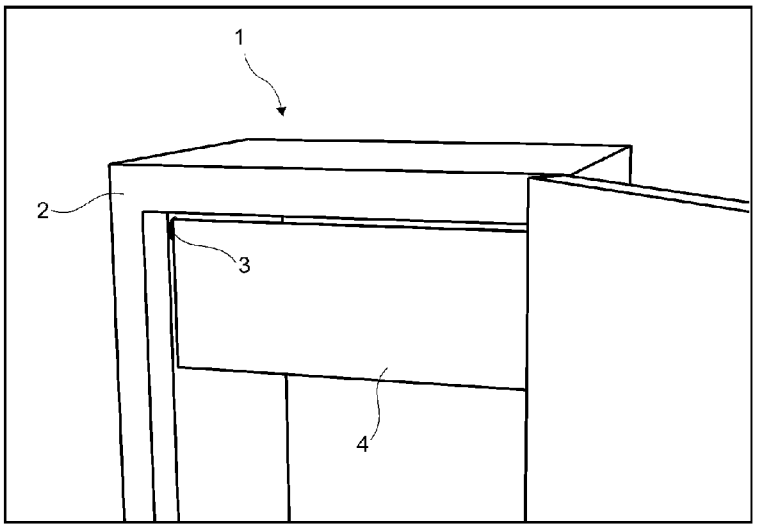
(54) Title: REFRIGERATOR PROVIDED WITH A FLAP CONNECTION MECHANISM

Fig. 1



(57) Abstract: The present invention relates to a refrigerator (1) comprising a refrigeration compartment accessible by way of opening a rotatable flap (4) connected to the inner walls of the refrigeration compartment by a flap connection device. More particularly, the present invention proposes a refrigerator (1) having an interior refrigeration cabin (2) enclosed by a heat-insulating housing and a refrigeration cabin door, the refrigeration cabin (2) comprising at least one inner compartment (13) having a flap (4) closing the outer side thereof, the flap (4) being in mechanical communication with two flap mounting devices (3) in a rotatably supported manner.

Description

REFRIGERATOR PROVIDED WITH A FLAP CONNECTION MECHANISM

[0001] The present invention relates to a refrigerator having a refrigeration compartment accessible by way of opening a rotatable flap connected to the inner walls of the refrigeration compartment by a flap connection device.

[0002] A refrigerator has a plurality of shelves and containers for preserving food items. In order for providing ease of access, refrigerator compartments are generally covered by a rotatable flap by which different predetermined operational positions thereof are possible. The rotatable flap conventionally opens and closes through rotational movement around a connection unit attached to the inner wall of the refrigerator.

[0003] It is to be noted that such connection units may cause loss of usable inner space depending on their structural features as well as their position relative to the surface of the refrigerator wall. For example, if the flap mounting device has a structural depth over the wall surface, this may result in loss of the shelf space.

[0004] A more prominent issue in regards to the stabilizing of the flap in different operation positions necessitates a structurally robust design to withstand regular use during a prolonged period of time, i.e. the lifetime of the product. To this end, the flap mounting mechanism is expected to stationarily support the flap in opened positions, i.e. it should carry the weight of the same when it is opened by way of preventing rotational movement of a positioning pin by itself in a definite manner. Therefore, the flap and the flap mounting device are basically expected to interact in such a way to afford stable positioning of the flap during prolonged use.

[0005] A prior art publication in the technical field of the present invention may be referred to as EP2295901, disclosing a container having a body, and a flap tiltable around a rotational axis, where a spring element i.e. compression spring, is clamped between contact points at a disk and an inner frame of a side wall and provided for loading the flap with pulling force. A latch mechanism is activated by closing the flap and has two guiding slots, and a pin is movable in the slots, where the guiding slots are pressed against

each other by the force of the spring element. The pin is engaged into the slots in a direction parallel to the axis, where the flap is coupled with a rotary motion damper.

[0006] The present invention provides that the flap is rotatably attached to a pair of flap mounting devices so as to support at least two operational positions. Each operational position is supported by two separately locked positioning pins whereby a more stable opened position is obtainable. The stability of the opened position during which the flap itself is carried by two opposite flap mounting devices is particularly advantageously ensured by the structural cooperation of the flap mounting devices by double-point locked connections with the flap. Further, the fact that the flap mounting devices are embedded within the lateral walls of the refrigerator body enables a space saving installation of the flap.

[0007] The flap mounting device according to the invention additionally affords a mechanically more compact structure involving a substantially reduced number of interacting members, thereby ensuring a lowered overall manufacturing cost compared to prior art mechanisms, while at the same time not compromising stability.

[0008] The present invention provides a refrigerator with improved flap mounting devices and an associated flap as defined by the characterizing features in Claim 1 and subsequent Claims.

[0009] Primary object of the present invention is hence to provide a refrigerator with improved flap mounting devices by which the flap's operation is made more reliable with accurate and stable positioning of the flaps.

[0010] The present invention proposes a refrigerator with a rotatable flap having a pair of oppositely extending axle pins insertable into axle pin receiving holes of the flap mounting devices disposed on the opposite lateral walls of the refrigerator cabin. Each flap mounting device has two locking cap receiving holes around the axle pin receiving hole such that two locking caps at each side of the flap are separately receivable into one of the two locking cap receiving holes, each of the locking cap receiving holes defining two separate positions for each locking cap.

[0011] The two locking cap receiving holes surround the axle pin receiving hole

so as to form a diametrically interrupted circular path in the form of bean-shaped cavities. Two pairs of first and second position slots are formed within the two locking cap receiving holes in a sequentially disposed manner. The first position slots are positioned 180 degrees apart from each other just like the second position slots. The first and second position slots are disposed at two extremities of the locking cap receiving holes.

[0012] Each locking cap passes through a flexibly deformable position transition zone between first and second position slots during opening and closing of the flap.

[0013] Accompanying drawings are given solely for the purpose of exemplifying a refrigerator with flap mounting devices whose advantages over prior art were outlined above and will be explained in brief hereinafter.

[0014] The drawings are not meant to delimit the scope of protection as identified in the claims nor should they be referred to alone in an effort to interpret the scope identified in the claims without recourse to the technical disclosure in the description of the present invention.

[0015] Fig. 1 demonstrates a general perspective view of an inner compartment inside a refrigerator according to the present invention.

[0016] Fig. 2 demonstrates a general perspective view of a flap to cover the inner compartment inside the refrigerator according to the present invention.

[0017] Fig. 3a demonstrates a general perspective view of the inner compartment while the flap is in half-open position and Fig. 3b demonstrates the flap in fully open position according to the present invention.

[0018] Fig. 4 demonstrates a general perspective view of the flap mounting device according to the present invention.

[0019] The following numerals are assigned to different part numbers used in the detailed description:

1. Refrigerator
2. Refrigerator cabin
3. Flap mounting device
4. Flap
5. Locking cap receiving hole

6. Axle pin receiving hole
7. Locking cap
8. Axle pin
9. Shelf
10. First position slot
11. Second position slot
12. Position transition zone
13. Inner compartment

[0020] The present invention relates to a refrigerator (1) comprising one or more refrigeration compartments in the form of storage divisions with shelves (9). The refrigerator (1) may also comprise a certain number of divisions such as for instance a freezer compartment adapted to be covered by a flap (4) closing the outer front side thereof. The flaps (4) are typically configured to be opened by rotating around a rotation axis in parallel to the rear wall as well as the base of the refrigerator (1). A flap (4) according to the invention is opened to be rotated upwards in the manner to be supported by two opposite flap mounting devices (3) as will be delineated hereinafter.

[0021] The flap (4) of the invention is adapted to communicate with the inner lateral walls of the refrigeration cabin (2) through the flap mounting devices (3) which are fixedly installed into corresponding cavities of the refrigerator cabin's (2) inner lateral walls in a manner to fixedly support and carry the flap (4) in a plurality of operational positions.

[0022] The refrigerator's (1) inner compartment (13) flaps (4) can be rotatably opened and closed relative to the refrigerator cabin (2) in the manner that a pair of axle pins (8) of the flap (4) is oppositely introduced into axle pin receiving holes (6) of the flap mounting devices (3).

[0023] The flap mounting devices (3) further have locking cap receiving holes (5) providing connection with locking caps (7) while the axle pins (8) remain pivotally rotatable in the axle pin receiving holes (6). Each flap mounting device's (3) locking cap receiving holes (5) have a pair of first and a second position slots (10, 11) such that while the first position slots (10) are positioned 180 degrees apart from each other around the axle pin

receiving hole (6), the second position slots (11) are also positioned 180 degrees apart from each other around the axle pin receiving hole (6).

[0024] Each locking cap receiving hole (5) is in the form a bean-shaped cavity with the first and second position slots (10, 11) at the extremities thereof. Two locking cap receiving holes (5) therefore surround the axle pin receiving hole (6) around which two pairs of first and second position slots (10, 11) are formed one after another in a sequential manner.

[0025] In the initial closed position of the flap (4), two locking caps (7) arranged 180 degrees apart from each other at two vertically extending sides of an axle pin (8) are located within the first position slots (10), in which case the second position slots (11) are empty. Therefore the two locking caps (7) as well as the associated first position slots (10) are in parallel alignment with the vertical direction perpendicular to the base of the refrigerator (1) in the closed position of the flap (4).

[0026] During the rotational movement of the flap (4), the locking caps (7) start displacing inside the locking cap receiving holes (5) in opposite directions; while one travels upwards from a respective first position slot (10) to the second position slots (11) of the respective locking cap receiving hole (5), the other one moves downwards towards the second position slot (11) in the opposite locking cap receiving hole (5). Two locking caps (7) at each lateral side of the flap (4) simultaneously move from one slot to another while the flap (4) is being opened or closed.

[0027] While a locking cap (7) in the form of a circular protrusion travels between two slots, it passes through a position transition zone (12), the largest dimension of the opening of which is narrower compared to the diameter of the locking cap (7), therefore the transition between neighboring position slots of the locking cap receiving hole (5) being made more difficult. The locking cap (7) flexibly deforms the position transition zone (12) to settle in the respective position slot it is moved. The flap mounting devices (3) are therefore made of a plastics material and the amount of deformation of the position transition zone (12) required to take a locking cap (7) from one position slot to another is adjusted to prevent reverse movement of the locking cap (7) by itself. This is especially true in the

case the open position of the flap (4) is needed to be maintained against the gravitational force exerted on the same. The flap's (4) open position is maintained by the two position transition zones (12) at both sides of the flap (4) because four locking caps (7) are simultaneously prevented from changing their position slots.

[0028] The usable space of the shelf (9) inside the inner compartment (13) of the refrigerator (1) is fully maintained due to the placement of the flap mounting devices (3) inside the wall of the refrigerator cabin (2). The rotational movement of the flap (4) during its opening and closing is accomplished in the manner that each position is reliably maintained due to multiple-point locking by the locking caps (7) at both sides of the flap (4).

[0029] According to the present invention, the fact that the length of the intermediary opening of the position transition zone (12) in the middle of the bean-like locking cap receiving hole (5) between two longitudinal edges thereof is shorter than the diameter of a locking cap (7) provides a third position where the flap (4) can be fixed in half-open position. This position is considered particularly advantageous because it prevents sudden and violent closing of the flap (4).

[0030] In a nutshell, the present invention proposes a refrigerator (1) having an interior refrigeration cabin (2) enclosed by a heat-insulating housing and a refrigeration cabin door, the refrigeration cabin comprising at least one inner compartment (13) having a flap (4) closing the outer side thereof, the flap (4) being in mechanical communication with two flap mounting devices (3) in a rotatably supported manner.

[0031] In one embodiment of the present invention, a pair of axle pins (8) of the flap (4) are oppositely introduced into axle pin receiving holes (6) of the flap mounting devices (3). Each flap mounting device (3) has two locking cap receiving holes (5) each of which simultaneously communicating with a locking cap (7) of the flap (4) while the axle pin (8) remain pivotally rotatable in the axle pin receiving hole (6). The two locking cap receiving holes (5) surround the axle pin receiving hole (6) such that two pairs of first and second position slots (10, 11) are formed around the axle pin

receiving hole (6) one after another in a sequentially disposed manner.

[0032] In a further embodiment of the present invention, each locking cap receiving hole (5) have a pair of first and a second position slots (10, 11) such that the first position slots (10) are positioned 180 degrees apart from each other around the axle pin receiving hole (6) and the second position slots (11) are positioned 180 degrees apart from each other around the axle pin receiving hole (6) as well.

[0033] In a further embodiment of the present invention, each locking cap receiving hole (5) is in the form of a bean-shaped cavity with the first and second position slots (10, 11) disposed at the extremities thereof.

[0034] In a further embodiment of the present invention, the flap (4) is adapted to communicate with opposite inner lateral wall portions of the refrigeration cabin (2) through the flap mounting devices (3) which are fixedly stationarily mountable into wall cavities of the refrigerator cabin (2) to fixedly support and carry the flap (4) in a plurality of operational positions.

[0035] In a further embodiment of the present invention, two locking caps (7) arranged 180 degrees apart from each other and located within the first position slots (10) of the locking cap receiving hole (5) are in parallel alignment with the vertical direction perpendicular to the base of the refrigerator (1) in the closed position of the flap (4).

[0036] In a further embodiment of the present invention, during the opening movement of the flap (4), the locking caps (7) in the first position slots (10) of the locking cap receiving hole (5) displace in opposite directions inside the locking cap receiving holes (5).

[0037] In a further embodiment of the present invention, two locking caps (7) arranged 180 degrees apart from each other and located within the second position slots (11) of the locking cap receiving hole (5) are in parallel alignment with the base of the refrigerator (1) in the opened position of the flap (4).

[0038] In a further embodiment of the present invention, two locking caps (7) at each lateral side of the flap (4) are simultaneously movable between the first and second position slots (10, 11) in both directions while the flap (4) is being opened or closed.

[0039] In a further embodiment of the present invention, a locking cap (7) in the form of a circular protrusion traveling between the first and second position slots (10, 11) in clockwise or counterclockwise direction, passes through a flexibly deformable position transition zone (12) thereinbetween.

[0040] In a further embodiment of the present invention, the largest dimension of the opening of the position transition zone (12) is narrower compared to the diameter of the locking cap (7).

[0041] In a further embodiment of the present invention, the flap mounting devices (3) are made of a plastics material.

[0042] In a further embodiment of the present invention, the amount of deformation of the position transition zone (12) required to take a locking cap (7) from one position slot to another is substantially adjusted to prevent reverse movement of the locking cap (7) by itself.

[0043] In a further embodiment of the present invention, the flap (4) is fixable in half-open position.

[0044] The present invention proposes a pair of flap mounting devices (3) sturdily supporting different operational positions of the flap (4). Each operational position is supported by two separately locked caps at each side whereby the stability of the opened position during which the flap (4) is carried is ensured. The flap mounting devices (3) are embedded within the lateral walls of the refrigerator cabin (2) in a space saving manner.

Claims

1. A refrigerator (1) comprising an interior refrigeration cabin (2) enclosed by a heat-insulating housing and a refrigeration cabin door, the refrigeration cabin comprising at least one inner compartment (13) having a flap (4) closing the outer side thereof, the flap (4) being in mechanical communication with two flap mounting devices (3) in a rotatably supported manner, **characterized in that**

   - a pair of axle pins (8) of the flap (4) are oppositely introduced into axle pin receiving holes (6) of the flap mounting devices (3),

   - each flap mounting device (3) has two locking cap receiving holes (5) each of which simultaneously communicating with a locking cap (7) of the flap (4) while the axle pin (8) remain pivotally rotatable in the axle pin receiving hole (6) and

   - the two locking cap receiving holes (5) surround the axle pin receiving hole (6) such that two pairs of first and second position slots (10, 11) are formed around the axle pin receiving hole (6) one after another in a sequentially disposed manner.

2. A refrigerator (1) as in Claim 1, **characterized in that** each locking cap receiving hole (5) have a pair of first and second position slots (10, 11) such that the first position slots (10) are positioned 180 degrees apart from each other around the axle pin receiving hole (6) and the second position slots (11) are positioned 180 degrees apart from each other around the axle pin receiving hole (6).

3. A refrigerator (1) as in Claim 2, **characterized in that** each locking cap receiving hole (5) is in the form of a bean-shaped cavity with the first and second position slots (10, 11) disposed at the extremities thereof.

4. A refrigerator (1) as in Claim 1, 2 or 3, **characterized in that** the flap (4) is adapted to communicate with opposite inner lateral wall portions of the refrigeration cabin (2) through the flap mounting devices (3) which are fixedly stationarily mountable into wall cavities of the refrigerator cabin (2) to fixedly support and carry the flap (4) in a plurality of operational positions.

5. A refrigerator (1) as in Claim 2 or 3, **characterized in that** two locking caps (7) arranged 180 degrees apart from each other and located within the first position slots (10) of the locking cap receiving hole (5) are in parallel alignment with the vertical direction perpendicular to the base of the refrigerator (1) in the

closed position of the flap (4).

6. A refrigerator (1) as in Claim 5, **characterized in that** during the opening movement of the flap (4), the locking caps (7) in the first position slots (10) of the locking cap receiving hole (5) displace in opposite directions inside the locking cap receiving holes (5).
7. A refrigerator (1) as in Claim 2 or 3, **characterized in that** two locking caps (7) arranged 180 degrees apart from each other and located within the second position slots (11) of the locking cap receiving hole (5) are in parallel alignment with the base of the refrigerator (1) in the opened position of the flap (4).
8. A refrigerator (1) as in Claim 5, 6 or 7, **characterized in that** two locking caps (7) at each lateral side of the flap (4) are simultaneously movable between the first and second position slots (10, 11) in two directions while the flap (4) is being opened or closed.
9. A refrigerator (1) as in Claim 2, 3, 5, 6, 7 or 8, **characterized in that** a locking cap (7) in the form of a circular protrusion traveling between the first and second position slots (10, 11) in clockwise or counterclockwise direction passes through a flexibly deformable position transition zone (12) thereinbetween.
10. A refrigerator (1) as in Claim 9, **characterized in that** the largest dimension of the opening of the position transition zone (12) is narrower compared to the diameter of the locking cap (7).
11. A refrigerator (1) as in Claim 1, 9 or 10, **characterized in that** the flap mounting devices (3) are made of a plastics material.
12. A refrigerator (1) as in Claim 9, 10 or 11, **characterized in that** the amount of deformation of the position transition zone (12) required to take a locking cap (7) from one position slot to another is substantially adjusted to prevent reverse movement of the locking cap (7) by itself.
13. A refrigerator (1) as in Claim 10, **characterized in that** the flap (4) is fixable in half-open position.

Fig. 1

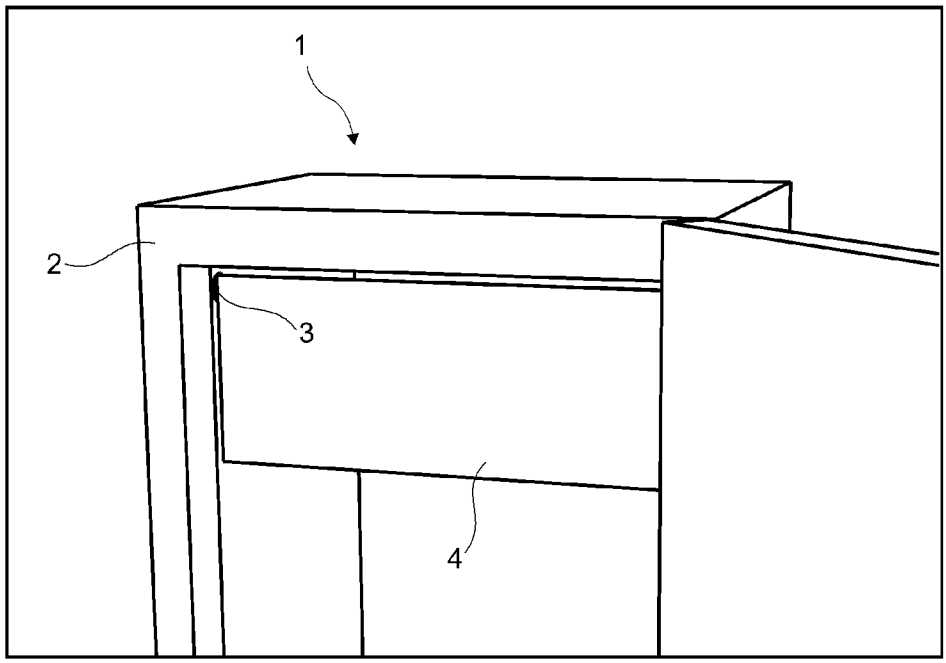


Fig. 2

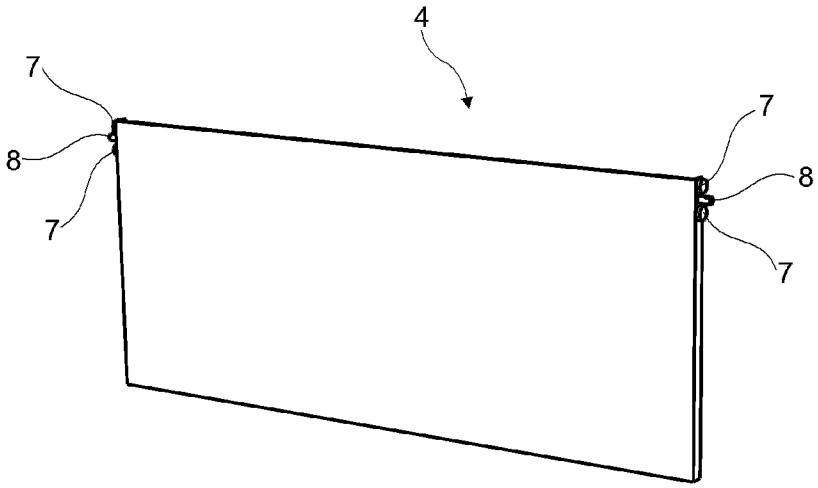


Fig. 3a

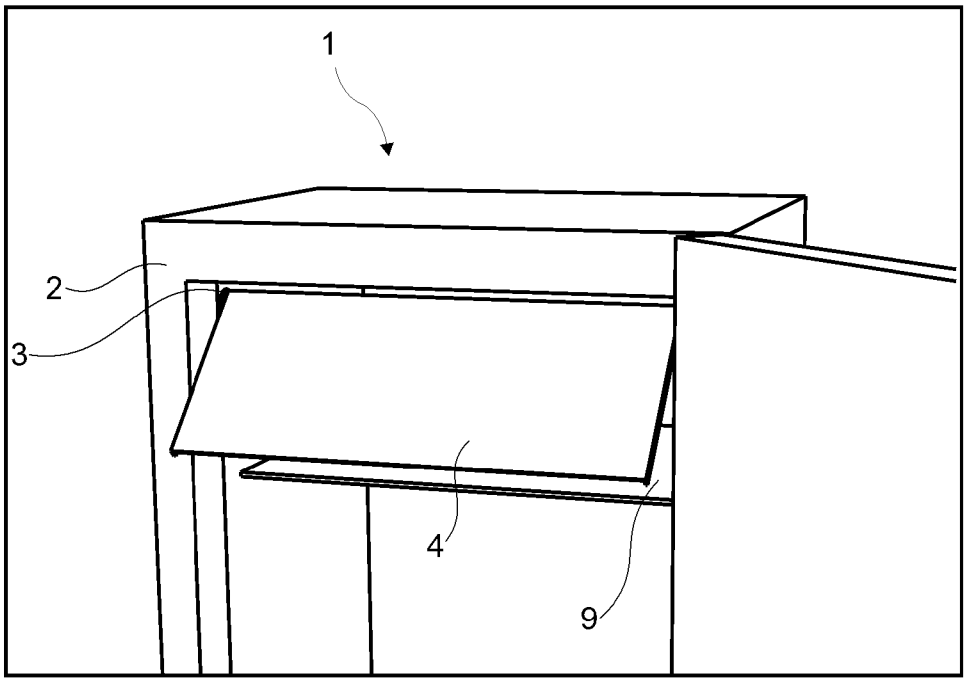


Fig. 3b

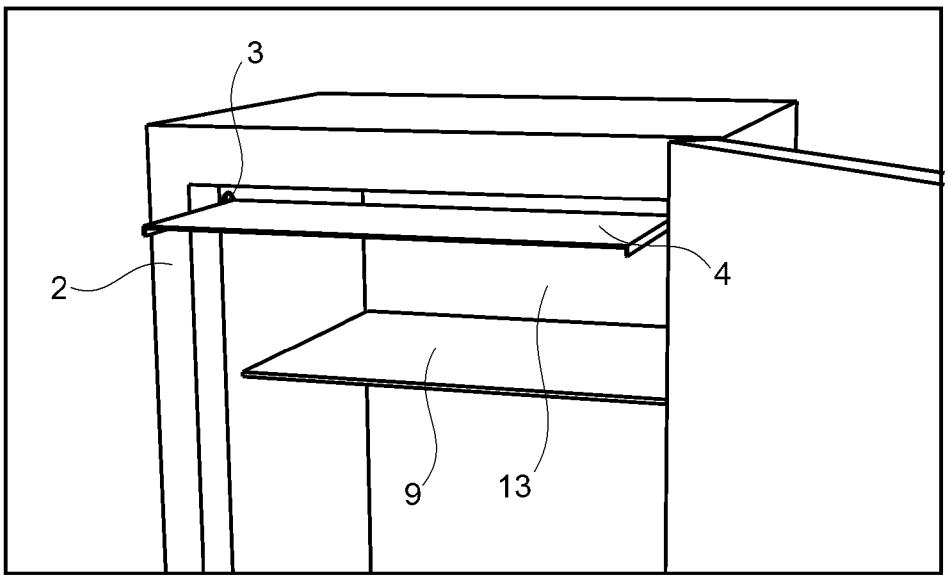
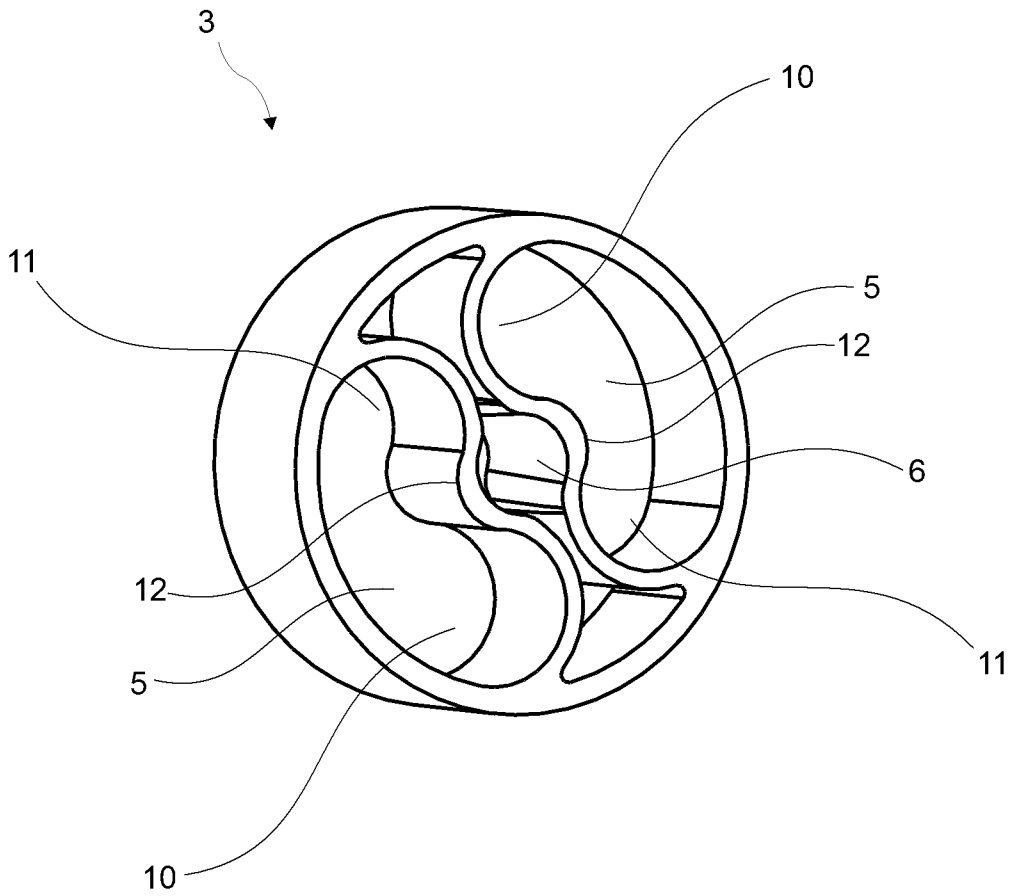


Fig. 4



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/065508

A. CLASSIFICATION OF SUBJECT MATTER
INV. E05D11/06 F25D23/02
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 E05D

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	EP 2 778 579 A1 (WHIRLPOOL CO [US]) 17 September 2014 (2014-09-17) abstract; figures 1-7 paragraphs [0001], [0010] - [0017]	1-4,9-13 5-8
Y A	GB 2 201 456 A (COLTRAN PRODUCTS LIMITED) 1 September 1988 (1988-09-01) abstract; figure 2 page 3 - page 4	5-8 1
A	EP 2 405 217 A2 (VESTEL BEYAZ ESYA SANAYI VE TICARET AS [TR]) 11 January 2012 (2012-01-11) the whole document	1-13
A	JP H04 53255 U (NOT KNOWN) 7 May 1992 (1992-05-07) the whole document	1

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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
29 January 2016	10/02/2016

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	Bejaoui, Amin

2

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/065508

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 87 207 236 U (NOT KNOWN) 9 March 1988 (1988-03-09) the whole document -----	1

2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2015/065508

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2778579 A1	17-09-2014	NONE	
GB 2201456 A	01-09-1988	NONE	
EP 2405217 A2	11-01-2012	EP 2405217 A2	11-01-2012
		TR 201005608 A2	21-12-2010
JP H0453255 U	07-05-1992	NONE	
CN 87207236 U	09-03-1988	NONE	