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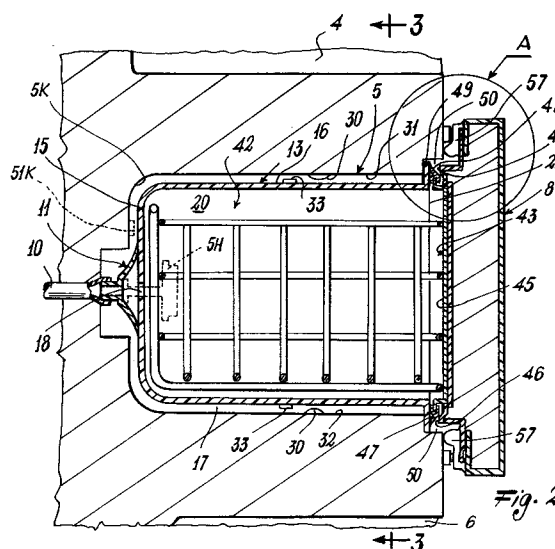
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I-21025 Comerio (VA) (IT)(54) **Improved refrigeration appliance such as a domestic refrigerator, freezer or the like, with a vacuum compartment.**

(57) A refrigeration appliance, such as a domestic refrigerator, freezer or the like, comprises a plurality of compartments with their own access apertures closed by usual doors, one of said compartments being advantageously of the convertible type with controlled temperature and being connected via a pipe to a vacuum-generating pumping member. A box member open on one side is removably contained in at least one of said compartments and is at least to a limited extent movable in a guided manner along walls of said compartment, the box member comprising an internal cavity arranged to communicate with the pipe connected to the pumping member via connection means, at the aperture of said box member there being provided means for its sealed closure supporting stiffening means arranged to lie against the cavity of said box member in which the vacuum is generated.

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This invention relates to a refrigeration appliance, such as a domestic refrigerator, freezer or the like, comprising a plurality of compartments with their own access apertures closed by usual doors, one of said compartments being advantageously of the convertible type with controlled temperature and being connected via a pipe to a pumping member for generating vacuum in said compartment.

Refrigeration appliances, such as refrigerators, of the stated type in which vacuum is generally generated within the entire compartment or in a box member provided with its own lid or closure element have been known for some time.

In the first case, the known constructions are often ineffective because of the inevitable seepage of air into the compartment, with consequent breaking of the vacuum

In the second case this seepage is prevented by locating a box member with its own lid inside the compartment. However this method is more costly than the first and comprises means, often not of simple construction, for opening the lid when the compartment door opens.

An object of the present invention is to provide a refrigeration appliance of the aforesaid type which is of simple construction and low cost.

A further object is to provide a refrigeration appliance of the aforesaid type in which vacuum is reliably obtained in a compartment thereof.

A further object is to provide a refrigeration appliance of the aforesaid type in which by opening said compartment the vacuum therein is automatically broken, said opening being achieved without requiring particular force by the user.

These and further objects which will be apparent to the expert of the art are attained by a device of the stated type, characterised in that a box member open on one side is removably contained in at least one of its compartments and is at least to a limited extent movable in a guided manner along walls of said compartment, the box member comprising an internal cavity arranged to communicate with the pipe connected to the pumping member via connection means, at the aperture of said box member there being provided means for its sealed closure supporting stiffening means arranged to lie against the cavity of said box member in which the vacuum is generated.

The present invention will be more apparent from the accompanying drawing, which is provided by way of non-limiting example and in which:

Figure 1 is a partial cross-section through an upright refrigerator constructed in accordance with the invention;

Figure 2 is an enlarged partial cross-section through a part of the refrigerator of Figure 1;

Figure 3 is a partial section on the line 3-3 of Figure 2; Figure 4 is an enlarged view of the part indicated by A in Figure 2.

With reference to said figures, an upright refrigerator is indicated overall by 1 and comprises a cabinet 2 insulated with a usual insulating material (such as polyurethane) 3 and comprising three compartments 4, 5, 6. These compartments have their own access apertures 4A, 5A, 6A closed by corresponding doors 7, 8 and 9; said compartments are specifically a usual freezer compartment 4, a refrigeration or preserving compartment 6 and a convertible compartment 5 able to be used at variable but controlled temperature, for example close to 0°C or to the temperature of a freezer compartment (-18°C).

Into one of these compartments, for example the convertible compartment 5, there opens a pipe 10 connected to a usual pumping member (not shown) for creating vacuum.

The pipe 10 is associated with a deformable member or sucker 11 arranged to cooperate with a box member 13 removably contained in the compartment 5.

The box member 13, constructed of a mechanically strong material (such as metal), comprises side walls 14, a rear wall 15, a top 16 and a base or lower part 17. The rear wall 15 comprises a through hole 18 to connect the interior cavity 20 of the box member 13 to the sucker 11 and hence to the pipe 10.

Said cavity is open on that side 22 thereof where the door 8 is provided.

The box member 13 comprises, externally on its side walls 14, wheels 25 (such as ball bearings or wheels of anti-friction material) movable within guides 26 associated with side walls 27 of the compartment 5. Said movement is limited by bosses 30 provided on the roof 31 and/or on the bottom 32 of the compartment 5, and with which corresponding axially movable elements 33 cooperate against the action of a spring 35.

Specifically (see Figure 4), each element 33 comprises a substantially annular body 36 having a cavity 34 containing a substantially T-shaped pin 37. The head 38 of this latter cooperates with an annular edge projecting into the cavity 34.

The pin is fixed in known manner to the outside of the top 16 of the box member 13, the spring being mounted about it to cooperate with said top and with the body 36.

Internally on its side walls 14 the box member 13 supports guides 40 within which there slide wheels 41 (wheels of anti-friction material or ball bearings) of a usual basket 42 contained advantageously removably in the box member 13.

The basket 42 is rigid with that side 43 of the door 8 which faces the open side 22 of the cavity

20 and is arranged to seal this latter.

In detail, on the side 43 there is provided a member 45 of a material of high mechanical strength (such as metal), comprising an end edge 46 arranged to cooperate via a seal member 47, maintaining vacuum in the box member 13, with a flanged edge 49 of this latter arranged in a relative seat 50 provided in a position corresponding with the compartment 5.

Advantageously, one of said edges 46 cooperates with a microswitch 51 positioned to correspond with the flanged edge 49 of the box member 13 and connected to a usual control circuit (not shown) for the pumping member.

The opening of this microswitch on opening the door 8 halts the pumping member.

Finally, the door 8 (formed in the usual manner with a plastic structure 53 into which polyurethane or another insulating material 54 is injected and with which the member 45 is rigid) carries usual magnetic gaskets 57 ensuring the thermal seal of the compartment.

It will now be assumed that a refrigerator of the aforescribed type is to be used. In particular, it will be assumed that food is contained in the basket 42.

To extract food from the compartment for its consumption, the door 8 is pulled to separate it from the cabinet 2.

This action (in the direction of the arrow F of Figure 1) exerts a pull on the basket 42 and on the box member 13, which at least partly separates from the sucker 11. This separation breaks the vacuum in said box member because air at atmospheric pressure can now penetrate into it through the hole 18, which is no longer protected by the sucker 11. The separation of the box member 13 from this latter is achieved by the cooperation between the wheels 41 on the basket and the guides 40 on said box member, and in particular by virtue of the fact that the vacuum causes the member 45 to adhere to the box member 13.

The separation of this latter from the sucker leads, as stated, to breakage of the vacuum within the box member. In this manner the pressure in its interior equals the external pressure, with the result that the member 45 separates from the box member 13. Consequently, by completely opening the door 8 the basket 42 is extracted from the box member 13, allowing food to be withdrawn from it. By the effect of a friction force which, although minimal, is always present between the wheels 41 of the basket 42 and its guides 40, the box member 13 moves still further away from the sucker 11 and halts against the bosses 30 when the elements 33 rest thereagainst.

In addition, the opening of the door and the separation of the member 45 from the box member

13 leads to the opening of the microswitch 51 and hence, as already stated, to stoppage of the pumping member which provides the vacuum.

If the door is now closed, the box member 13 is returned into contact with the sucker 11 and the microswitches 51 close. In this manner, if the operating pushbutton for the pumping member is again pushed, the pumping member immediately operates to create vacuum in the box member 13 to help to hermetically seal the door 8 against the cabinet 2.

It should be noted that because of the form of the elements 33, the box member 13 can be extracted from the compartment 5, for example for cleaning. To achieve this, the box member has to be pulled directly with the door open, to overcome the resistance of the springs 35 against which the elements 33 move.

In a modified embodiment according to the invention, the microswitch 51 is positioned on the rear wall 5K of the compartment 5 (as shown by dashed lines in Figure 2 and indicated by 51K). It cooperates with the box member 13 on opening and closure of the door with resultant movement of the box member 13 along the guides 26.

In a further modification, a fixed stop 5H (indicated by dashed lines in Figure 2) is associated with the rear wall 5K of the compartment 5, and against which the box member 13 halts when the door 8 is opened. In this case the bosses 30 and elements 33 can be omitted.

Various embodiments of the invention have been described. However other embodiments are possible (such as one in which vacuum sensors are provided within the box member 13 and are connected to vacuum indicators located on the front or control panel of the refrigeration appliance), these to be considered as falling within the scope of the present document.

Claims

1. A refrigeration appliance, such as a domestic refrigerator, freezer or the like, comprising a plurality of compartments with their own access apertures closed by usual doors, one of said compartments being advantageously of the convertible type with controlled temperature and being connected via a pipe to a pumping member for generating vacuum, characterised in that a box member (13) open on one side (22) is removably contained in at least one (5) of said compartments (4, 5, 6) and is at least to a limited extent movable in a guided manner along walls (27) of said compartment (5), the box member (13) comprising an internal cavity (20) arranged to communicate with the pipe (10) connected to the

pumping member via connection means (11), at the open side (22) of said box member (13) there being provided means for its sealed closure supporting stiffening means (45) arranged to lie against the cavity (20) of said box member (13) in which the vacuum is generated.

2. A refrigeration appliance as claimed in claim 1, characterised in that the box member (13) is contained in the convertible compartment of controlled temperature (5).
3. A refrigeration appliance as claimed in claim 1, characterised in that the box member (13) comprises wheels (25) movable within guides (26) rigid with walls (27) of the compartment (5) which contains it.
4. A refrigeration appliance as claimed in claim 1, characterised in that the box member comprises walls (14, 15, 16, 17) defining the internal cavity (20), one of said walls (15) having a through hole (18) arranged to communicate with the connection means (11) connected to the pipe (10) leading to the pumping member.
5. A refrigeration appliance as claimed in claim 4, characterised in that the box member (13) contains a basket (42) movable along guides (40) associated with walls (14) of said box member, said basket being associated with the closure means.
6. A refrigeration appliance as claimed in claim 5, characterised in that the closure means are the door (8) of the convertible compartment (5), the stiffening means being a member (45) formed from material of high mechanical strength associated with that side (43) of said door which faces the open side (22) of the box member (13).
7. A refrigeration appliance as claimed in claim 6, characterised in that the member (45) associated with the door (8) comprises an end edge (46) supporting a seal member (47) which is arranged to cooperate with a flanged edge (49) of the box member (13), said seal member enabling vacuum to be maintained within said box member (13).
8. A refrigeration appliance as claimed in claim 1, characterised by comprising a switch member (51) connected to the control circuit for the pumping member.
9. A refrigeration appliance as claimed in claims 7 and 8,

characterised in that the switch member (51) is positioned on the flanged edge (49) of the box member (13) and is operated by the door (8).

10. A refrigeration appliance as claimed in claim 6, characterised in that the switch member (51) is positioned on the rear wall (5K) of the convertible compartment (5).
11. A refrigeration appliance as claimed in claim 6, characterised in that the door (8) of the compartment (5) comprises a seal member (57) which provides a thermal seal for said compartment (5).
12. A refrigeration appliance as claimed in claim 7, characterised in that the flanged edge (49) of the box member (13) lies in a seat (50) provided in a position corresponding with the compartment (5) which contains said box member.
13. A refrigeration appliance as claimed in claim 1, characterised by comprising travel limiting means (30, 33) for limiting the movement of the box member (13) within its compartment.
14. A refrigeration appliance as claimed in claim 13, characterised in that the travel limiting means comprise projections (30) associated with walls (31) of that compartment (5) containing the box member (13) and cooperating with movable elements (33) against the action of springs (35) associated with said box member (13).
15. A refrigeration appliance as claimed in claim 13, characterised in that the travel limiting means comprise a fixed stop (5H) associated with the rear wall (5K) of the convertible compartment (5).
16. A refrigeration appliance as claimed in claim 1, characterised in that the connection means are a flexible sucker member cooperating with the box member (13) and with the pipe (10) connected to the pumping member.

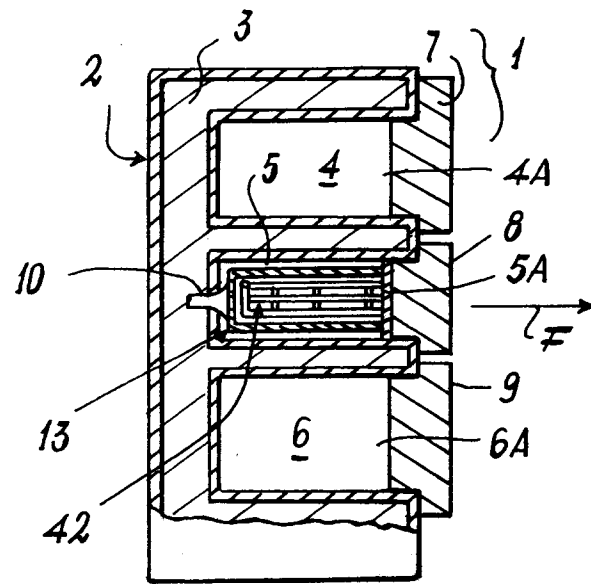


Fig. 1

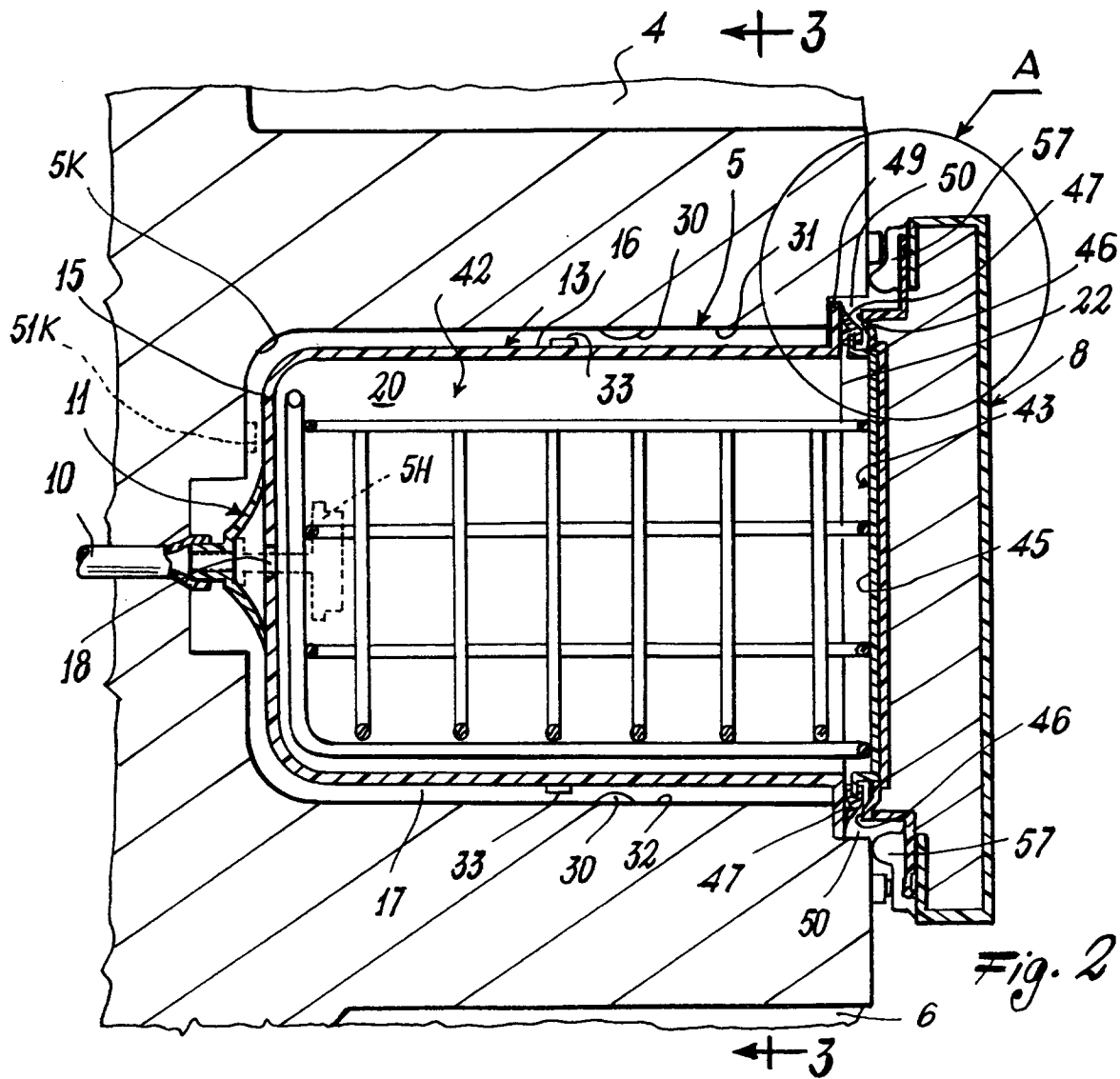


Fig. 2

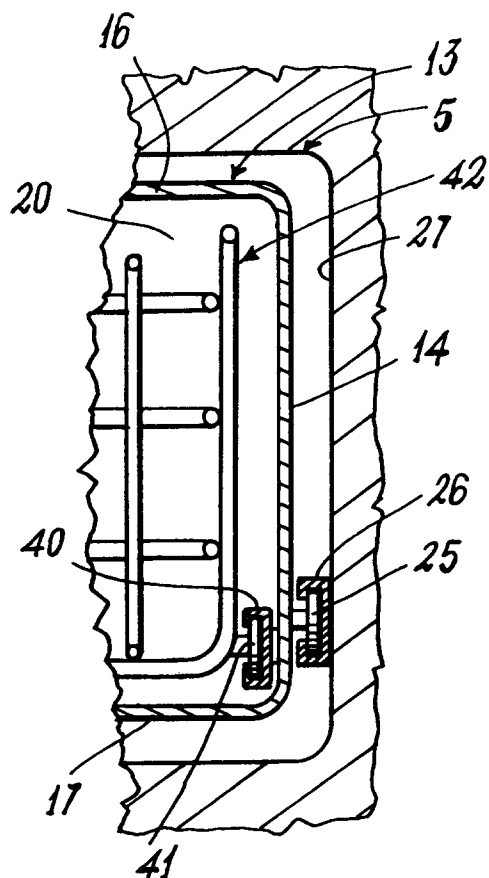


Fig. 3

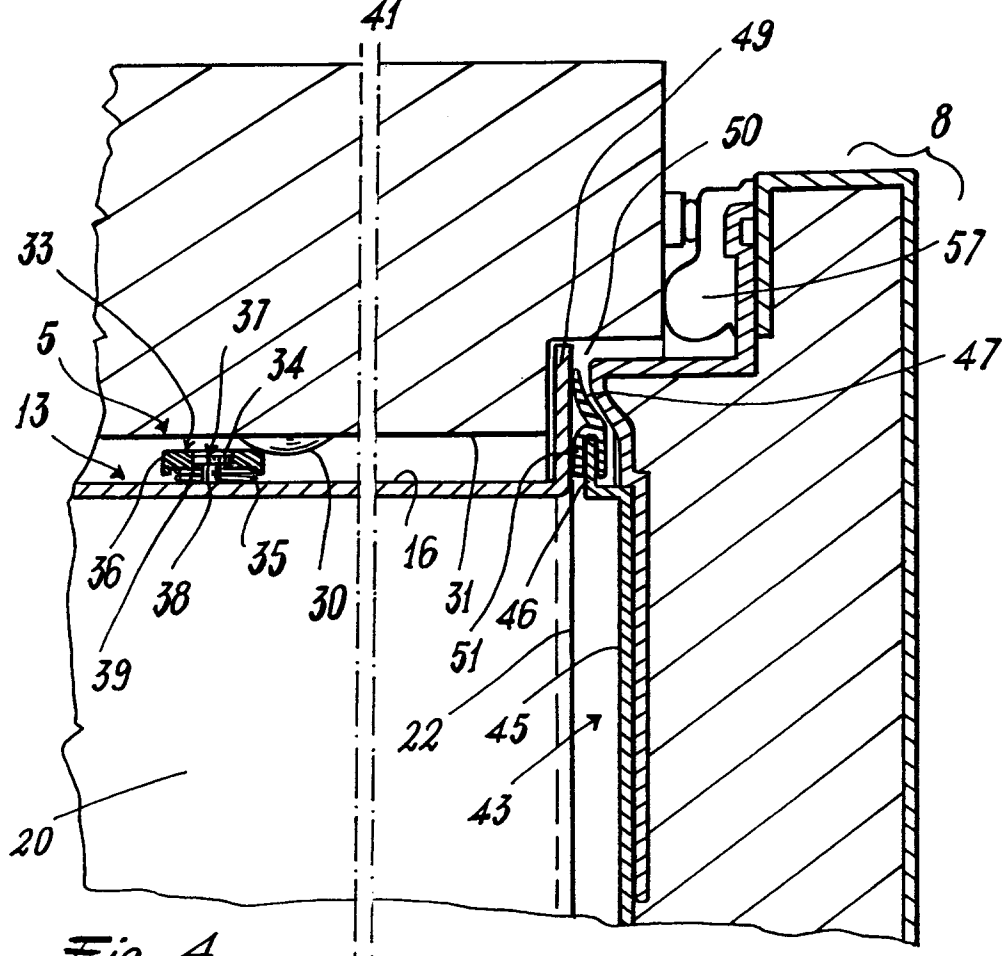


Fig. 4