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(54) Isolation element, in particular for the connection regions between parts of a refrigeration circuit

(57) An isolation element (3), in particular for the connection regions (20) between parts (21, 22) of a refrigeration circuit, namely between pipes (1) or between a pipe (21) and an evaporator (22), comprising a body (17) provided with a seat (15) for said connection region (20) or part (21, 22) of said circuit, and having an open-cell structure.

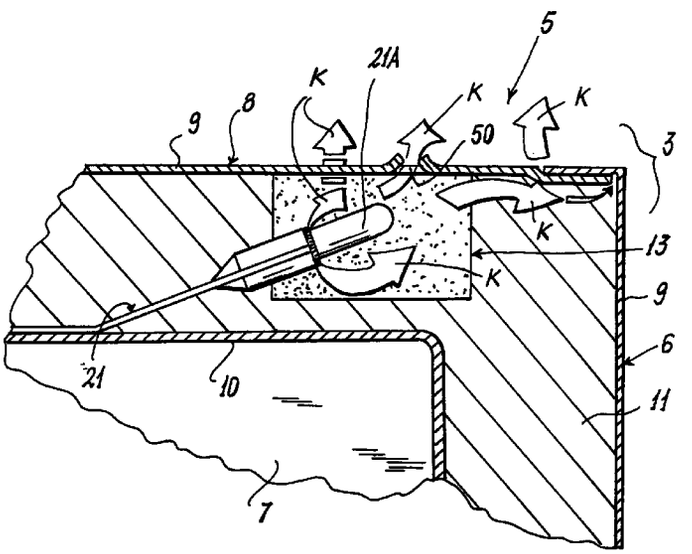

Fig. 4

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Description

This invention relates to an isolation element, particularly for the the connection regions between parts of a refrigeration circuit.

Following the need to replace chlorofluorocarbon refrigerant gases, it is now known to use within refrigeration circuits, for example of a domestic refrigerator, gases (such as isobutane) which could create problems should they leak from said circuit and saturate an environment or compartment within the refrigerator.

In this respect, in the improbable eventuality that the usual circuit components (pipes, evaporator etc.) develop cracks, microfractures or the like which could result in the refrigerant gas leaking into the refrigerator internal compartments with consequent saturation of such environments, serious problems could arise. Specifically, such leakages have their greatest (although minimal) possibility of occurring within the connection regions between pipes of said circuit or within the connection regions between such pipes and other circuit components (such as the evaporator or the usual capillary tube). This could be caused by poor welding in such regions or by accidental stresses to which said components may be subjected during refrigerator construction.

An object of the present invention is to provide an isolation element able to prevent the entry of improbable (but not totally impossible) refrigerant gas leakages therefrom into the interior compartments of the refrigeration appliance, in particular a refrigerator, freezer or the like, hence constituting a potential danger to the owner or user of the appliance, combined with the fact that large concentrations of such gas within said compartments (of small dimensions in relation to the possible concentration) can give rise to explosions if in the presence of possible detonating agents such as electrical discharges which may be generated by the usual electrical components within the refrigerator.

A particular object of the invention is to provide an isolation element for those regions of the refrigeration circuit in which there is the greatest (even though infinitesimal) probability of refrigerant gas leakage, namely the connection regions between the various circuit components.

A further object is to provide an element of the stated type which is of low cost and is easily and quickly positioned or formed within the refrigeration appliance.

These and further objects which will be apparent to the expert of the art are attained by an isolation element in accordance with the accompanying claims.

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

Figure 1 is an exploded view of one embodiment of an isolation element according to the invention associated with a pipe of a refrigeration circuit, for example of a domestic refrigerator;

Figure 2 is a partial longitudinal section through a domestic refrigerator provided with the isolation element of Figure 1;

Figure 3 is an exploded view of an isolation element according to the invention positioned in correspondence with a plate evaporator of a domestic refrigerator; and

Figure 4 is a partial longitudinal section through a domestic refrigerator provided with the isolation element of Figure 3.

With reference to said figures and initially to Figures 1 and 2, a refrigeration circuit (not shown in its entirety) comprises a pipe 1 for containing a refrigerant fluid such as isobutane. The pipe 1 is arranged to be positioned within the cabinet of a refrigeration appliance or domestic refrigerator 5 (shown only partly) comprising a side 6, an internal compartment 7 and a top 8. The outer walls 9 and inner walls 10 of the refrigerator define a usual interspace containing a usual thermoinsulating element 11, generally foamed polyurethane. The pipe 1 is positioned within this latter.

According to the invention, said pipe (Figures 1 and 2) is at least partly covered with an isolation element 13 comprising a body 17 of substantially cylindrical shape (generally of circular cross-section in the example), slotted longitudinally at 14 and provided with an internal cavity 15 able to contain the pipe 1. The body 17 is of open-cell structure and is arranged to enclose the pipe 1 advantageously such that the slot 14 faces an outer wall 9 of the cabinet 3.

Figures 3 and 4 show a modification of the invention. In these figures (in which parts corresponding to those of Figures 1 and 2 are indicated by the same reference numerals) the element 13 is associated with a circuit region 20 between a refrigerant fluid pipe 21 and a plate evaporator 22. The connection between these parts is formed in the usual manner, for example by welding. In the example under examination, the element 13 comprises a body 17 of polyhedral shape provided with apertures 25 and 26 opening into its two adjacent sides 28 and 29. These apertures enable those portions 21A and 22A of the pipe 21 and plate 22 in proximity to the region 20 to be inserted into the inner cavity 15 of the body 17, which cavity is shaped in such a manner as to receive said portions.

The body 17 of the element 13 shown in Figures 1 to 4 has an open-cell structure and is formed for example of polyurethane. It can be flexible or rigid and can be formed by reacting isocyanates and/or polyesters or polyesters with added foaming agents and/or catalysts of known type. The constituent material of the body 17 can either be a virgin material or can originate from recycling or from salvage and re-working of pieces already formed and used (such as the thermoinsulating material present in scrap refrigerators).

The body 17 can also be formed independently of the refrigerator by moulding, continuous casting and/or rolling. The body obtained in this manner is finished to

the required dimensions and fitted to the refrigeration circuit before the final completion of the refrigerator, ie before introducing the thermoinsulating material into the cabinet 3.

Alternatively, by the use of simultaneous injection, said thermoinsulating material is fed into the cabinet 3 substantially simultaneously with the feed into said cabinet of the material which is to form the open-cell structure of the body 17 of each element 13. This second method of forming each element 13 positioned within the cabinet 3 obviously results in the creation of bodies 17 for said elements which are not perfectly geometrical. An alternative to this latter method for forming each element 13 is to form apertures within the outer walls 9 of the cabinet 3 in positions corresponding with those regions of the refrigeration circuit to be "covered" with the elements 13, then inject the element 11 into the cabinet, and then subsequently inject into this latter through the apertures in the walls 9 the material which is to form the elements 13.

In all cases, each element 13 becomes associated with a corresponding part of the refrigeration circuit (whether this be a circuit region between different parts or an actual part of the circuit, such as a pipe, an evaporator part, etc.) in such a manner as to lie against the outer walls 9 of the refrigerator cabinet 3. In this manner (see Figure 4), in the hypothetical eventuality of a refrigerant gas leakage from the refrigeration circuit, the gas passes into the open-cell structure of the element 13 adjacent to the cracked circuit region (the gas leaking through the microfracture or microfractures) instead of penetrating into the refrigerator thermoinsulating element 11, which is of higher density than said element 13. By virtue of its structural characteristics, said element directs the leaking gas (arrows K in Figure 4) towards the adjacent wall 9, from which it can escape to the environment external to the refrigerator. This improbable but not impossible gas leakage could possibly also cause cracking 50 of the walls 9, as shown in Figure 4.

The invention therefore enables a refrigeration circuit to safely use a refrigerant gas which could be potentially dangerous in case of leakage from the circuit, this being achieved by the presence at various parts of the circuit (and in particular at circuit regions where percentage-wise the probability of leakage is greater) of elements 13 shaped and formed in such a manner as to direct this gas towards the outside of the refrigerator in which said circuit is located. This prevents any gas accumulation within the refrigerator, a situation which could lead to obvious problems.

Claims

1. An isolation element (13) for part of the refrigeration circuit of a refrigeration appliance (5) such as a domestic refrigerator, a freezer or the like, said part being a circuit component such as a pipe (1), the evaporator (22) or the like or a circuit region (20) between two components (21, 22) of said circuit, said element comprising a body (17) provided with a seat (15) for said part (21, 22) of said circuit and having a structure of density less than that of the usual thermoinsulating element (11) of the refrigeration appliance in which said circuit is at least partly embedded.

2. An isolation element as claimed in claim 1, characterised in that its body (17) has an open-cell structure.

3. An isolation element as claimed in claim 1, characterised by being of flexible or rigid polyurethane.

4. An isolation element as claimed in claim 3, characterised in that the polyurethane body (17) comprises isocyanates and/or polyesters with added foaming agents.

5. An isolation element as claimed in claim 1, characterised in that the body (17) is of material originating from the re-use of recycled materials.

6. An isolation element as claimed in claim 1, characterised by being positioned in correspondence with outer walls (9) of the cabinet (3) of the refrigeration appliance (5).

7. An isolation element as claimed in claim 1, characterised by being formed by moulding.

8. An isolation element as claimed in claim 1, characterised by being formed by rolling.

9. An isolation element as claimed in claim 1, characterised by being formed by injection directly into the refrigeration appliance (5).

10. An isolation element as claimed in claim 9, characterised in that the injection is simultaneous with the injection of thermoinsulating material (11) into the refrigeration appliance (3).

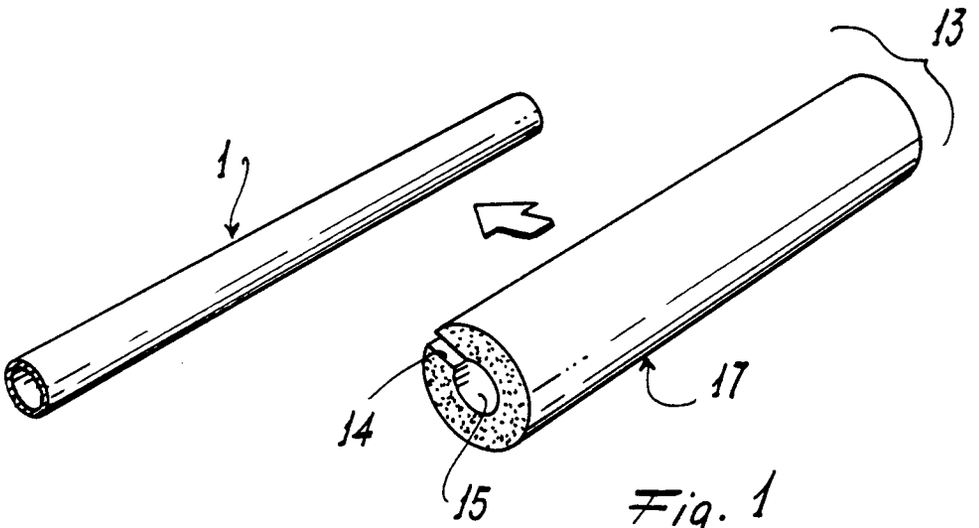

Fig. 1

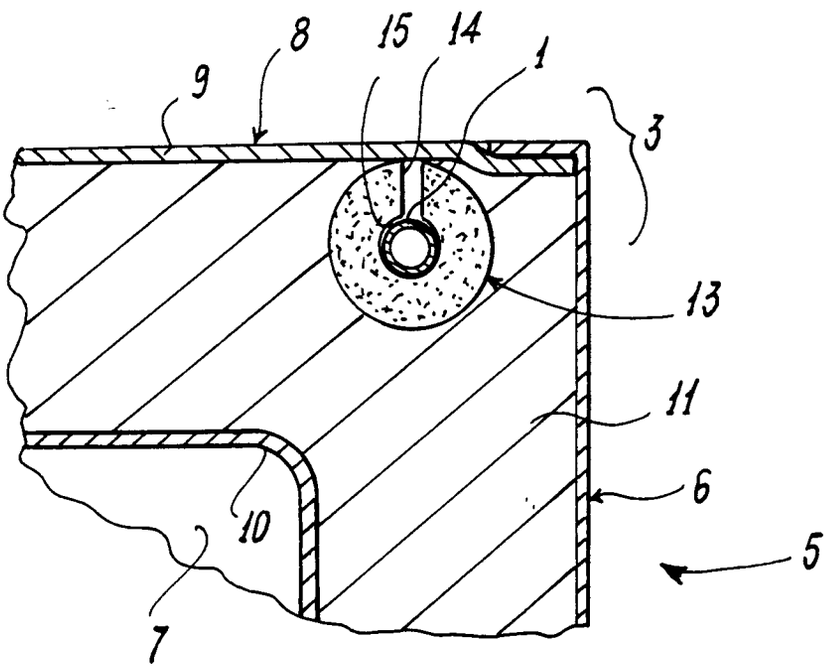

Fig. 2

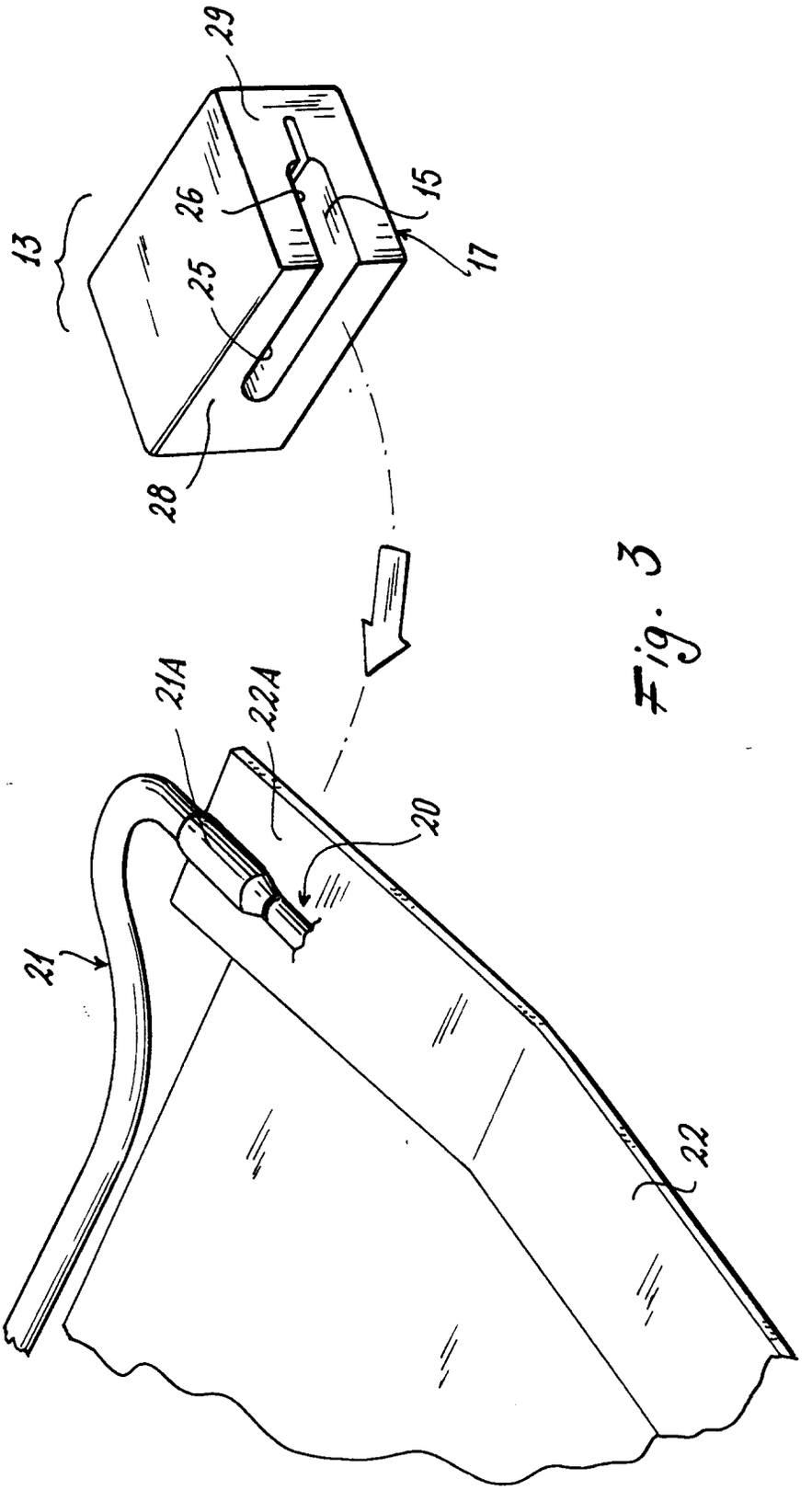

Fig. 3

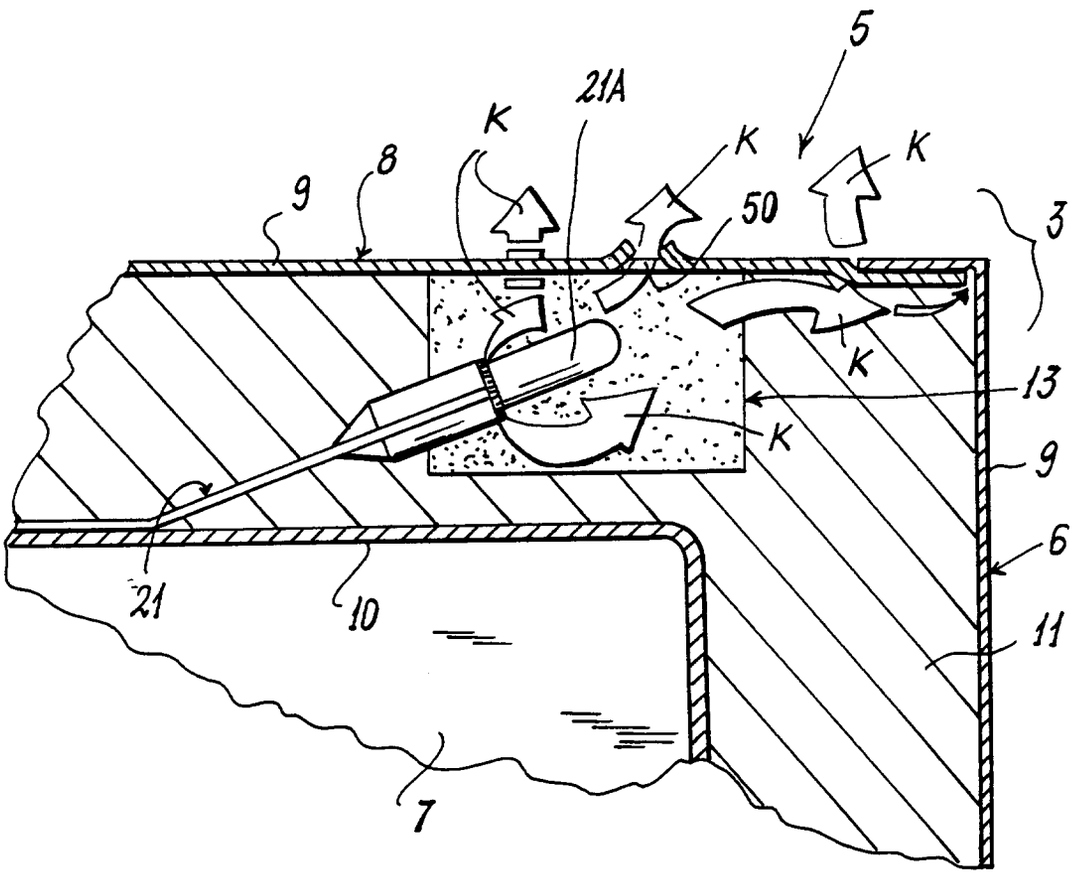

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 94 11 8083

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)
A	US-A-1 829 748 (HOFFERBERTH) * page 1, line 38 - line 72; figures *	1,9	F25D23/06
A	FR-A-2 205 179 (ROBERT BOSCH HAUSGERÄTE G.M.B.H.) * page 1, line 11 - line 17 * * page 3, line 34 - page 4, line 2; figures *	1,6	
A	DE-A-14 51 113 (SIEMENS-ELEKTROGERÄTE GMBH) * page 4, last paragraph; figures *	1,6	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F25D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 March 1995	Eccetto, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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