

(19)



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(11)

EP 0 713 066 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
08.09.1999 Bulletin 1999/36

(51) Int Cl.⁶: **F25D 23/06**

(21) Application number: **94118083.8**

(22) Date of filing: **17.11.1994**

(54) **Refrigeration appliance with an isolation element, in particular for the connection regions between parts of a refrigeration circuit**

Kühlgerät mit einem Isolierelement, insbesondere für Anschlussbereiche von Teilen eines Kältekreislaufes

Appareil de réfrigération comprenant un élément d'isolation, en particulier pour les régions de connexion entre des parties d'un circuit frigorifique

(84) Designated Contracting States:
DE ES FR GB

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(43) Date of publication of application:
22.05.1996 Bulletin 1996/21

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(56) References cited:
DE-A- 1 451 113 **FR-A- 2 205 179**
US-A- 1 829 748

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Description

[0001] This invention relates to a refrigeration appliance as defined in the preamble of claim 1. Such an appliance is known, for example, from FR-A-2 205 179.

[0002] 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.

[0003] 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.

[0004] 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.

[0005] 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.

[0006] 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.

[0007] These and further objects which will be apparent to the expert of the art are attained by a refrigeration appliance in accordance with the accompanying claims.

[0008] 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 ex-

ample 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.

[0009] 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.

[0010] 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.

[0011] 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.

[0012] 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).

[0013] 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.

[0014] 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.

[0015] 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 of the walls 9, as shown in Figure 4.

[0016] 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. A refrigeration appliance (5) such as a domestic re-

frigerator, a freezer or the like, having outer walls (9) and inner walls (10) which define an interspace containing a thermoinsulating element (11), said appliance further having an isolation element (13) for part of the refrigeration circuit, 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 isolation element (13) comprising a body (17) provided with a seat (15) for said part of said circuit, characterized in that said isolation element (13) has a structure of density less than that of the thermoinsulating element (11) of the refrigeration appliance, said circuit is at least partly embedded in the thermoinsulating element (11) and said isolation element (13) lies against the outer walls (9) of the refrigeration appliance.

2. A refrigeration appliance as claimed in claim 1, characterised in that the body (17) of the isolation element (13) has an open-cell structure.
3. A refrigeration appliance as claimed in claim 1, characterised by the element (13) being of flexible or rigid polyurethane.
4. A refrigeration appliance as claimed in claim 3, characterised in that the polyurethane body (17) comprises isocyanates and/or polyesters with added foaming agents.
5. A refrigeration appliance as claimed in claim 1, characterised in that the body (17) is of material originating from the re-use of recycled materials.
6. A refrigeration appliance as claimed in claim 1, characterised by the element (13) being formed by moulding.
7. A refrigeration appliance as claimed in claim 1, characterised by the element (13) being formed by rolling.
8. A refrigeration appliance as claimed in claim 1, characterised by the element (13) being formed by injection directly into the refrigeration appliance (5).
9. A refrigeration appliance as claimed in claim 9, characterised in that the injection is simultaneous with the injection of thermoinsulating material (11) into the refrigeration appliance (5).

Patentansprüche

1. Kühlgerät (5), wie ein Haushaltskühlschrank, ein Gefrierschrank oder dergleichen, mit Außenwänden (9) und Innenwänden (10), die einen ein Wär-

meisolierungselement (11) enthaltenden Zwischenraum bilden, ferner mit einem Isolierungselement (13) für ein Teil des Kühlkreises, wobei das Teil eine Kühlkreis-komponente, beispielsweise eine Rohrleitung (1), ein Verdampfer (22) oder dergleichen, oder ein Kühlkreisbereich (20) zwischen zwei Kühlkreis-komponenten (21, 22) ist und wobei das Isolierungselement (13) einen Körper (17) aufweist, der mit einem Sitz (15) für das genannte Kühlkreis-teil versehen ist,

dadurch gekennzeichnet, daß das Isolierungselement (13) eine Struktur von geringerer Dichte als die des Wärmeisolationselements (11) des Kühlgeräts aufweist, daß der Kühlkreis mindestens teilweise im Wärmeisolationselement (11) eingebettet ist und daß das Isolierungselement (13) an den Außenwänden (9) des Kühlgeräts anliegt.

2. Kühlgerät nach Anspruch 1, dadurch gekennzeichnet, daß der Körper (17) des Isolierungselements (13) eine Offenzellstruktur hat.

3. Kühlgerät nach Anspruch 1, dadurch gekennzeichnet, daß das Isolierungselement (13) aus elastischem oder festem Polyurethan besteht.

4. Kühlgerät nach Anspruch 3, dadurch gekennzeichnet, daß der Polyurethan-Körper (17) Isocyanate und/oder Polyester mit zugesetzten Ausschäumungsmitteln aufweist.

5. Kühlgerät nach Anspruch 1, dadurch gekennzeichnet, daß der Körper (17) aus Material besteht, das aus wiederverwertetem Material stammt:

6. Kühlgerät nach Anspruch 1, dadurch gekennzeichnet, daß das Isolierungselement (13) gespritzt ist.

7. Kühlgerät nach Anspruch 1, dadurch gekennzeichnet, daß das Isolierungselement (13) durch Rollen geformt ist.

8. Kühlgerät nach Anspruch 1, dadurch gekennzeichnet, daß das Isolierungselement (13) durch unmittelbares Spritzen in das Kühlgerät (5) gebildet ist.

9. Kühlgerät nach Anspruch 8, dadurch gekennzeichnet, daß die Einspritzung gleichzeitig mit der Einspritzung des Wärmeisolationmaterials (11) in das Kühlgerät (5) erfolgt.

Revendications

1. Appareil électroménager de réfrigération (5), tel qu'un réfrigérateur domestique, un congélateur ou analogue, ayant des parois externes (9) et des parois internes (10) qui délimitent un espace intermédiaire contenant un élément (11) d'isolation thermique, l'appareil ayant en outre un élément d'isolement (13) d'une partie du circuit de réfrigération, cette partie étant un composant du circuit tel qu'un tube (1), l'évaporateur (22) ou analogue ou une région (20) de circuit comprise entre deux composants (21, 22) du circuit, l'élément d'isolement (13) comprenant un corps (17) ayant un siège (15) pour ladite partie de circuit, caractérisé en ce que l'élément d'isolement (13) a une structure de masse volumique inférieure à celle de l'élément d'isolation thermique (11) de l'appareil électroménager de réfrigération, le circuit étant enrobé au moins partiellement dans l'élément d'isolation thermique (11), et l'élément d'isolement (13) est placé contre les parois externes (9) de l'appareil électroménager de réfrigération.

2. Appareil électroménager de réfrigération selon la revendication 1, caractérisé en ce que le corps (17) de l'élément d'isolement (13) a une structure à cellules ouvertes.

3. Appareil électroménager de réfrigération selon la revendication 1, caractérisé en ce que l'élément (13) est formé d'un polyuréthane flexible ou rigide.

4. Appareil électroménager de réfrigération selon la revendication 3, caractérisé en ce que le corps (17) de polyuréthane contient des isocyanates et/ou des polyesters avec des agents de moussage qui ont été ajoutés.

5. Appareil électroménager de réfrigération selon la revendication 1, caractérisé en ce que le corps (17) est formé d'un matériau tiré d'une réutilisation de matériaux recyclés.

6. Appareil électroménager de réfrigération selon la revendication 1, caractérisé en ce que l'élément (13) est formé par moulage.

7. Appareil électroménager de réfrigération selon la revendication 1, caractérisé en ce que l'élément (13) est formé par calandrage.

8. Appareil électroménager de réfrigération selon la revendication 1, caractérisé en ce que l'élément (13) est formé par injection directe dans l'appareil électroménager de réfrigération (5).

9. Appareil électroménager de réfrigération selon la

revendication 9, caractérisé en ce que l'injection est simultanée à l'injection du matériau d'isolation thermique (11) dans l'appareil électroménager de réfrigération (5).

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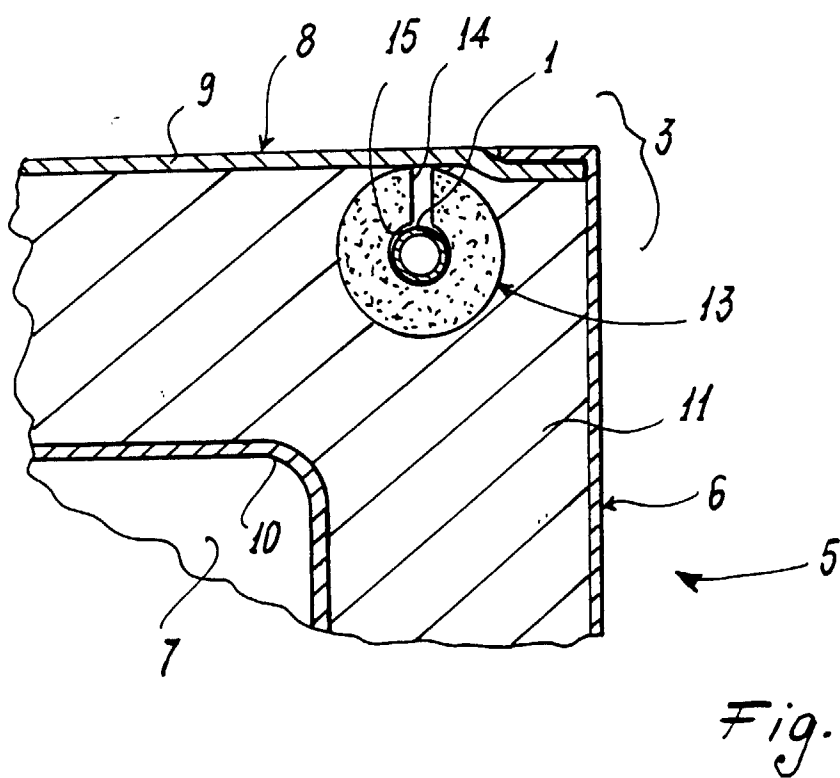
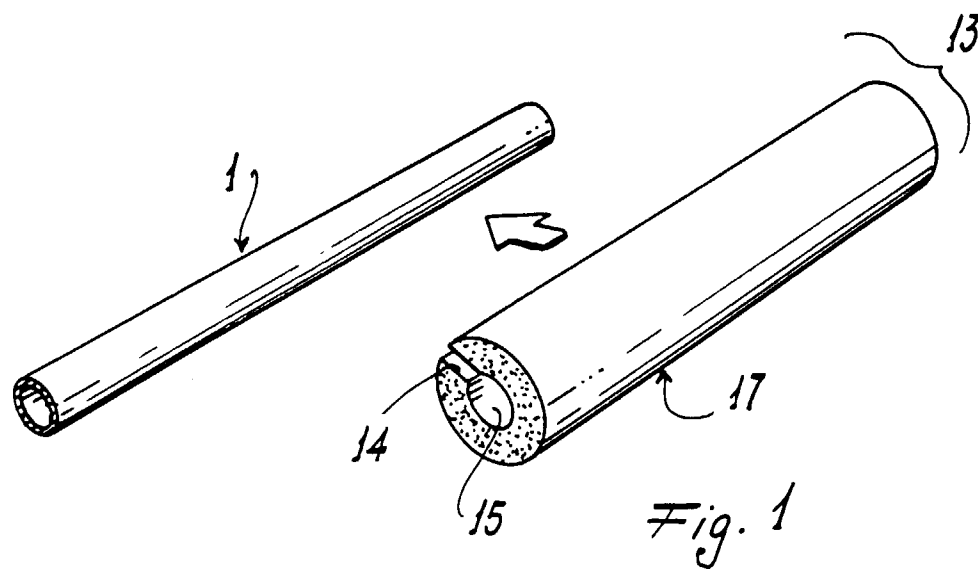
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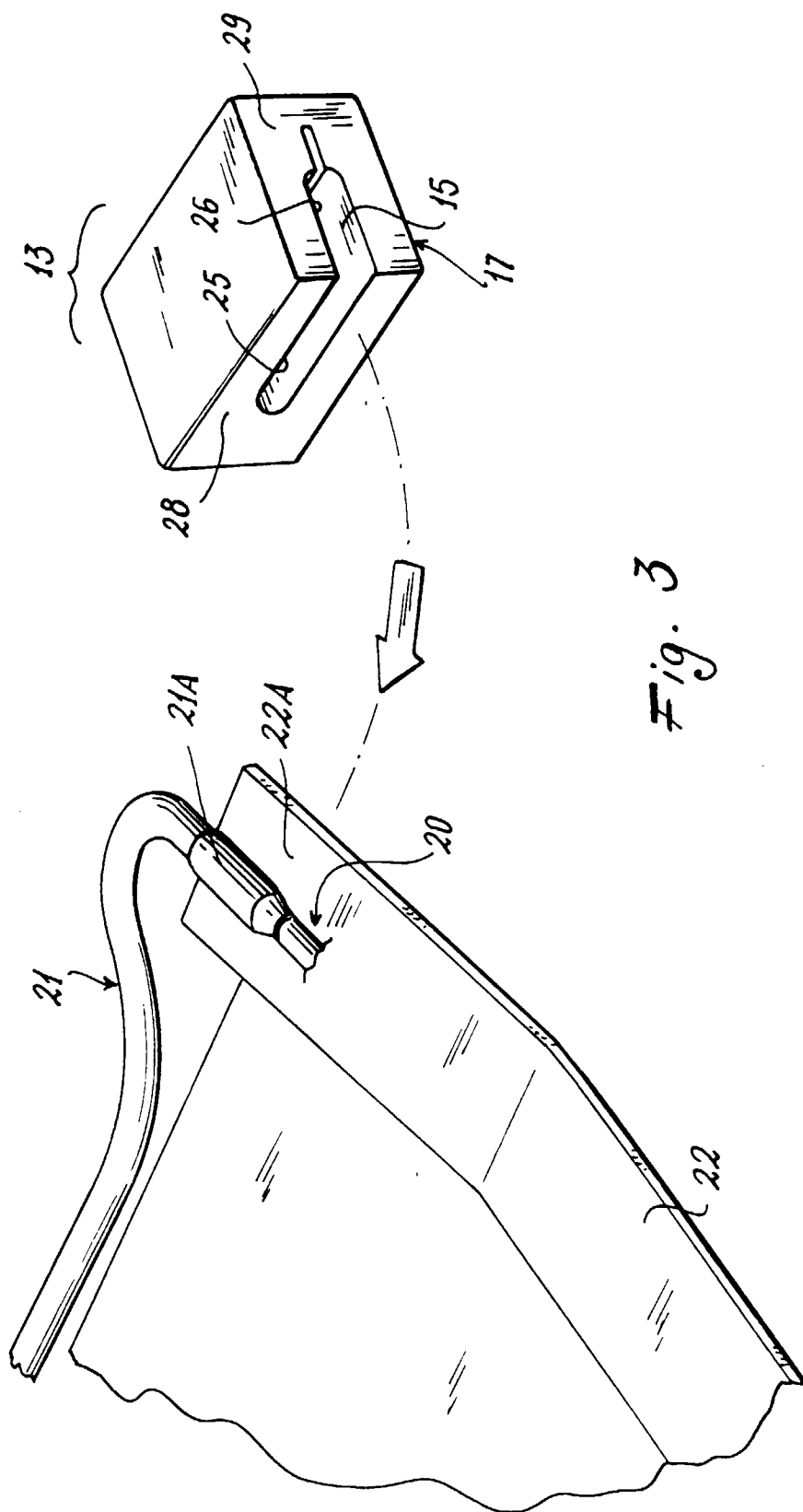


Fig. 3

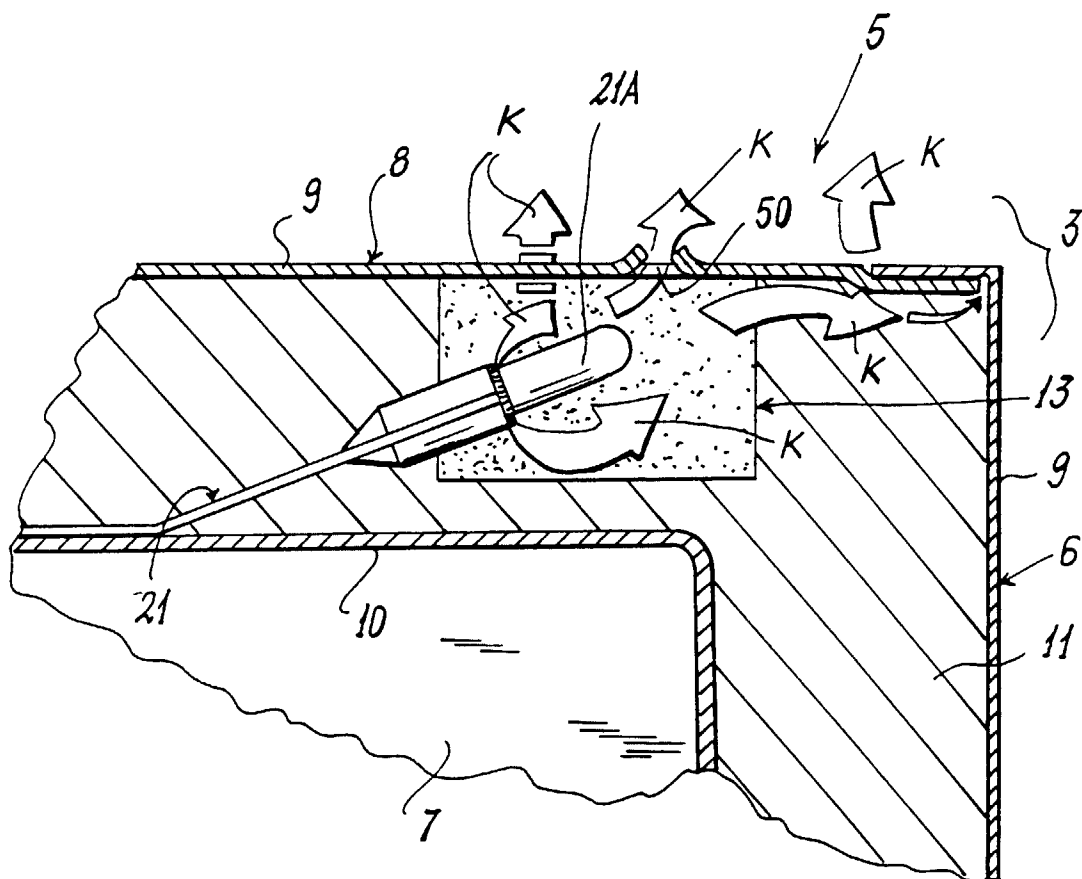


Fig. 4