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**(54) TRANSFER VESSEL FOR USE IN TRANSFERRING PRODUCTS BETWEEN RADIATION
CONTAINMENT CHAMBERS**

TRANSFERBEHÄLTER ZUR VERWENDUNG BEIM TRANSFERIEREN VON STOFFEN ZWISCHEN
RADIOAKTIVEN ABSCHIRMBEHÄLTERN

RECIPIENT DE TRANSFÉRT POUR L'USAGE POUR TRANSFÉRER DES PRODUITS ENTRE DES
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Description

BACKGROUND TO THE INVENTION

[0001] THIS invention relates to a transfer vessel for use in transferring products between radiation containment chambers, and more particularly but not exclusively, to transfer products from one chamber to another without cross-contamination. The invention also relates to a process of transferring products between radiation containment chambers without cross-contamination.

[0002] Shielded nuclear radiation containment chambers are commonly referred to as hot cells, with the word "hot" in this context referring to radioactivity. Hot cells are used in both the nuclear-energy and the nuclear-medicines industries. They are required to protect individuals from radioactive isotopes by providing a safe containment chamber inside which scientists and routine operators can work with the radioactive material using suitable control and manipulation equipment. Hot cells are, for example, commonly used in the nuclear medicines industry in the production of radiopharmaceuticals.

[0003] In the context of this specification the word "product" will be used to describe any matter that is normally worked with inside a hot cell, and in particular extends to solids, liquids and gasses.

[0004] In the hot cell environment, frequent use is made of transportation containers or transfer vessels. These containers are configured and dimensioned to connect to a door of the hot cell, and the inside of the transfer vessel is exposed to the hot cell when the doors of the hot cell and transportation container are opened, which happens simultaneously. The design and configuration of these containers, as well as their interaction with the hot cells via the hot cell doors, are well known in the art. The containers are typically placed inside an additional shielded transportation container, known in the trade as a "padirac", when transported from one cell to another.

[0005] Typically, the transfer vessel comprises a cylindrical receptacle having a first closed end and a second open end. A flange formation extends radially outwardly from the second open end, and in use engages a complementary receiving formation provided on the hot cell in order for the receptacle to be securable to the hot cell. A lid is also provided, and in use closes off the inner volume of the receptacle. The lid engages the container, and in particular includes a connecting formation which is complementary to a flange and receiving formation extending inwardly from the flange formation on the open end of the receptacle. The lid is of the same dimensions and configuration of a door provided in the hot cell. The lid and the door in the hot cell are furthermore adapted to engage one another in use so as to form a door-lid combination. Furthermore, when the door of the hot cell is opened, the lid contemporaneously disengages from the receptacle, in order for the lid to be opened when the door of the hot cell is opened. Importantly, during oper-

ation the operatively outer surface of the lid is covered and hence shielded by the operatively outer surface of the door of the hot cell, and neither surface is therefore exposed to radiation when the door-lid combination is opened. A number of standard door sizes are used in industry, and some hot cells have more than one door (for example a 270mm diameter door and a concentric 105mm diameter door) in order to receive differently sized transfer vessels having different lid sizes.

[0006] In some situations there is a need to transfer product from a first hot cell to a second hot cell, especially when the second hot cell is remotely situated, but without the second hot cell being contaminated by the undesirable radioactive material present in the first cell. This is typically achieved by using a third hot cell as an intermediate transfer cell, in which the undesirable radioactive contaminant can be removed or decontaminated. However, this is not always possible due to constraints insofar as availability and productivity of hot cell space are concerned. It will be appreciated that the product cannot merely be transferred between the first and second hot cell using a transfer vessel, as the inside of the transfer vessel will in use be in sequential flow communication with the insides of both hot cells, thus resulting in contamination of the second hot cell by exposure to contaminants emanating from the first hot cell, with the transfer vessel effectively serving as contamination conduit.

[0007] A process and installation for transferring products from a contaminated enclosure into a second enclosure, without contaminating the latter, is disclosed in US 5,226,781 (Glachet et al). In accordance with the invention disclosed in US 5,226,781 it is proposed for an empty transfer vessel to engage a first, contaminated hot cell. A second container is located inside the transfer vessel in such a way that the outside of the lid of the second container is engaged to the inside of the lid of the transfer vessel. Thus, when a door of the hot cell and the matching coupled lid of the transfer vessel are opened, the lid of the second container is simultaneously opened and the second container can be accessed, so that product located inside the contaminated hot cell can be placed inside the second container. This is done while the second container remains in position inside the transfer vessel, with the configuration being such that the second container seals off the internal volume of the transfer vessel against any contamination. The transfer vessel therefore remains "clean" during this step as do the outside of the lid of the second container and the inside of the lid of the transfer vessel by virtue of their engagement as described above. The lid-combination of the transfer vessel and the second container is then closed (with the product now housed inside the second container) and the transfer vessel is ready for transportation. The transfer vessel subsequently engages the target hot cell, in such a way that this time only the lid of the transfer vessel is engaged to the door of the target hot cell so that the second container, still in a closed state, may be moved into the target hot cell. At this time the inner volume of the transfer vessel

will be contaminated by any contamination of the second hot cell, but this does not matter because the transfer has been effected, and no further contamination can occur. The lid can be closed, and the second container, housing the product, remains behind in the target hot cell. It is correct that the target hot cell has, at this time, not been contaminated from contaminants emanating from the contaminated first hot cell.

[0008] However, the target cell will be contaminated if the second container is opened in order to provide access to the product. It follows that the above process will only be useful for the purposes of storage, and that it will not prevent contamination when there is a need to work with the product inside the target cell.

[0009] It is accordingly an object of the invention to provide a transfer vessel and transfer arrangement for use in transferring products between radiation containment chambers that will, at least partially, alleviate the above disadvantages.

[0010] It is also an object of the invention to provide a transfer vessel and transfer arrangement for use in transferring products between radiation containment chambers which will be a useful alternative to existing transfer vessels.

[0011] It is a further object of the invention to provide a transfer process for use in transferring products between radiation containment chambers that will, at least partially, alleviate the above disadvantages.

[0012] It is also an object of the invention to provide a transfer process for use in transferring products between radiation containment chambers which will be a useful alternative to existing transfer processes.

SUMMARY OF THE INVENTION

[0013] According to the invention there is provided a transfer vessel as set out in claim 1, suitable for use in transferring products between radiation containment chambers, the transfer vessel including:

an outer receptacle having a closed end and an open end, with a securing flange extending radially outwardly from the open end, the securing flange being suitable for securing the outer receptacle to a receiving formation provided on a hot cell;
a lid which is removably securable to the open end of the receptacle so as to define a first enclosed volume when the lid is located on the receptacle;
a displaceable closure provided in the lid; and
an inner receptacle extending from the lid into the outer receptacle, wherein the inner receptacle includes a closed end and an open end, and wherein the displaceable closure is removably securable relative to the open end of the inner receptacle so as to define a second enclosed volume;
the configuration being such that the first enclosed volume and the second enclosed volume can selectively be accessed by opening the lid and the dis-

placeable closure respectively.

[0014] The lid and the displaceable closure are configured to engage two complementary doors provided on the hot cell contemporaneously.

[0015] The lid and the displaceable closure are also configured to be displaceable between open and closed positions independently from one another so as to allow only the displaceable closure or the combination of the lid and the displaceable closure to be displaced when a corresponding door on the hot cell is displaced.

[0016] There is provided for a product transfer arrangement to be provided between the first enclosed volume and the second enclosed volume, the product transfer arrangement enabling the transfer of product between the enclosed volumes without allowing transfer of contaminating matter between the enclosed volumes.

[0017] The product transfer arrangement may be in the form of a septum which enables the use of a cannula transfer process.

[0018] Preferably the transfer arrangement includes two septa.

[0019] A storage container or sample vessel for receiving the product may be provided inside the first enclosed volume, and may be in flow communication with the septum by way of a suitable conduit.

[0020] There is provided for the outer receptacle and the inner receptacle to be of cylindrical configuration.

[0021] The inner receptacle may be integrally formed with the lid, or may be releasably securable inside a complementary aperture provided in the lid.

[0022] The septum may be located in an end wall of the inner receptacle.

[0023] According to a further aspect of the invention there is provided a method of transferring products between radiation containment chambers, the method including the steps of:

providing a transfer vessel including a first enclosed volume or enclosure, a second enclosure, and a product transfer arrangement suitable for transferring product between the two enclosures without transferring contaminating matter;
securing the transfer vessel to a first hot cell and bringing the second enclosure in contact with the internal volume of the first hot cell;
transferring product via the product transfer arrangement from the second enclosure to the first enclosure;
sealing the second enclosure;
releasing the transfer vessel from the first hot cell and securing the transfer vessel to a second hot cell; bringing the first enclosure in contact with the internal volume of the second hot cell;
moving the product in the first enclosure into the second hot cell.

[0024] There is provided for the first closure to be se-

lectively closed off by a displaceable lid, and for the second closure to be selectively closed off by a displaceable closure in the lid, and for the lid and the displaceable closure contemporaneously to engage two complementary doors provided on the hot cell when the transfer vessel is secured to the hot cell.

[0025] There is provided for the transfer vessel to be the transfer vessel as referred to above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] A preferred embodiment of the invention is described by way of a non-limiting example, and with reference to the accompanying drawings in which:

Figure 1 is a cross-sectional side view of a transfer vessel in accordance with an embodiment of the invention;

Figure 2 is a an enlarged cross-sectional side view of the lid of the transfer vessel of Figure 1; and

Figures 3a to 3f are schematic representations showing the transfer sequence used to transfer product utilizing the transfer vessel.

DETAILED DESCRIPTION OF INVENTION

[0027] Referring to the drawings, in which like numerals indicate like features, a non-limiting example of a transfer vessel for use in transferring products between radiation containment chambers in accordance with the invention is generally indicated by reference numeral 10.

[0028] For the purposes of clarity, and before arriving at the invention, the general interaction between transfer vessels and hot cells will now be discussed in more detail. Radiation containment chambers or hot cells are well known in the trade, and are not discussed in any detail. Suffice it to say that these hot cells (not shown) include an enclosed volume 120 which is sufficiently shielded from the environment to house radioactive material. The enclosed volume 120 can be accessed through a door 110. During use, a transfer vessel 10 is secured relative to the door 110 on the outside of the hot cell, in order for the inner volume 25 of the transfer vessel to be exposed to the enclosed volume 120 of the hot cell when the door 110 is opened. The door 110 of the hot cell and the lid 40 of the transfer vessel are designed to be of a complementary nature, and to effectively become a single unit once the transfer vessel is secured to the hot cell. The lid 40 of the transfer vessel remains engaged to the door 110 of the hot cell, and they therefore open and close as a single unit. The significance of this is that the operatively outer faces of both the door and the lid are not exposed to the enclosed volume of the hot cell during the transfer process, and are therefore also not contaminated. This

feature is not new, but is an important aspect of hot cell technology that has also been incorporated into the present invention.

[0029] The new transfer vessel 10, as well as the door 110 of the hot cell required for use with the transfer vessel, will now be discussed in more detail. Referring to figures 1 and 2, the first hot cell 100 (not shown) includes a double door 110 that consists of a small circular inner door 111 and a large circular outer door 112. The inner door 111 is located on the outer door 112, but can be opened and closed independently of the outer door 112. A flange receiving formation 130 extends from a sidewall 140 of the hot cell.

[0030] The transfer vessel 10 includes an outer receptacle 20, and an inner receptacle 30 and a lid 40. The outer receptacle 20 is in the form of a cylindrical body 21 having a closed end 22 and an open end 23. A securing flange 24 extends radially outwardly from the open end 23 of the cylindrical body 21, and is configured and dimensioned to engage the flange receiving formation 130 extending from the sidewall 140 of the hot cell. The arrangement may be a bayonet or screw type engagement configuration in which the transfer vessel 10 is secured to the hot cell upon rotation of the transfer vessel 10, and hence the securing flange 24, relative to the hot cell, and hence the flange receiving formation 130. A first enclosed volume 25 is defined inside the outer receptacle 20.

[0031] The inner receptacle 30 is located inside the outer receptacle 20. The inner receptacle 30 is in the form of a cylindrical body 31 having a closed end 32 and an open end 33, with a second enclosed volume 35 defined inside the inner receptacle 30. The inner receptacle does not have to be of large volume, and will be sized depending on the purpose that it will fulfil, as is described in more detail below. The inner receptacle 30 is formed as part of the lid 40, or is alternatively securable to the lid 40, in order for the lid 40 and the inner receptacle 30 to be functionally integral in use. The lid 40 removably seals off the outer receptacle, and can be removed or opened (together with the inner receptacle 30) to provide access to the outer receptacle 20.

[0032] The lid 40 includes a displaceable closure 43 suitable for covering the open end 33 of the inner receptacle 30 when in use. The displaceable closure 43 can be removed from the lid 40 when the small door 111 of the hot cell engages engagement formations 42 provided on the outer surface of the displaceable closure 43 while at the same time the engagement formation 34 engaging the displaceable closure 43 to the inner receptacle 30 is thereby disengaged, as is known in the art. As mentioned above, the lid 40 in totality also acts as a removable cover for the open end 23 of the outer receptacle 20. Again, engagement formations 41 are provided, and are in use engaged by the large door 112 while engagement formation 44 is simultaneously disengaged in order for the lid 40 to be displaced away from the outer receptacle 20 when the large door 112 of the hot cell is opened. The lid 40 is therefore configured to allow selective access to

either the outer receptacle 20 or the inner receptacle 30, depending which one of the complementary sized and configured doors (112 or 111 respectively) of the hot cell is opened.

[0033] Furthermore, in order for the engagement formations 34, 41, 42 and 44 to respectively engage or disengage by the same turning action of the transfer vessel 10, the respective flanges 24 and 41 of the outer receptacle 20 and lid 40 had to be modified to allow for the greater angular displacement required for the small door 111 and displaceable closure 43 engagement configuration. Thus, both small and large doors and their respective complementary displaceable closure and lid are eventually fully engaged or disengaged contemporaneously. This is a very important aspect of the invention, and is key to the implementation of the product transfer methodology described below.

[0034] A transfer arrangement 50 is provided for transferring product from the inner receptacle 30 to the outer receptacle 20. The transfer arrangement 50 is typically in the form of a dual septum arrangement 51 of which one end is in flow communication with the inner receptacle 30 through a connecting spigot 52, and an opposing end is in flow communication with the outer receptacle 20 through a connecting spigot 53. In use a sample vessel 60 is located on a rotating basket 65 inside the outer receptacle 20. The rotating basket 65 ensures that the sample vessel 60 remains upright through gravitational bias, even when the transfer vessel 10 is rotated. The sample vessel 60 is in flow communication with the transfer arrangement 50 by way of a conduit 61 that extends between the sample vessel 60 and the connecting spigot 53.

[0035] The use of the transfer vessel 10 to transfer products between radiation containment chambers or hot cells, without cross-contamination between the chambers, is described with reference to Figures 3(a) to 3(f).

[0036] Figure 3(a) shows a transfer vessel 10 in accordance with the invention, the transfer vessel including an outer receptacle 20 and an inner receptacle 30 as described above. Both receptacles are at this time sealed from the environment by way of the closed lid 40 and closure 43. The door 110 of the first hot cell 100 (not shown) is also in a closed position, and more particularly both the small door 111 and the large door 112 are closed. At this time the inside 120 of the first hot cell is therefore isolated from the environment, as is the enclosed volumes of both the outer receptacle 20 and the inner receptacle 30. It is important to note that the two receptacles are also not in flow communication with one another, even though the inner receptacle 30 is at least partially housed inside the outer receptacle 20 and lid 40.

[0037] In Figure 3(b) the transfer vessel 10 is secured to the door 110 of the first hot cell by rotating the transfer vessel relative to the hot cell in order for the securing flange 24 that extends from the open end 23 of the outer receptacle 20 to engage the complementary flange receiving formation 130 provided on the first hot cell. At the

same time the large door 112 engages the lid 40 of the transfer vessel 10 at engagement formation 41, whereas the small door 111 engages the displaceable closure 43 provided on the lid 40 at engagement formation 42. During this process the lid 40 and the large door 112 temporarily becomes a single functional object, as do the closure 43 and the small door 111. Opening of the large door 112 will therefore automatically result in opening of the lid 40, whereas opening of the small door 111 will also result in opening of the closure 43. This is not only important from an operational point of view, but also insofar as contamination is concerned, because neither the outer surface of the doors (111 and 112) nor the outer surfaces of the lid 40 and closure 43 will be exposed to the inside of the first hot cell, and will therefore not be contaminated.

[0038] In Figure 3(c) the small door 111, and hence the closure 43 on the lid 40, are opened, and the inside 35 of the inner receptacle 30 is now in flow communication with the inner volume 120 of the first hot cell. Product 70 can now be transferred from the first hot cell into the inner receptacle 30. It is important to note that the enclosed volume of the outer receptacle 20 is isolated relative to the inner volume of the first hot cell and the enclosed volume 35 of the inner receptacle 30, and the outer receptacle is therefore not contaminated during this step.

[0039] The product 70 can now be transferred from the inner receptacle 30 to the outer receptacle 20 by way of the product transfer arrangement 50, which in this particular example is in the form of a septum arrangement 51 as described above. More particularly, the product 70 is transferred to the product cylinder or sample vessel 60 located inside the outer receptacle 20.

[0040] In Figure 3(d) the small door 111, and hence the closure 43 has been closed, and by rotating the transfer vessel 10 in the opposite direction relative to the hot cell, the first hot cell and the transfer vessel 10 have therefore been isolated from one another and also from the environment. The enclosed volume 35 of the inner receptacle 30 has however been contaminated by exposure to the contaminating matter inside the first hot cell. It is imperative that this contamination is not transferred to the second hot cell 200 (not shown) to which the product 70 is being transferred. However, the product 70 has been transferred to the outer receptacle 20 via a product transfer arrangement such as 50 without concomitant contamination of the outer receptacle 20, and the remaining requirement is therefore to transfer the product from the outer receptacle 20 to the second hot cell, without exposing the second hot cell to the enclosed volume of the inner receptacle 30 of the transfer vessel.

[0041] In order to achieve this, the transfer vessel 10 is secured to the second hot cell 200, as is shown in Figure 3(e). This action is identical to when the transfer vessel 10 was secured to the first hot cell, as described with reference to Figure 3(b). It is foreseen that the second hot cell will preferably only be provided with a large

door 212, so that in the absence of a small door 211 accidental exposure of the inner receptacle 30 to the enclosed volume of the second hot cell cannot take place. The inner receptacle 30 in any event remains closed during this part of the operation, and the small door 211 will be superfluous. However, this is not an absolute requirement, and it will still be possible to use the same methodology should a small door be present.

[0042] The large door 212 and lid 40 is now opened, as is shown in Figure 3(f), and the inner volume 220 of the second hot cell is now in flow communication with the enclosed volume 25 of the outer receptacle 20 of the transfer vessel 10. The product 70, housed inside the product cylinder/(storage cylinder/sample vessel) 60 in the outer receptacle 20, is now transferred to the second hot cell. At this time, the contaminated enclosed volume 35 of the inner receptacle 30 is not exposed to the second hot cell, and the contamination emanating from the first hot cell is therefore not transferred to the second hot cell. The large door 212 and the lid 40 are now closed, and the transfer process has been completed.

[0043] It will be noted that the product 70 has therefore been transferred from the first hot cell to the second hot cell without requiring the use of an intermediate hot cell, and also without resulting in cross-contamination between the hot cells.

Claims

1. A transfer vessel suitable for use in transferring products between radiation containment chambers, the transfer vessel including:

an outer receptacle having a closed end and an open end, with a securing flange extending radially outwardly from the open end, the securing flange being suitable for securing the outer receptacle to a receiving formation provided on a hot cell;

a lid which is removably securable to the open end of the receptacle so as to define a first enclosed volume when the lid is located on the receptacle;

a displaceable closure provided in the lid; and
an inner receptacle extending from the lid into the outer receptacle, wherein the inner receptacle includes a closed end and an open end, and wherein the displaceable closure is removably securable relative to the open end of the inner receptacle so as to define a second enclosed volume;

the configuration being such that the first enclosed volume and the second enclosed volume can selectively be accessed by opening the lid and the displaceable closure respectively;

characterised in that a product transfer arrangement is provided between the first en-

closed volume and the second enclosed volume, the product transfer arrangement enabling the transfer of product between the enclosed volumes without allowing transfer of contaminating matter between the enclosed volumes.

2. The transfer vessel of claim 1 in which the lid and the displaceable closure are configured to engage two complementary doors provided on the hot cell contemporaneously.

3. The transfer vessel of claim 2 in which the lid and the displaceable closure are configured to be displaceable between open and closed positions independently from one another so as to allow only the displaceable closure or the combination of the lid and the displaceable closure to be displaced when a corresponding door on the hot cell is displaced.

4. The transfer vessel of any one of the preceding claims in which the product transfer arrangement is in the form of a septum.

5. The transfer vessel of claim 4 in which the transfer arrangement includes two septa.

6. The transfer vessel of claims 4 or 5 in which a storage container or sample vessel for receiving the product is provided inside the first enclosed volume, and is in flow communication with the product transfer arrangement by way of a suitable conduit.

7. The transfer vessel of any one of the preceding claims in which the outer receptacle and the inner receptacle are of cylindrical configuration.

8. The transfer vessel of any one of the preceding claims in which the inner receptacle is integrally formed with the lid, or may be releasably securable inside a complementary aperture provided in the lid.

9. A method of transferring products between radiation containment chambers, the method including the steps of:

providing a transfer vessel including a first enclosed volume or enclosure, a second enclosure, and a product transfer arrangement suitable for transferring product between the two enclosures without transferring contaminating matter;

securing the transfer vessel to a first hot cell and bringing the second enclosure in contact with the internal volume of the first hot cell;

transferring product via the product transfer arrangement from the second enclosure to the first enclosure;

sealing the second enclosure;

releasing the transfer vessel from the first hot cell and securing the transfer vessel to a second hot cell;
 bringing the first enclosure in contact with the internal volume of the second hot cell;
 moving the product in the first enclosure into the second hot cell.

10. The method of claim 9 in which there is provided for the first closure to be selectively closed off by a displaceable lid, and for the second closure to be selectively closed off by a displaceable closure in the lid, and for the lid and the displaceable closure contemporaneously to engage two complementary doors provided on the hot cell when the transfer vessel is secured to the hot cell.
11. The method of claim 10 in which the transfer vessel is the transfer vessel of any one of claims 1 to 8.

Patentansprüche

1. Transferbehälter, geeignet zur Verwendung beim Transferieren von Produkten zwischen Strahlenschutzkammern, wobei der Transferbehälter Folgendes beinhaltet:

einen äußeren Aufnahmebehälter, der ein geschlossenes Ende und ein offenes Ende aufweist, mit einem Sicherungsflansch, der sich vom offenen Ende radial nach außen erstreckt, wobei der Sicherungsflansch zum Befestigen des äußeren Aufnahmebehälters an einer Aufnahmeformation geeignet ist, die an einer heißen Zelle bereitgestellt ist;
 einen Deckel, der entferntbar an dem offenen Ende des Aufnahmebehälters befestigbar ist, um so ein erstes umschlossenes Volumen zu definieren, wenn sich der Deckel auf dem Aufnahmebehälter befindet;
 einen verschiebbaren Verschluss, der in dem Deckel bereitgestellt ist; und
 einen inneren Aufnahmebehälter, der sich von dem Deckel in den äußeren Aufnahmebehälter erstreckt, wobei der innere Aufnahmebehälter ein geschlossenes Ende und ein offenes Ende beinhaltet, und wobei der verschiebbare Verschluss relativ zu dem offenen Ende des inneren Aufnahmebehälters entferntbar befestigbar ist, um so ein zweites umschlossenes Volumen zu definieren;
 wobei die Konfiguration derart ist, dass das erste umschlossene Volumen und das zweite umschlossene Volumen selektiv jeweils durch Öffnen des Deckels und des verschiebbaren Verschlusses zugänglich sind;
dadurch gekennzeichnet, dass eine Produkt-

transferanordnung zwischen dem ersten umschlossenen Volumen und dem zweiten umschlossenen Volumen bereitgestellt ist, wobei die Produkttransferanordnung den Transfer eines Produkts zwischen den umschlossenen Volumina ermöglicht, ohne einen Transfer kontaminierender Stoffe zwischen den umschlossenen Volumina zu erlauben.

2. Transferbehälter nach Anspruch 1, in dem der Deckel und der verschiebbare Verschluss konfiguriert sind, um mit zwei komplementären Türen, die an der heißen Zelle bereitgestellt sind, gleichzeitig in Eingriff zu gelangen.
3. Transferbehälter nach Anspruch 2, in dem der Deckel und der verschiebbare Verschluss konfiguriert sind, um unabhängig voneinander zwischen offenen und geschlossenen Positionen verschiebbar zu sein, um so nur dem verschiebbaren Verschluss oder der Kombination des Deckels und des verschiebbaren Verschlusses zu erlauben, verschoben zu werden, wenn eine entsprechende Tür an der heißen Zelle verschoben wird.
4. Transferbehälter nach einem der vorstehenden Ansprüche, in dem die Produkttransferanordnung in der Form eines Septums ist.
5. Transferbehälter nach Anspruch 4, in dem die Produkttransferanordnung zwei Septen beinhaltet.
6. Transferbehälter nach Anspruch 4 oder 5, in dem ein Lagergefäß oder Probenbehälter zum Aufnehmen des Produkts im Inneren des ersten umschlossenen Volumens bereitgestellt ist und durch eine geeignete Leitung in Strömungsverbindung mit der Produkttransferanordnung steht.
7. Transferbehälter nach einem der vorstehenden Ansprüche, in dem der äußere Aufnahmebehälter und der innere Aufnahmebehälter von zylindrischer Gestalt sind.
8. Transferbehälter nach einem der vorstehenden Ansprüche, in dem der innere Aufnahmebehälter in einem Stück mit dem Deckel gebildet ist oder lösbar an einer Innenseite einer komplementären Öffnung befestigbar sein kann, die im Deckel bereitgestellt ist.
9. Verfahren zum Transferieren von Produkten zwischen Strahlenschutzkammern, wobei das Verfahren die folgenden Schritte beinhaltet:

Bereitstellen eines Transferbehälters, der ein erstes umschlossenes Volumen oder einen ersten Raum, einen zweiten Raum und eine Pro-

dukttransferanordnung beinhaltet, die zum Transferieren eines Produkts zwischen den zwei Räumen, ohne Transfer kontaminierender Stoffe, geeignet ist;

Befestigen des Transferbehälters an einer ersten heißen Zelle und In-Kontakt-Bringen des zweiten Raums mit dem Innenvolumen der ersten heißen Zelle;

Transferieren von Produkt über die Produkttransferanordnung vom zweiten Raum zum ersten Raum;

Abdichten des zweiten Raums;

Freigeben des Transferbehälters aus der ersten heißen Zelle und Befestigen des Transferbehälters an einer zweiten heißen Zelle;

In-Kontakt-Bringen des ersten Raums mit dem Innenvolumen der zweiten heißen Zelle;

Bewegen des Produkts im ersten Raum in die zweite heiße Zelle.

10. Verfahren nach Anspruch 9, in dem vorgesehen ist, dass der erste Raum selektiv durch einen verschiebbaren Deckel verschlossen wird und der zweite Verschluss selektiv durch einen verschiebbaren Verschluss im Deckel verschlossen wird und der Deckel und der verschiebbare Verschluss gleichzeitig mit zwei komplementären Türen in Eingriff gelangen, die an der heißen Zelle bereitgestellt sind, wenn der Transferbehälter an der heißen Zelle befestigt ist.
11. Verfahren nach Anspruch 10, in dem der Transferbehälter der Transferbehälter nach einem der Ansprüche 1 bis 8 ist.

Revendications

1. Récipient de transfert approprié pour une utilisation dans le transfert de produits entre des chambres de confinement de radiations, le récipient de transfert incluant :

un réceptacle extérieur ayant une extrémité fermée et une extrémité ouverte, avec une bride de fixation s'étendant de façon radiale vers l'extérieur à partir de l'extrémité ouverte, la bride de fixation étant appropriée pour fixer le réceptacle extérieur à une formation de réception prévue sur une cellule chaude ;

un couvercle qui peut être fixé de façon amovible à l'extrémité ouverte du réceptacle de façon à définir un premier volume clos lorsque le couvercle est placé sur le réceptacle ;

une fermeture pouvant être déplacée prévue dans le couvercle ; et

un réceptacle intérieur s'étendant à partir du couvercle jusque dans le réceptacle extérieur, dans lequel le réceptacle intérieur inclut une ex-

trémité fermée et une extrémité ouverte, et dans lequel la fermeture pouvant être déplacée peut être fixée de façon amovible par rapport à l'extrémité ouverte du réceptacle intérieur de façon à définir un second volume clos ;

la configuration étant telle que l'on peut accéder au premier volume clos et au second volume clos de manière sélective en ouvrant respectivement le couvercle et la fermeture pouvant être déplacée ;

caractérisé en ce qu'un agencement de transfert de produit est prévu entre le premier volume clos et le second volume clos, l'agencement de transfert de produit validant le transfert de produit entre les volumes clos sans permettre le transfert de matière contaminante entre les volumes clos.

2. Récipient de transfert selon la revendication 1, dans lequel le couvercle et la fermeture pouvant être déplacée sont configurés pour mettre en prise deux trappes complémentaires prévues sur la cellule chaude de façon simultanée.
3. Récipient de transfert selon la revendication 2, dans lequel le couvercle et la fermeture pouvant être déplacée sont configurés pour pouvoir être déplacés entre des positions ouverte et fermée indépendamment l'un de l'autre afin de permettre seulement à la fermeture pouvant être déplacée ou à la combinaison du couvercle et de la fermeture pouvant être déplacée d'être déplacée quand une trappe correspondante sur la cellule chaude est déplacée.
4. Récipient de transfert selon l'une quelconque des revendications précédentes, dans lequel l'agencement de transfert de produit est sous la forme d'une cloison.
5. Récipient de transfert selon la revendication 4, dans lequel l'agencement de transfert inclut deux cloisons.
6. Récipient de transfert selon les revendications 4 ou 5, dans lesquelles un conteneur de stockage ou un récipient d'échantillon pour recevoir le produit est prévu à l'intérieur du premier volume clos, et est en communication de flux avec l'agencement de transfert de produit à l'aide d'un conduit approprié.
7. Récipient de transfert selon l'une quelconque des revendications précédentes, dans lequel le réceptacle extérieur et le réceptacle intérieur ont une configuration cylindrique.
8. Récipient de transfert selon l'une quelconque des revendications précédentes, dans lequel le réceptacle intérieur est formé d'un seul tenant avec le cou-

vercle, ou peut être fixé de façon amovible à l'intérieur d'une ouverture complémentaire prévue dans le couvercle.

9. Procédé de transfert de produits entre des chambres de confinement de radiations, le procédé incluant les étapes de :

fourniture d'un récipient de transfert incluant un premier volume clos ou enceinte, une seconde enceinte et un agencement de transfert de produit approprié pour transférer du produit entre les deux enceintes sans transférer de matière contaminante ;
 fixation du récipient de transfert à une première cellule chaude et amenée de la seconde enceinte en contact avec le volume interne de la première cellule chaude ;
 transfert de produit via l'agencement de transfert de produit depuis la seconde enceinte jusqu'à la première enceinte ;
 scellement de la seconde enceinte ;
 libération du récipient de transfert depuis la première cellule chaude et fixation du récipient de transfert à une seconde cellule chaude ;
 amenée de la première enceinte en contact avec le volume interne de la seconde cellule chaude ;
 déplacement du produit dans la première enceinte jusque dans la seconde cellule chaude.

10. Procédé selon la revendication 9, dans lequel on prévoit que la première fermeture soit fermée de manière sélective par un couvercle pouvant être déplacé, et que la seconde fermeture soit fermée de manière sélective par une fermeture pouvant être déplacée dans le couvercle, et que le couvercle et la fermeture pouvant être déplacée de façon simultanée mettent en prise deux trappes complémentaires prévues sur la cellule chaude lorsque le récipient de transfert est fixé à la cellule chaude.

11. Procédé selon la revendication 10, dans lequel le récipient de transfert est le récipient de transfert selon l'une quelconque des revendications 1 à 8.

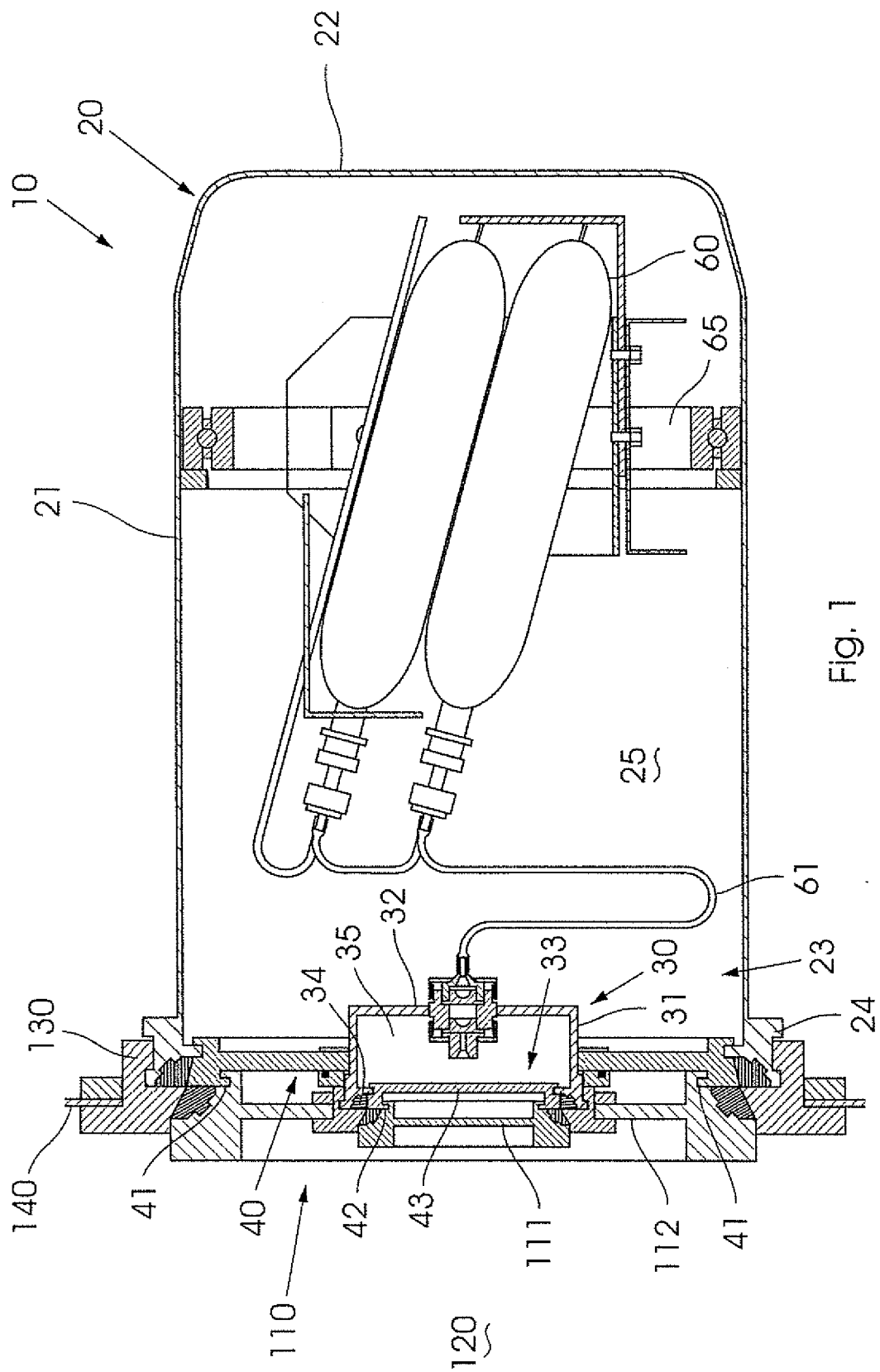


Fig. 1

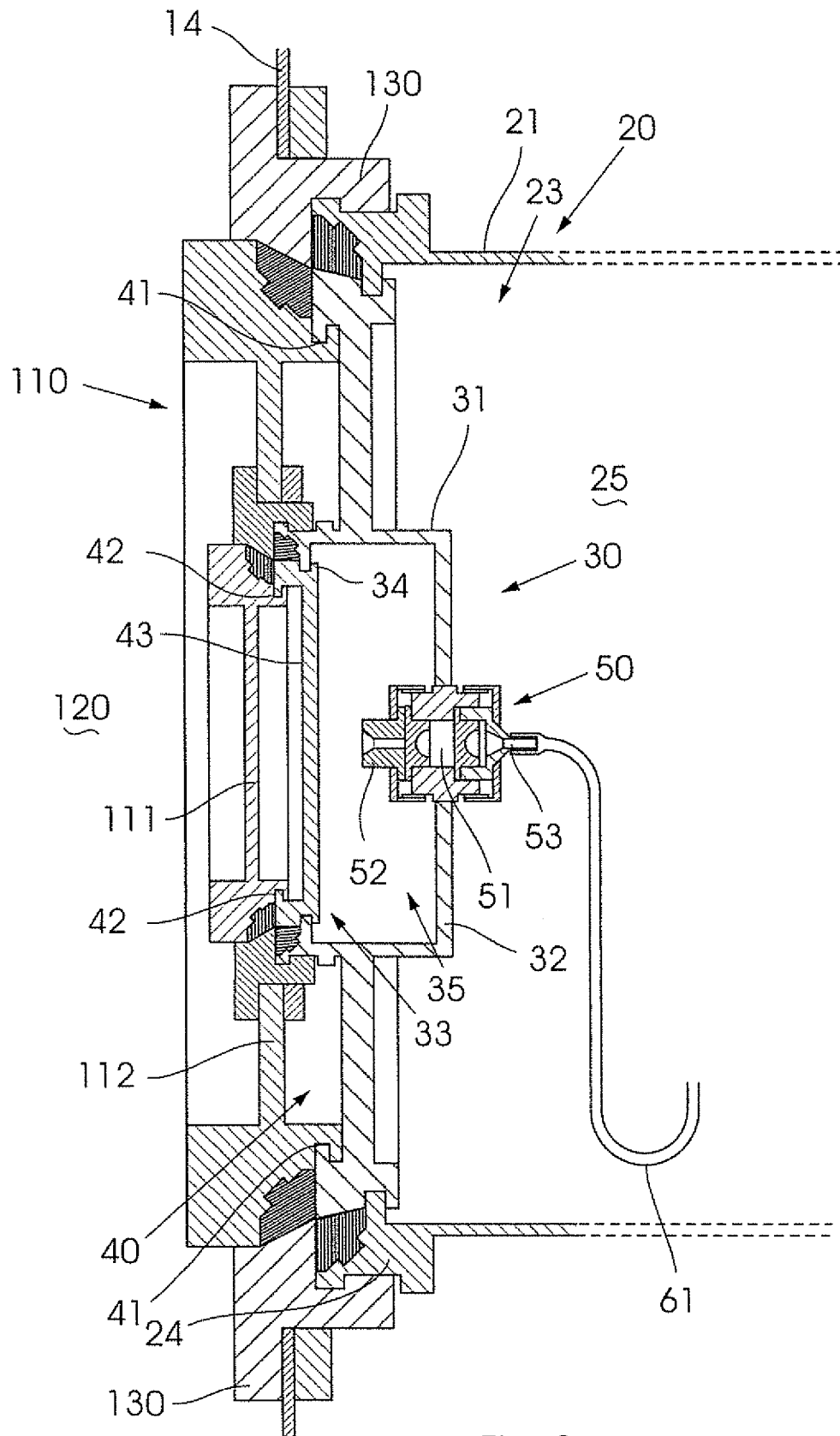


Fig. 2

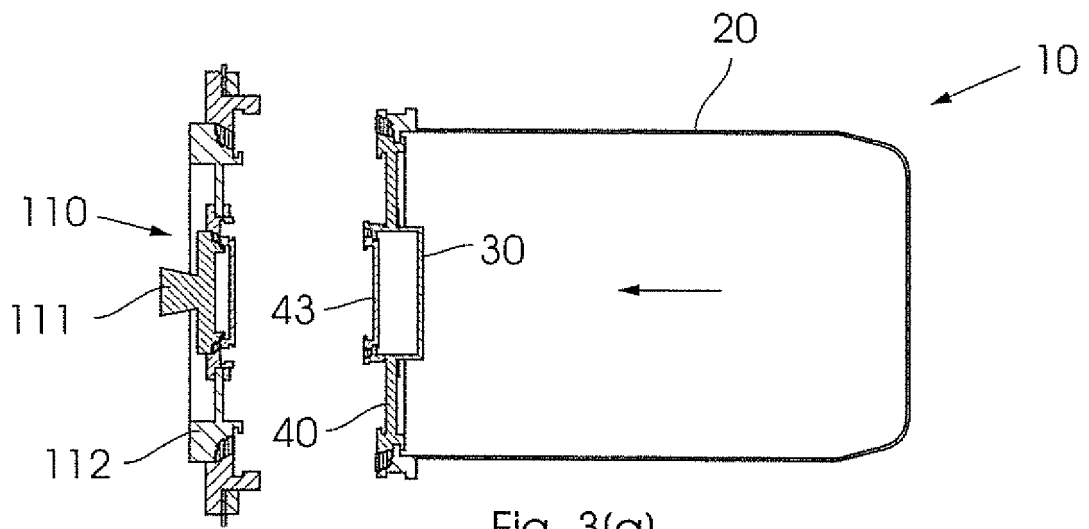


Fig. 3(a)

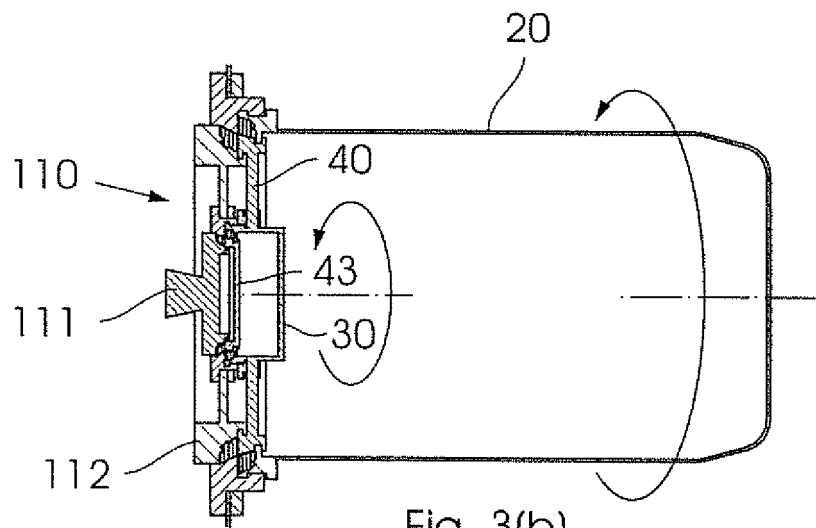


Fig. 3(b)

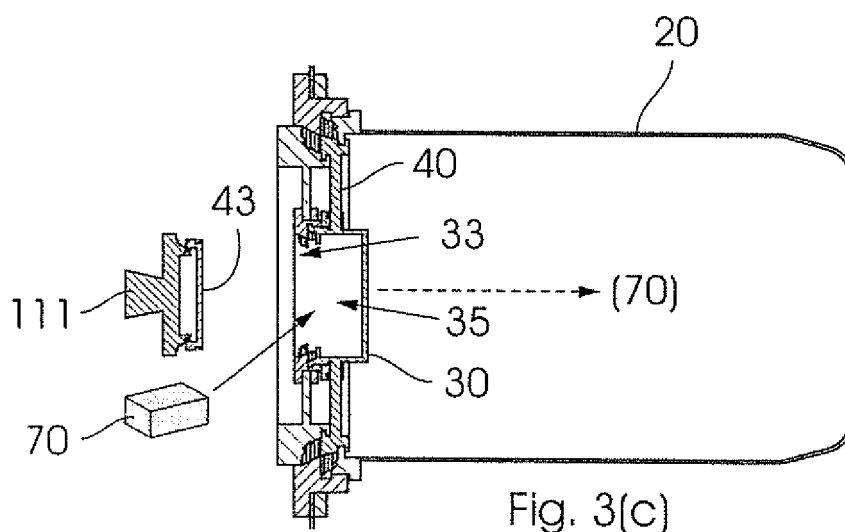
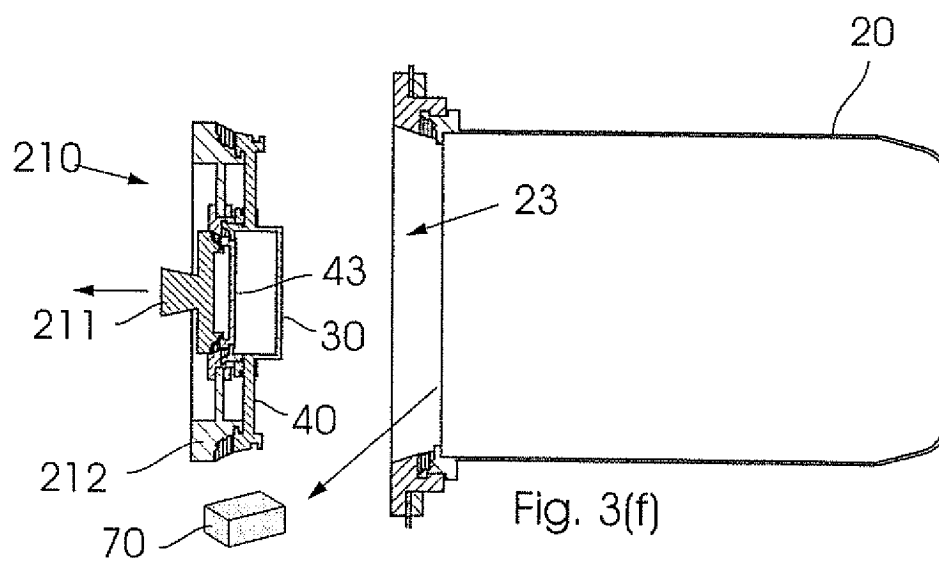
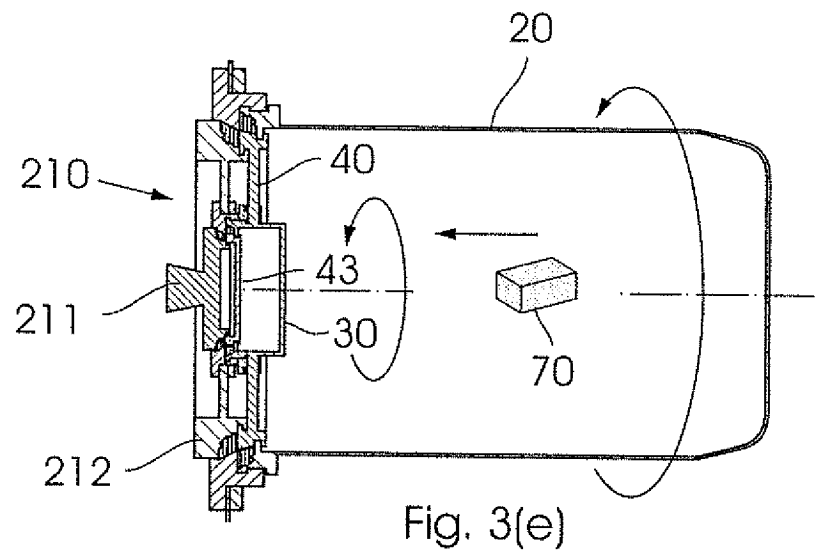
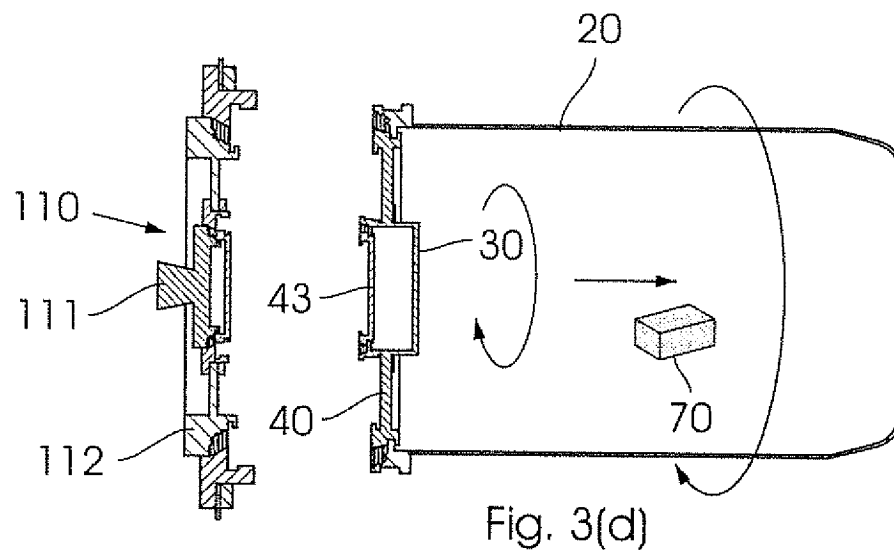


Fig. 3(c)



REFERENCES CITED IN THE DESCRIPTION

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