March 23, 1965 A. AUPETIT ETAL 3,175,087

CONTAINER FOR RADIOACTIVE MATERIALS

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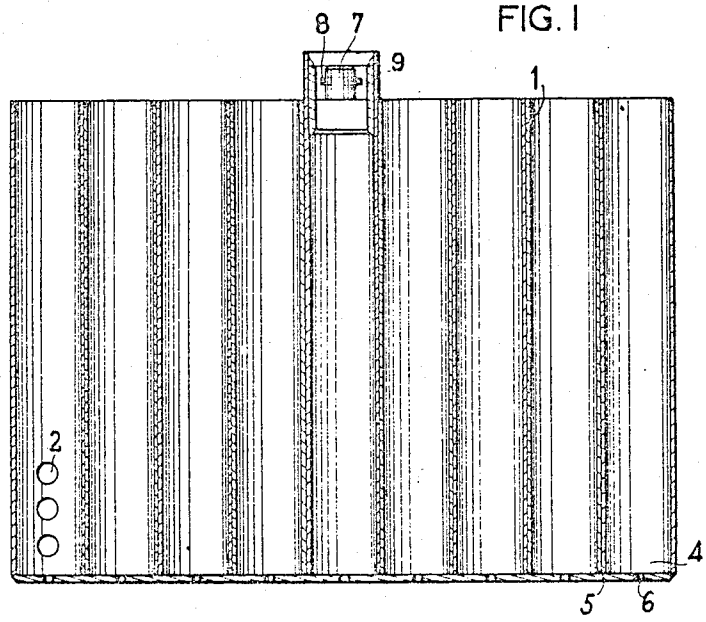
FIG. 1



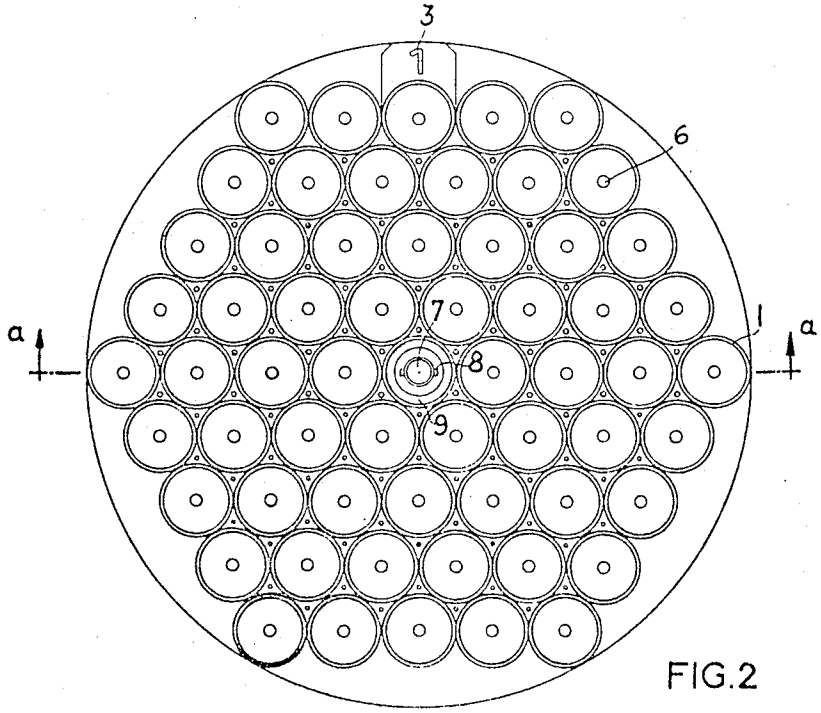


FIG. 2

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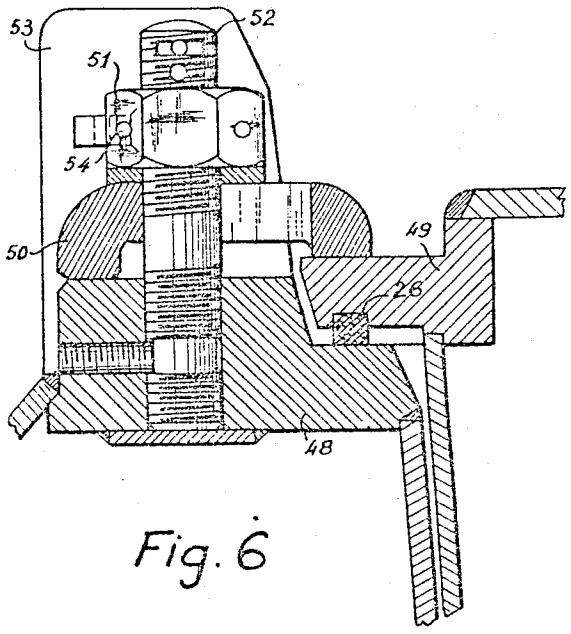

Fig. 6

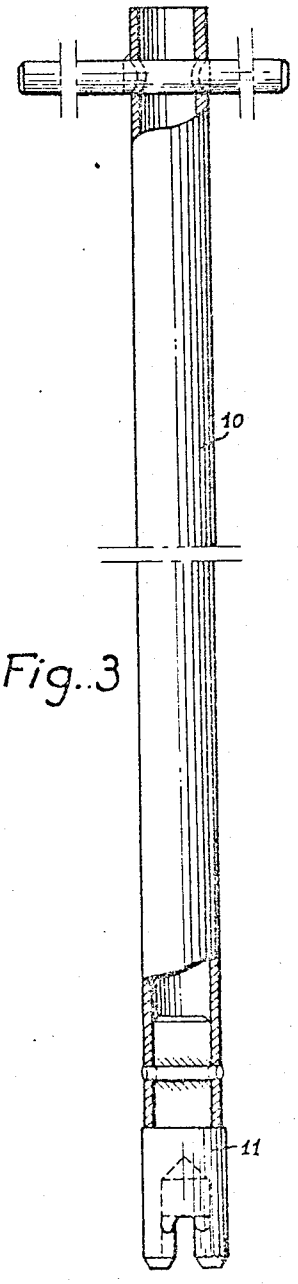

Fig. 3

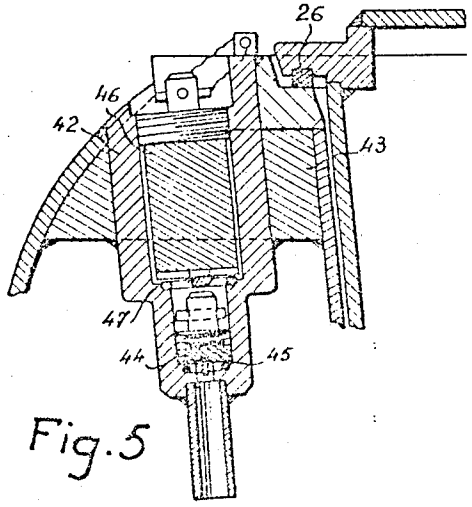

Fig. 5

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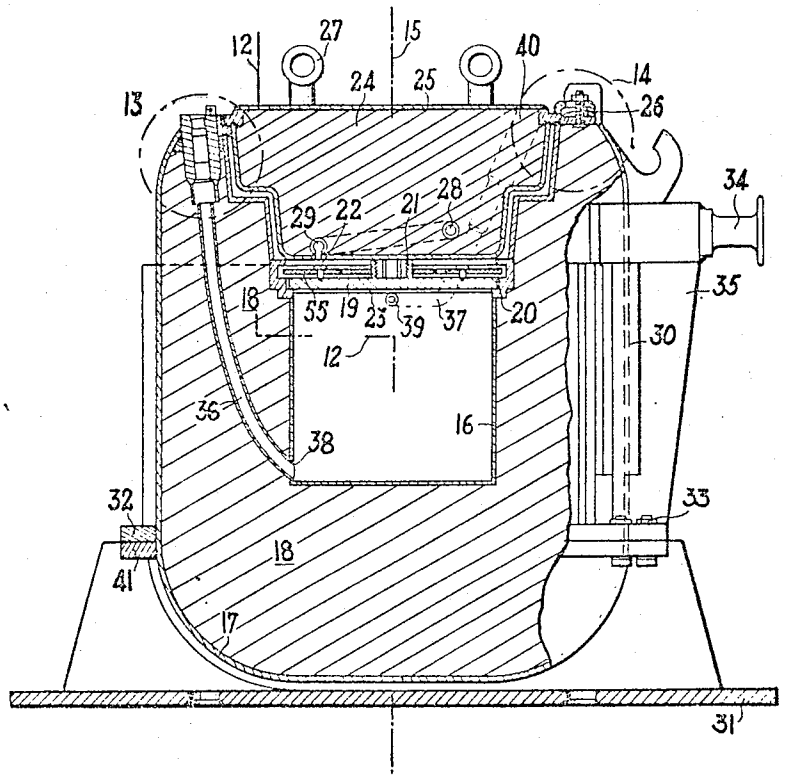

FIG. 4

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CONTAINER FOR RADIOACTIVE MATERIALS

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7 Claims. (Cl. 250—108)

There are numerous types of lead containers for transporting radioactive materials. However, none of them has hitherto enabled real safety to be obtained both during transport and while loading and unloading without leading to an increase in weight or making the whole more awkward to handle.

The present invention, which relates to an improvement in despatching containers, complies with these various requirements by way of a simple whole which is easy to handle and is especially adapted in use to transporting cartridges of fissile material.

The invention concerns a despatching container of the type comprising a body made up of two stainless steel chambers with lead filling the space between them, the outer one being equipped with cooling fins and devices for handling and securing purposes, and the inner bounding a cavity, a cartridge carrier basket disposed in the cavity of the said body and a base-plate, characterised in that the body of the container comprises a combination of a first cover, means for fixing the said cover in fluid-tight fashion above the cavity, a second cover made of lead in which there is an air-chamber, means for fixing the said second cover in fluid-tight fashion to the body of the container above the first, and an exhausting device in the form of a siphon.

In a preferred form of embodiment, the exhausting device is made up of at least two ducts closed by systems giving a double fluid-tight seal, and opening out at opposite points on the cavity, for example one at the top and the other at the bottom of the latter.

The cartridge-carrier basket is made up of perforated aluminium tubes welded together.

A non-limitative example of use of a despatching container improved in accordance with the invention will be described hereinafter with reference to the appended FIGURES 1 to 6.

FIGURE 1 is a vertical section through the cartridge-basket.

FIGURE 2 is a view from above of the said basket.

FIGURE 3 is a part-sectioned elevation on the handling key of the said basket.

FIGURE 4 is a vertical section through the container disposed on its base-plate.

FIGURE 5 is an enlarged vertical section through the plug of one exhauster.

FIGURE 6 is an enlarged vertical section through a means of fixing the plug of the container.

Only the elements required for an understanding of the invention are illustrated in these figures, corresponding elements in the various figures bearing identical reference numbers.

In the particular embodiment in FIGURES 1 and 2, the cartridges are arranged in a basket made up of tubes such as 1, made of aluminium for example, pierced with holes such as 2, and assembled in a bundle. A pierced number such as 3 both enables the basket to be indexed and the

origin of the co-ordinates of arrangement in the basket to be indicated. The height of the basket is less than that of the cartridges in order to facilitate picking up the latter. The cartridges may be packed up by foam rubber washers such as 4 disposed at the bottom of the tubes 1. The base 5 of the basket is pierced with holes such as 6, each coaxial with a tube 1. At the top of the basket there is a system intended to fix the end of a handling key, in the form of a spindle 7 through which another smaller spindle 8 passes perpendicularly, the whole being disposed in a cylindrical element 9.

As may be seen in FIGURE 3, the handling key 10 carries at the end a piece 11 which is complementary to the fixing system attached to the basket.

FIGURE 4 is a vertical section through the container disposed on its base-plate, the part on the right of the broken line 12 corresponding to a section along the vertical plane of the figure, and the part on the left of the said line to a section along a vertical perpendicular plane, in order to juxtapose the groups 13 and 14 which will be described later.

As may be seen in this figure, the container and its base-plate form a group substantially of revolution about the axis 15.

The body of the container is made up of two steel chambers, the inner one 16 and the outer one 17, the space 18 between them being filled with lead; these chambers are fluid-tight.

The container is closed by a cover 19 of the manhole-lid type, made of solid stainless steel for example, and having a lever 55 fitted to it by two screws 22, the ends of the said lever locking under a flange at the top of the cavity when rotated about a screw 21 at the middle of the said lever, tightening down the cover 19 and compressing a packing 20 against the edge of the cavity. When tightened down, the cover 19 is rotationally immobilised by screws 22 disposed in bores in the lever 55. The interior of the cover is covered with foam rubber 23. A special key is used to manipulate the cover under water.

A plug 24 made of lead covered with stainless steel 25 completes the protection; this plug gives a double fluid-tight seal since it compresses a second packing 26; closure is effected by eight replaceable pins protected by bosses, forming eight groups such as 14 which will be described later. Seals may be fitted to these pins. The operation of placing the plug 24 in position is carried out with the aid of rings such as 27, which may be replaced by handling arms. There is an "air-chamber" 28 intended to facilitate tightening the packing down, the said "air-chamber" being disposed in the plug 24 and taking the form, for example, of a short length of toroid-shaped tube communicating at 29 with the internal surface of the plug.

The outer chamber of the container carries a series of cooling fins such as 30.

In a variant of embodiment, the chambers 16, 17 and the lead 18 are linked by an intermediate layer, of tin for example, giving good heat-exchange by conduction and convection, and cooling the device. The fins 30 may then be omitted.

The base-plate 31 is made of painted soft steel; it is of substantially rectangular shape, and may be covered with a cushion of rubber-like material such as that known by the name of "Perbunan"; holes facilitate handling, drainage and securing. The said base-plate supports the container by way of a rim 41 on to which bolts 33 hold

a rim 32 welded to the body of the container at the base of the fins 30, which act as reinforcing brackets. Pins facilitate fixing the container to its base.

The body of the container, whether or not it is fitted with its base-plate, is handled by way of two journals such as 34 reinforced by brackets such as 35 made of stainless steel.

There are two exhausters 36 and 37 opening out at 38 and 39 into the cavity which receives the cartridge-basket; their position in FIGURE 4 is conventional, as has been stated, and the orifices 38 and 39 are really one at the top and one at the bottom of two diametrically opposed generatrices on the inner cylinder forming the cavity of the container. The said exhausters open out to the outside of the container via two identical systems 13 and 40, whereof one will be described hereinafter. These exhausters enable water to be drawn off before unloading and renewed, and heat-measuring or -safety devices to be introduced, and their plugs may be replaced by any appliance considered expedient. They likewise facilitate rinsing and decontaminating the container.

As may be seen in FIGURE 5, the system 13 at the end of the exhauster 36, and consequently the system 40 at the end of the exhauster 37 which resembles it, comprises a box 42 fixed in a block 43 which holds it, a lower plug 44 which compresses a toroid ring 45, an upper plug 46 which compresses a second toroid ring 47, the whole system constituting a plug giving a double fluid-tight seal. The said plug may be leaded and fitted with a seal.

As may be seen from FIGURE 6, the groups such as 14, which are intended to close the plug of the container, comprise a rim 48 fast with the body of the container and a rim 49 fast with the plug, between which the packing 26 is compressed, a stirrup 50 which brings the rim 49 and the packing 26 to bear against the rim 48, a pin 52, a nut 51 and a boss 53; a seal may pass via the orifice 54 into the pin, the nut and the boss.

The improved container is loaded in a bath.

The body of the container, equipped with its base-plate (with a rubber cushion), is lowered to the bottom of the bath; the exhauster plugs and the cover plug of the container are previously removed. Lowering is carried out with the aid of a rocking lever manipulated by a gantry, the said rocking lever remaining cottered to the journals of the container while the latter is in the bath.

The cartridges are arranged in the basket, and the latter is placed in the cavity of the container by means of the key provided for that purpose.

The container cover is lowered with the aid of its special key, which also serves to lock it.

The lead plug is lowered, trapping air in the "air-chamber" which forms an expansion chamber.

The body of the container is raised to the surface of the bath and rinsed; the bolts then cover the plug-fixing pins. The exhausters are likewise shut off after a little water has been withdrawn in order to produce an "air-chamber." After a last check on the activity of the water, the seals are placed in position.

The rubber cushion of the base-plate is withdrawn, and the container is secured to a transporter platform.

In one example of embodiment of a container such as that which has just been described, designed for transporting 60 cartridges of enriched uranium, the basket is made up of 60 aluminium tubes welded together. The cartridges may be more or less deformed, but each of them may easily be introduced into a cylinder 40 mm. in diameter and 360 mm. high.

These cartridges have been de-activated for long enough for the residual power of the 60 cartridges not to exceed 1 kw.

Protection is provided by 260 mm. of lead 18. The chambers 16 and 17 are made of stainless steel with a minimum thickness of 5 mm. The welds are made in argon, and the assemblies are perfectly de-burred, scoured and bright.

The fluid-tight packings 20 and 26 are made of a material known by the name of "Perbunan." The body of the container is equipped with 94 cooling fins 30, and handling journals 34 having a diameter of 63 mm., an effective length of 96 mm. and a distance between axes of 1390 mm.

The exhausters take the form of tubes 12 mm. in internal diameter.

The following performance has been checked:

With water as the internal fluid, and with a power of 1 kw., the water temperature does not exceed 89°, and that of the external wall 82° C., the container being placed in a shop in which the air temperature is 40° C.

Without water, the sheath of the cartridges cannot reach a temperature of 550° C., i.e. 100° C. below the melting point of aluminium.

The design of the container, in accordance with standard existing principles, enables it to be sent to most countries and unloaded and decontaminated in most factories.

In particular, it exhibits good characteristics as regards biological protection, weight, ease of handling and closure, mechanical resistance to the effects of acceleration in transport, fluid-tightness and heat-transmission.

What we claim is:

1. A transportation container for radioactive materials comprising in combination with an inner stainless steel shell, a chamber defined by said inner shell, an outer stainless steel shell spaced from said inner shell, cooling fins and handling devices for said outer shell, a lead mass between said shells and a cartridge basket in said chamber, a first plug for said chamber, fluid tight connection means between said first plug and said chamber, a radiation shielding plug above said first plug, fluid tight connection means between said radiation shielding plug and said inner shell and an air chamber in said radiation shielding plug opening adjacent said first plug.

2. A transportation container for radioactive materials comprising in combination an inner stainless steel shell, a first chamber defined by said inner shell, an outer stainless steel shell spaced from said inner shell, cooling fins and handling devices for said outer shell, a lead mass between said shells and a cartridge basket in said chamber, a first plug for said chamber, fluid tight connection means between said first plug and said chamber, a radiation shielding plug above said first plug, fluid tight connection means between said radiation shielding plug and said inner shell, an air chamber in said radiation shielding plug opening adjacent said first plug, for exhausting said first chamber and a double fluid tight seal closing each of said ducts, said ducts opening at opposite points in said chamber.

3. A container as describer in claim 2, one of said ducts opening into the top of and another of said ducts opening into the bottom of said chamber.

4. A container as described in claim 2, including a cylindrical mouth piece closing each of said ducts, and two co-axial internal shoulders of different diameters for each of said mouthpieces, a plug mounted on said shoulders and a toroid packing between said plug and said shoulders.

5. A container as described in claim 1 in which said fluid tight connection means between said first plug and said chamber comprise a fluid tight packing between said first plug and said chamber, a member for forcing said first plug down onto said packing, a lever pivoted on said member, a flange on said chamber, said lever bearing against said flange, and means for securing said lever to said plug preventing relative rotation therebetween.

6. A container as described in claim 1 in which said fluid tight connection means between said shielding plug and said container comprise a first rim secured to said container, a fluid tight packing on said rim, a second rim secured to said shielding plug, and means for forcing said second rim onto said first rim and for compressing said packing including stirrups, bolts and nuts.

7. A container as described in claim 1, said cartridge basket comprising perforated tubes secured to each other about a central tube, a circular perforated sole-plate secured to said tubes and a handling device received by said central tube.

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