

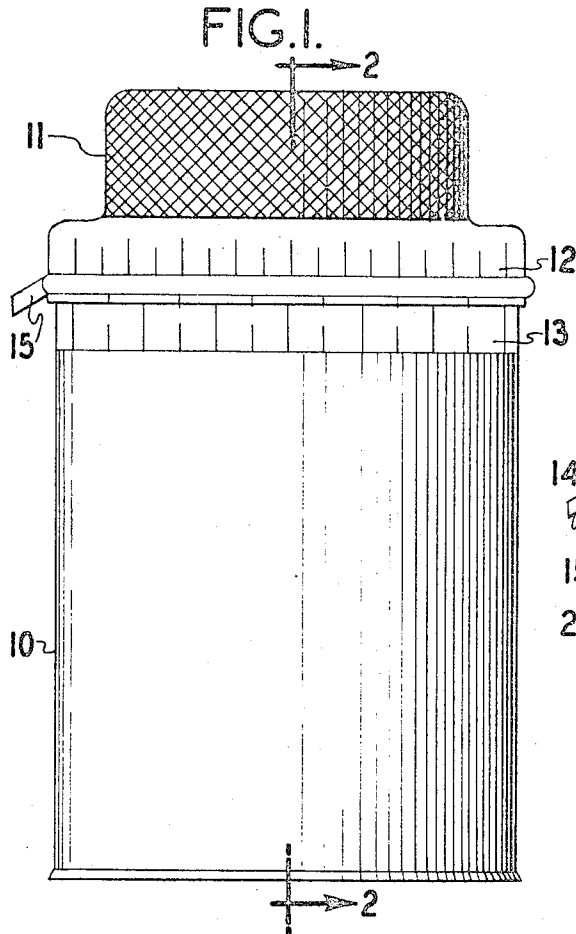
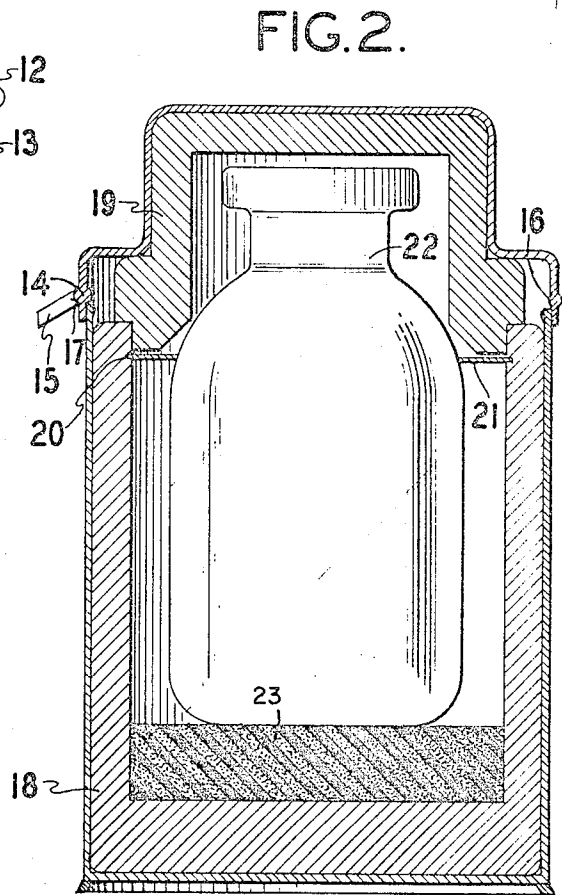
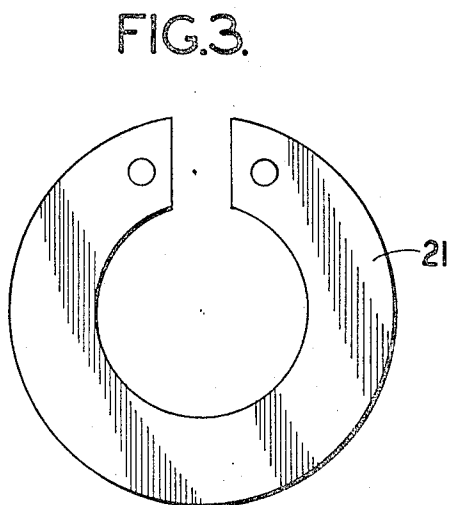
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PACKAGING ASSEMBLY FOR RADIOACTIVE MATERIALS

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PACKAGING ASSEMBLY FOR RADIOACTIVE MATERIALS

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ABSTRACT OF THE DISCLOSURE

A packaging assembly for radioactive materials having an outer container and cap, an inner radioactive shielding receptacle and cap, and a vessel retained within the receptacle for radioactive material.

This invention relates to a packaging assembly for radioactive materials. In one aspect, this invention relates to a radioactive packaging assembly useful for the transportation and storage of radiopharmaceuticals. In a further aspect, this invention is directed to a radiopharmaceutical packaging assembly, having features not previously present in known containers for radioactive materials.

In recent years the use of radioactive isotopes for industrial and medical applications has greatly increased. Of particular interest is the current use of radioactive materials for medical research, diagnosis and the treatment of various disfunctions and disorders in the human body. Heretofore a variety of containers have been proposed for the transportation and storage of radioactive material. In all instances, a principal feature of the containers is adequate shielding from radioactivity. The commonly used shielding containers consist of cylindrical lead receptacles into which the vessel containing the radioactivity is placed. In most instances, the receptacles are cumbersome and poorly designed, and needless exposure to radiation may be encountered when the clinician is obtaining a sample of radioactive material. It sometimes is necessary to remove the vessel or bottle partially or entirely from the shielding receptacle in order to obtain the desired sample. In addition to the aforementioned disadvantages, the clinician has no readily available or easy means in which to determine the activity of subsequent samples from the same container.

It is therefore an object of this invention to provide a novel packaging assembly for radioactive materials. Another object of this invention is to provide a novel radiopharmaceutical packaging assembly. A further object is to provide a novel packaging assembly wherein the shielding receptacle is enclosed and permanently contained within an outer container. A still further object of this invention is to provide a novel packaging assembly from which portions of radioactive material can be removed with a syringe while the assembly is in an inverted position and with a minimum amount of exposure. Another object of this invention is to provide a means for readily calculating the activity at a given time of unused radioactive material. These and other objects will readily become apparent to those skilled in the art in the light of the teachings herein set forth.

In its broad aspect, the present invention relates to a novel packaging assembly for radioactive materials. The packaging assembly comprises in combination:

(a) An outer container having a removable, rotatable, sealing cap,

(b) A radiation shielding receptacle enclosed within said container, and

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(c) A vessel for containing radioactive material disposed within said receptacle.

This packaging assembly provides a compact, and attractive container for radioactive materials and at the same time exhibits several features not previously found in shielding containers.

This invention will more clearly be understood by reference to the drawings.

FIG. 1 is a side elevation of one embodiment of the radioactive packaging assembly.

FIG. 2 is an axial sectional view of the assembly shown in FIG. 1, along the line 2—2.

FIG. 3 is a top plan view of one embodiment of the arcuately shaped retaining means.

With reference to the drawings, the radioactive packaging assembly of this embodiment of the invention comprises an outer container 10 and a removable, rotatable, sealing cap 11. The sealing cap 11 of the outer container can preferably contain a knurled edge to aid in removal. A portion of the upper circumferential area of container 10 is beaded inwardly in order to retain the radiation shielding receptacle in the container when elevated to an upside down position. A descriptive scale 12 indicating units of radioactivity is provided on the lower circumferential portion of cap 11 while descriptive scale 13 indicating units of time is provided on the upper circumferential portion of container 10.

Inasmuch as the function of the outer container is not to shield radioactivity, it can conveniently be composed of a wide variety of materials. For instance, it can be fabricated from steel, various metal alloys, plastic, or combinations thereof. The wall section of the container 10 is generally of cylindrical shape and closed at the bottom. The cap 11 is securely affixed to the container 10 by means of an O-ring seal 14 with pull tab 15. The seal fits into the inwardly beaded portion 16 on the container and the outwardly beaded portion 17 on the cap. In practice, the cap and container as used will be sealed and the bottom of the container open to receive the radioactive shielding receptacle and cap which encloses the vessel of radioactive material. Thereafter the bottom is permanently affixed to the container by methods well known in the container industry.

Within the outer container is provided a radiation shielding receptacle 18 having an open end and a removable radiation shielding cap 19. The cap is adapted to fit the receptacle in such a manner that a portion thereof of the lower edge fits inside and below the top edge of the shielding receptacle providing complete shielding of the atmosphere from the radioactive material. Since the main purpose of the shielding container is to shield radiation, it is fabricated of a material impervious to radioactivity such as lead, lead antimony alloy or the like.

As indicated previously, a portion of the upper edge of the outer container 10, is beaded inwardly to hold the shielding receptacle in place even when the container is inverted. The inwardly beaded portion of the container thus serves as the retaining means for holding the receptacle in place, as well as the location for the O-ring seal.

The upper inner circumferential portion of the shielding receptacle 18 has a groove 20 into which fits a removable retaining ring 21 to hold the vessel of radioactive material in place. FIG. 3 depicts one embodiment of the retaining ring 21 which is arcuately shaped and is provided with apertures to assist in removal.

Considering FIG. 2, a vessel, such as a bottle 22, containing radioactive material is positioned within the shielding receptacle and held in place by the retaining ring 21. The bottle is of conventional design, its sealed opening, in close proximity to the upper edge of the shielding receptacle. The shielding cap 19 is adapted to receive the top

and neck of the bottle. The shielding cap is held in place by the outer container cap 11.

In order to minimize the effects of shock to the vessel containing the radioactive material, or the spillage of radioactive material in the event the vessel breaks, cushioning and absorbing materials 23 may be placed between the outer walls of the vessel and the inner walls of the shielding receptacle.

In general, the packaging assembly of this invention is ideally suited for the shipment and storage of radioactive materials, particularly liquid radiopharmaceuticals. The radioactive material is placed in the vessel and the retaining ring inserted in place to hold the vessel in the shielding receptacle. Thereafter the receptacle cap is put in place and the entire unit placed in the outer container and the bottom sealed. The outer container provides an attractive covering for the normally drab shielding receptacle and can have affixed thereto an appropriate label describing the contents, manufacturer, and other desirable information. Additionally since the shielding receptacle cannot be removed from the outer container, there is little or no chance for confusing the identify of several samples.

When the radioactive material is to be used, the O-ring seal is broken and removed. This permits the container cap to be removed as well as rotated in either direction. Calibration of the activity scale to determine activity at any subsequent time can then easily be effected. Thereafter, removal of the shielding cap affords access to the vessel containing the radioactive material. By inverting the entire assembly and puncturing the pierceable cap sealing the vessel opening with a syringe, the desired measured quantity of radioactive material can be withdrawn. Since the vessel is retained in the receptacle by the retaining ring even when the assembly is inverted to withdraw the radioactive material, the chances of exposure are minimized. In the event that it is desired to remove the vessel from the shielding receptacle, the apertures in the retaining means permit easy removal of the ring with forceps. However, in most instances, there will be little or no need to remove the vessel from the shielding receptacle.

Before subsequent uses of the radioactive material from the same batch, the product concentration or activity can be readily calculated by the cooperative action of the descriptive scales on the container and cap.

Although the invention has been illustrated by the preceding disclosure, it is not to be construed as being limited to the materials employed therein, but rather, the invention encompasses the generic area as hereinbefore disclosed. Various modifications and embodiments of this invention can be made without departing from the spirit and scope thereof.

What is claimed is:

1. A packaging assembly for radioactive materials comprising in combination:

- (a) an outer container having a removable, rotatable sealing cap, said sealing cap provided on the lower circumferential edge with a descriptive scale indicating units of radioactivity, and said container provided on the upper circumferential edge with a descriptive scale indicating units of time, said scales disposed as to cooperatively act for calculating radioactivity at a given time after calibration,

(b) removable retaining means for sealing said cap to said container,

(c) a radio shielding receptacle enclosed within said container, said receptacle having an open end and a removable radiation shielding cap fitted over the open end of said receptacle, said container having means for permanently retaining said open end receptacle in said container,

(d) a vessel for containing radioactive material disposed within said receptacle and having a sealable opening terminating at a point in close proximity to said open end of said receptacle, and

(e) an arcuately shaped removable retaining means disposed between said vessel and said shielding receptacle for maintaining said vessel within the open end of said receptacle.

2. The packaging assembly of claim 1 wherein said means for sealing said sealing cap to said outer container is a pliable O-ring with a pulse tab disposed between the upper outer peripheral area of said container and the inner lower peripheral area of said cap.

3. The packaging assembly of claim 1 wherein the inner circumferential upper edge of said container is disposed so as to permanently retain radioactive shielding receptacle.

4. The packaging assembly of claim 1 wherein said radioactive vessel has a reduced neck forming a sealable opening terminating at a point above the open end of said receptacle.

5. The packaging assembly of claim 4 wherein said radioactive shielding cap is disposed to receive said sealable opening of said vessel.

6. The packaging assembly of claim 4 wherein said arcuately shaped removable retaining means is disposed over said neck of said vessel and is retained by a circumferential groove on the inner peripheral portion of said shielding receptacle.

7. The packaging assembly of claim 6 wherein said retaining means is an annulus of at least about 270 degrees and the terminal portions thereof are provided with apertures to assist in removal.

8. The packaging assembly of claim 1 wherein said vessel is separated from said shielding receptacle by a resilient material for absorption of shock.

9. The packaging assembly of claim 1 wherein said vessel is separated from said shielding receptacle by a material capable of absorbing liquid radioactive material.

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