Aug. 7, 1951 J. F. GIFFORD 2,563,718

SHIELDED CONTAINER

Filed April 13, 1949 2 Sheets-Sheet 1

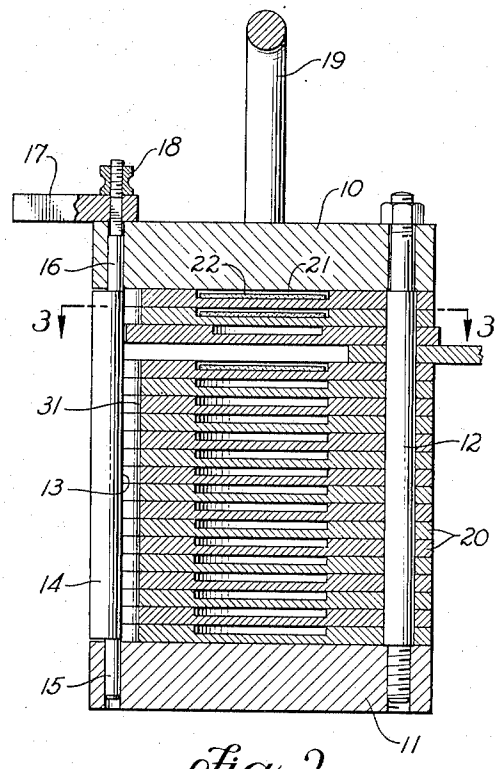


Fig. 2.

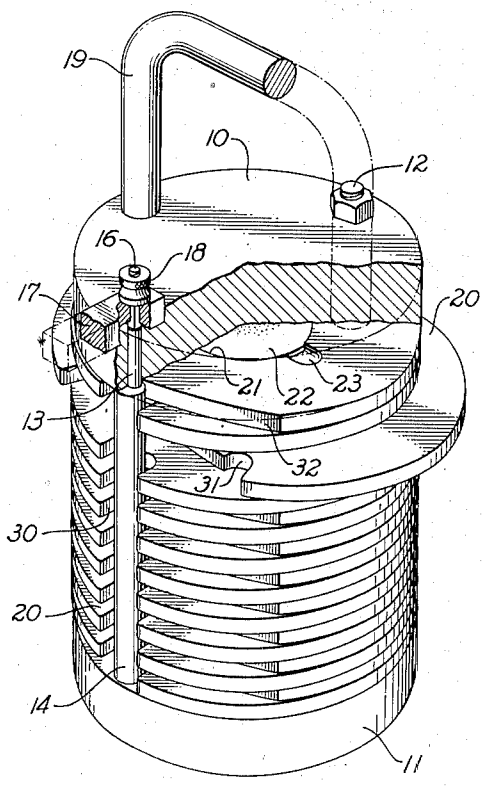


Fig. 1.

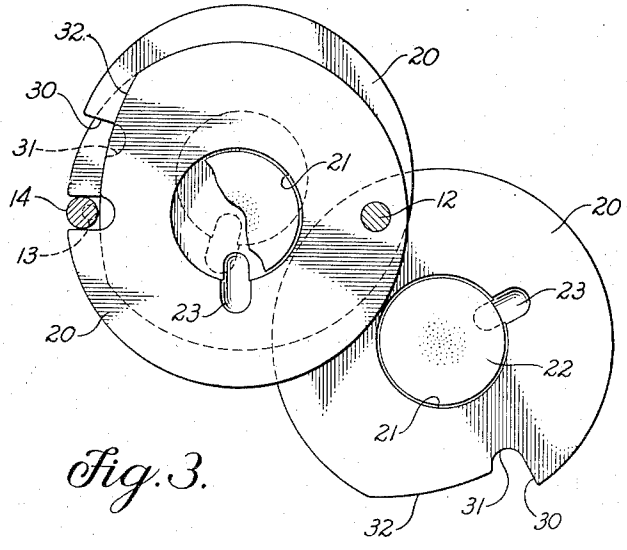


Fig. 3.

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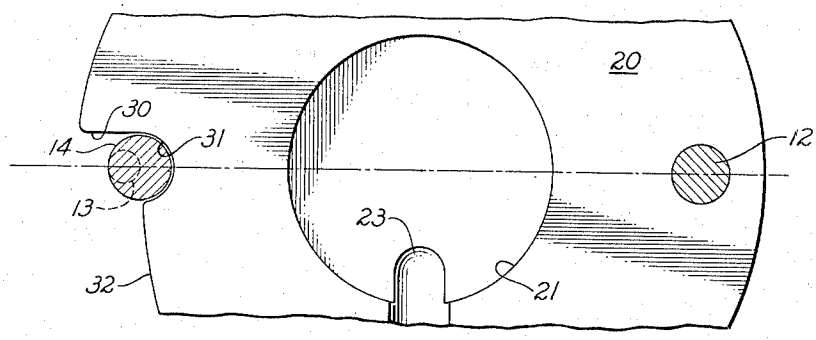


Fig. 4.

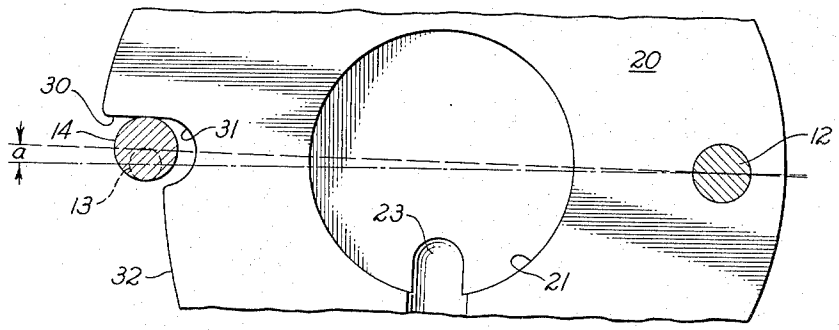


Fig. 5.

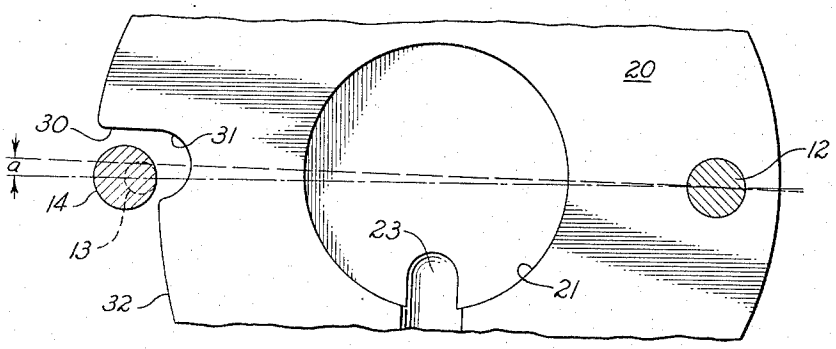


Fig. 6.

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SHIELDED CONTAINER

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4 Claims. (Cl. 312—199)

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This invention relates generally to containers and more particularly to a new and improved container for use in storing, handling and transporting of radioactive materials. As is generally known, the handling of such materials requires adequate shielding and unless an unduly heavy and cumbersome structure is to be expected, it is necessary to provide structure designed particularly for this special purpose. The mere adaptation of a structure designed for use in another field does not usually satisfy the exacting requirements met in the radioactive handling field. In view of this situation, the transporter disclosed in my copending application Serial No. 51,581, filed September 28, 1948, now Patent No. 2,533,102, was developed for the specific purpose of providing a container for radioactive materials, and has been found to satisfy a long felt need. It has now been determined, however, that certain additional improvements to the structure disclosed therein are desirable. One object of the present invention, therefore, is to provide a new and improved container providing a simple and effective locking means for a series of container trays.

Another object is to provide an improved container wherein the opening movement of a tray thereof serves to provide a closing movement for adjacent trays.

Another object is to provide an improved container for radioactive materials resulting in a large carrying capacity for a given amount of shielding.

A further object is to provide an improved container wherein the trays are slightly moved from locked position upon movement of the unlocking means for expediting subsequent withdrawal of any selected tray.

Still another object is to provide an improved container for radioactive materials maintained in separated compartments and in the use of which the operator is subjected to a minimum of radiation.

Other objects and advantages will become apparent from the following description and drawings in which

Figure 1 is a perspective view of the container with the trays in unlocked position;

Fig. 2 is a vertical sectional view taken through the center of the container showing parts in elevation and with certain trays shown partly withdrawn;

Fig. 3 is a view taken on line 3—3 of Fig. 2; while

Figs. 4, 5 and 6 are diagrammatic views showing the relation of the locking means and the notch edges of a tray in locked, separated and unlocked positions respectively.

One convenient form of structure embodying the invention may comprise comparatively

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massive bottom and top plates 10 and 11 of circular form and consisting of a radioactivity shielding material such as lead. A spacer rod 12 threaded into lower plate 11 and securely affixed in any suitable manner to upper plate 10 may be disposed adjacent the periphery of the plates while diametrically across said plates a rotatable locking rod assembly having an axis portion 13 and a cam surface portion 14 may be pivotally mounted therein adjacent the periphery of the same. The cam surface portion 14 serves a purpose later to be described, while the axis portion 13 may terminate at one end in a lower pin section 15, which is adapted to turn in a suitable bearing aperture in the lower plate, and at the other end in an upper pin section 16, which likewise is adapted to turn in a similar bearing aperture in the upper plate. Suitable means for turning the locking rod assembly may include a lever 17 united to upper pin section 16 to serve as a crank and retained thereon as by means of a nut 18. Moreover, for ease in transporting the structure a conventional handle 19 may be provided.

A series of flat tray members 20 of generally circular form, as best shown in Fig. 3, are pivotally mounted adjacent their peripheries upon spacer rod 12 in a vertically overlapping relation. Each tray is adapted to swing horizontally about its pivot point with its flat upper surface in frictional engagement with the lower surface of an adjacent tray or plate and with its flat lower surface in frictional engagement with the upper surface of an adjacent tray or plate. Diametrically opposite its pivot point the periphery of each tray is indented with a suitable notch having nonsymmetrical sides and adapted to engage with the locking rod assembly in a manner later to be described. For the purpose of holding the radioactive material, or any other material is desired, each tray 20 is provided near its center with a space or depression 21 into which a circular dish, such as indicated at 22, containing the radioactive material may be removably positioned. As in my aforementioned copending application a lateral space or depression 23 joining the space 21 may be provided for ease in inserting or removing close fitting dishes by means of an appropriate tool.

In order to provide a substantially uniform shielding effect at all points on the exterior of the structure the diameter of space 21 in the trays is so chosen that the minimum distance from the periphery of space 21 on the topmost or lowermost tray to the periphery of the tray is about the same as the distance from such space to the exterior of the corresponding top or bottom plates 10 and 11.

Referring now to Fig. 3 it will be noted that the notch on the tray 20 comprises a relatively long

wall 30 extending into a generally semicircular depression 31. Said depression merges into peripheral edge 32 of the tray, which edge is formed with a greater radius of curvature than the radius of the disk thus providing a greater distance from pivot point on rod 12 to the periphery of the tray on one side of the notch than to the periphery on the other side of the same. In mounting the several trays 20, alternate trays are preferably provided with the long wall 30 of their notches alternately disposed with respect to the depression 31 whereby alternate trays when mounted upon the spacer rod may be swung or withdrawn horizontally in alternate directions.

Referring now to Fig. 4, a single tray 20 pivoted on spacer 12 is diagrammatically shown in locked position in cooperation with the locking rod assembly. As will be noted, the cam surface 14 of said rod at this time fully engages the depression 31 and is tangent to the long wall 30 of the notch while the peripheral edge 32 on the opposite side of the notch, if projected, would pass through the cam surface closely adjacent to the axis 13 of the rod assembly. At this time this particular plate, as well as all other plates engaging the locking rod assembly, are in fully locked position and the entire structure may safely be transported or stored.

In order to unlock the structure, the rod assembly may be turned in either direction. Assuming that it is turned counterclockwise as indicated in Fig. 5, contact of cam surface 14 with long wall 30 moves the tray through a small angle a. Further movement of the rod assembly leaves the tray 20 displaced at the same angle a, but moves the cam section 14 to a withdrawn position with respect to this particular tray and all others having similarly disposed walls 30. As a result, edge 32 will clear both the cam surface 14 and the axis 13 of the locking rod assembly when the tray 20 is thereafter moved clockwise about pivot 12 to fully open position. On the other hand, all trays having their walls 30 oppositely disposed to that of the tray so illustrated cannot be moved clockwise about pivot 12 but are free only to move counterclockwise about that pivot. At this point it will be noted that any given tray may be moved to a fully withdrawn position merely by applying pressure to the edge of the easily accessible wall 30 and that the use of a tool for prying the same open is not required. In moving to such withdrawn position the frictional engagement of a given tray with its adjacent trays tends to move them into or retain them in fully closed position thus providing an additional safety factor. In locking the trays, for transportation or storage, each tray is first positioned with its wall 30 in contact with cam surface 14 whereupon by turning the locking rod on its axis 13 the surface 14 moves into a position filling depression 31 on each tray and pulling the trays into the single axial position shown in Fig. 4. Obviously, if for some reason it is desired to lock certain trays while leaving others unlocked this may be done without departing from the invention.

It has also been found that in the handling of radioactive materials the user of this structure may avoid unnecessary radiation exposure by loading the container while using the container itself for a shield, by withdrawing any given tray only far enough to permit insertion or removal of the dish 22, as shown for example by the position of the righthandmost tray in Fig. 3, and by having no more than one tray in fully withdrawn position at any one time. Other advantages will also be evident to those skilled in the art. Accordingly, the invention is not intended to be restricted in its scope to the form as shown and described, but on the contrary should be restricted only as defined in the following claims.

What is claimed is:

1. A container comprising a top plate, a bottom plate, a spacer between said plates, a plurality of flat-surfaced, receptacle-containing trays combined into a single stack by being vertically mounted between said plates and pivotally secured upon said spacer adjacent the periphery of the tray, each of said trays frictionally engaging with adjacent trays and the uppermost tray and lowermost tray having frictional engagement with said top plate and bottom plate, respectively, a notch in the periphery of each tray substantially diametrically opposite the mounting point of said tray, a space in said trays for a radioactive material and disposed interiorly thereof at a distance from the nearest periphery of the trays substantially equal to the thickness of said top plate, and adjustable retaining means cooperating with said natches and mounted in said plates and adapted in one position to lock said trays in fixed relation providing a closed container and in a second position to permit rotation of said trays about said spacer in order to provide access to the receptacle of each tray.

2. Apparatus according to claim 1, wherein the notch in each tray has one side wall longer than the other side wall.

3. Apparatus according to claim 1, wherein the notch in each tray has one side wall longer than the other side wall and at least a plurality of said trays are mounted with adjacent long notch side walls alternately engaging opposite sides of said retaining means.

4. A container for radioactive material comprising a top plate, a bottom plate, a spacer between said plates, a plurality of flat surfaced, receptacle-containing trays combined into a single stack by being vertically mounted between said plates and pivotally secured upon said spacer adjacent the periphery of the tray, a radially extended notch in the periphery of each tray and spaced from the mounting point of said tray, the notches of alternately spaced trays being cut away to provide peripherally extending marginal walls, a space in said tray for a radioactive material and disposed interiorly thereof at a distance from the nearest periphery of the trays substantially equal to the thickness of said top plate, and adjustable retaining means cooperating with said notches and mounted in said plates and adapted in one position to lock said trays in fixed relation providing a closed container and movable to a position of alignment with the cut away portions of said notches to permit rotation of said trays about said spacer in order to provide access to the receptacle of each tray.

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