(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 859 370 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
19.08.1998 Bulletin 1998/34

(51) Int Cl.[6]: **G21F 5/015**, G21F 5/02

(21) Application number: **98301024.0**

(22) Date of filing: **12.02.1998**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **13.02.1997 GB 9702905**

(71) Applicant: **Wass, Malcolm Laing**
Brancepeth, Durham DH7 8DU (GB)

(72) Inventor: **Wass, Malcolm Laing**
Brancepeth, Durham DH7 8DU (GB)

(74) Representative: **Hughes, Brian Patrick**
Brian Hughes & Co.
Letterbox Cottage
Friezley Lane
Cranbrook, Kent TN17 2LL (GB)

(54) Container for radio-active isotopes

(57) A container 10 for a radio-active isotope comprises a shell 12, 14 for attenuating radiation from the isotope 34, a tube 30 extending into the shell 12, 14 from a rear end 16, the tube 30 being open at its rear end to allow the insertion of a drive linkage 32 for the isotope, an opening 42 in the casing and a lining 48 defining a passage 44 from the outside of the shell to the tube 30, and means at the mouth of the passage for locating in the passage either a collimator or a shielding member. The container can also mount an adjustable collimator at one end.

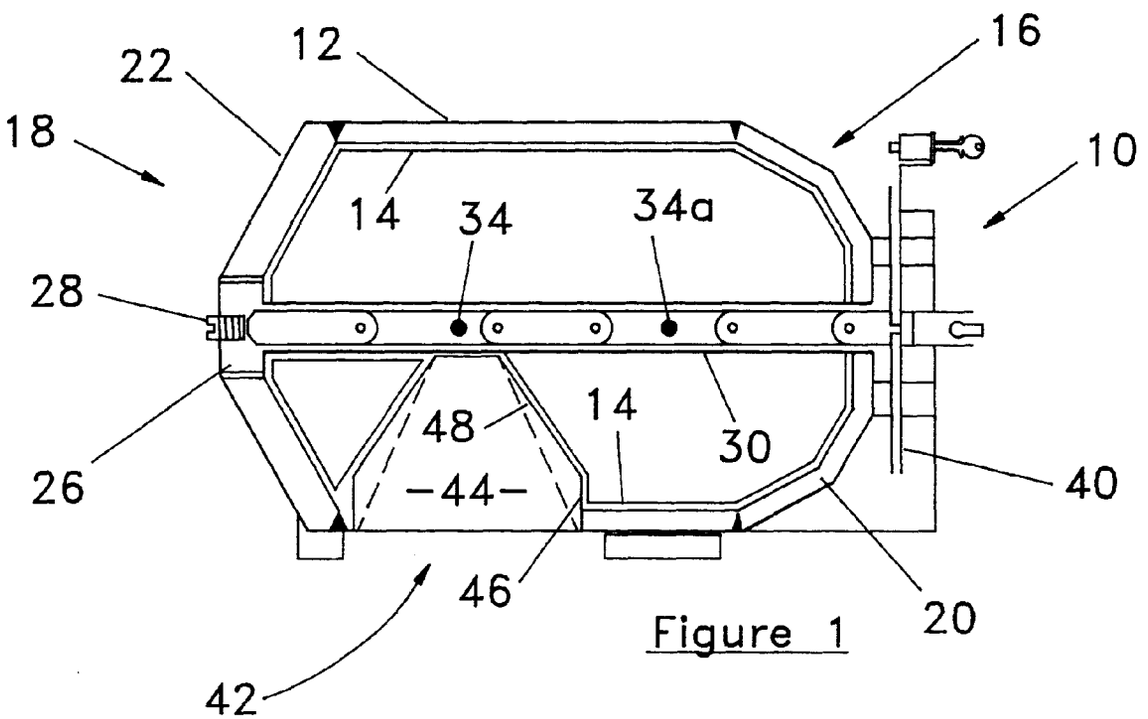

Figure 1

EP 0 859 370 A1

Description

This invention relates to a container for radio-active isotopes. Such containers are used to provide protection to operating personnel and the environment when the isotopes are used as a radiation source in radiography, particularly mobile radiography for industrial purposes.

Radio-active isotopes for radiography are, in general, held in one of two generic types of container. One type requires the isotope to be moved forward in the container into a delivery tube by means of a wind-out mechanism. The isotope is normally wound out until it reaches the end cap on the delivery tube at a safe distance from the operator at the rear of the container.

This type of container is flexible in use because the isotope can be used in a variety of ways to carry out exposures using a variety of techniques, for example inside a pipe or vessel (panoramic technique), or from outside a pipe to make a single radiograph in a contact or a stand off situation.

A major disadvantage with this type of container is that the isotope must be moved out of its container for use. As soon as the operator winds the isotope out of the container, and this can be for as much as thirty metres, the isotope is no longer shielded and the surrounding area is irradiated for the time that the isotope is travelling in the delivery tube and back and, if the end of the delivery tube is not shielded, for the time that the isotope is at the end of the tube. Another problem is that the radioactive source leaves the container making the safety features of the container ineffective so that safety problems can arise if the isotope cannot be rewound into the container.

The other type of container commonly used holds the isotope in a rotating shield mechanism and is shielded until the shield is rotated to an aperture. The main advantage of this second type of container is that the radiation from the isotope is totally contained apart from the radiation beam at the aperture. This makes it possible to be in very close proximity to the container even when the isotope is rotated to the exposure position, except of course in the beam path.

The major disadvantage of this second type is that the shape of the beam cannot be altered or collimated and sometimes it is too small resulting in the need to make more exposures than is desirable. Moreover, it is not possible to use this type of container for other techniques, for example panoramic exposures.

It is an object of the present invention to obviate or mitigate these difficulties.

The present invention is a container for a radio-active isotope, characterised by a shell for attenuating radiation from the isotope, a tube extending into the shell from a rear end, the tube being open at its rear end to allow the insertion of a support for the isotope, at least one opening in the side of the shell, and a lining defining a passage from the outside of the shell to the tube, and means at the mouth of the passage for locating in the passage a fitting.

An embodiment of the present invention will now be described, by way of example with reference to the accompanying drawings, in which:-

Fig.1 is a longitudinal cross section through a container according to the present invention;
Fig.2 is a cross section through a replaceable fitting used with the container of Fig.1;
Fig.3 is a cross section of a panoramic collimator used with the container of Fig.1; and
Fig.4 is a cross section of an adaptor for use with the container of Fig.1.

Referring now to the drawings, a container 10 for radio-active isotopes according to the present invention comprises an outer shell 12 of an inert metal, in this embodiment stainless steel, lined with a layer 14 of a radiation attenuating material, in this embodiment depleted uranium. The depleted uranium attenuates the radiation from within the container and the stainless steel protects the user from the depleted uranium and allows the container to be handled. Tungsten is equally satisfactory as the radiation attenuating material.

The container 10 is generally circular in transverse cross section and extends from a rear end 16 to a front end 18, the ends 16 and 18 being closed by respective end shields 20 and 22. The front end shield 22 has a central hole in which is located and secured a boss 26 which in turn has a central tapped hole in which is located a threaded adjuster 28, in this embodiment a socket or grub screw.

The boss 26 is in this embodiment secured by a spring clip, but other means, such as screw threads may be used to secure the boss in position.

A guide tube 30 of an inert metal such as stainless steel or aluminium alloy extends the length of the container between the boss 26 and the rear end shield 20 where it is open to the exterior of the container. In the guide tube 30 is provided a drive linkage 32 which mounts a radio-active isotope 34. The drive linkage 32 is made of a shielding material that attenuates radiation and shields the isotope in the direction of the guide tube. Radio-active isotopes in common use as the radiation source in radiography are iridium 192, cobalt 60, ytterbium 169 and selenium 75.

A control plate 40 is bolted to the rear end shield 20 and has a central aperture through which passes the drive linkage 32. Mounted on, or otherwise associated with, the control plate 40 are the controls for the drive linkage 32. These controls include means for moving the drive linkage 32 into and, as will be explained later, through the guide tube 30, means for securing the linkage 32 in a position in which the isotope is in a safe position 34a and is completely shielded, and an indicator to show when the isotope is in the safe position. The linkage and controls are conventional and will not be de-

scribed further.

Also provided at the rear end shield are any desired security devices such as a lock to prevent unauthorised use or removal of the container, and the security devices, linkage and controls are all in accordance with BSS 650 of 1978 and ISO 3999 of 1977.

An opening 42, radially spaced from the working position of the isotope 34, is provided in the outer shell 12 and its lining 40. From the opening 42 a passage 44 lined with stainless steel extends inwardly to the surface of the guide tube 30. The mouth of the passage 44 is a circular collar portion 46 which is provided with retaining means and from which a frusto-conical portion 48 tapers inwardly. The shape of the passage 44 is not critical and any convenient cross-section, for example circular, may be used.

In the passage 44 is located a fitting 50, shown in Fig.2, which may be either a collimator defining a shape of beam or a blank member made of a radiation attenuating or shielding material, preferably tungsten alloy. In this way any one of a number of different beam shapes may be provided as desired. The shape of the fitting 50 complements that of the passage 44. The fitting 50 is secured by the retaining means which may be simple threaded sections on the collar portion 52 and the corresponding collar portion 52 on the fitting 50.

In use, as so far described, the desired collimator is inserted and secured in the passage 44, and the drive linkage 32 is driven to advance the isotope 34 from its safe position 34a until the forward end of the drive linkage engages the adjuster 28 and the isotope is in its working position where a radiation beam of the desired shape issues from the collimator. The adjuster 28 can be screwed in and out to ensure that the isotope 34 is in its optimum working position.

If It is desired to use a panoramic mode of operation a collimator 60 as shown in Fig.3 is substituted for the boss 26 of Fig.1. The collimator 60 consists of a first flange 62 having on its rear face a boss which can be fitted into, and secured in, the aperture in the front end plate 22 and which has a central hole aligned with the guide tube 30. Extending forwardly from the front face of the first flange 62 is a threaded tube 66 onto which is screwed a flange assembly comprising a second flange 68, a forwardly projecting tubular extension 70 which is open to the central hole in the flange 62 and thence to the guide tube 30 and is closed at its forward end apart from a central bore in which is located an adjuster 28. The adjuster 28 is mounted in a tapped axial hole in an end cap 72 which is in turn mounted on the free end of the tubular extension 70.

In the operation of the collimator 60 of Fig.3, the flange assembly is screwed in or out on the threaded tube 66 to achieve the desired spacing of the flanges 62 and 68 and thus the desired shape of the radiation beam. The drive linkage 32 is then advanced into the passage through the collimator 60 defined by the tube 66 until the free end of the linkage 32 again engages the adjuster 28. Any fine adjustment is then made by screwing the adjuster 28 in or out to locate the isotope 34 in its optimum working position.

In a modified embodiment the cap 72 is integral with the second flange 68 such that moving the flange either forwardly or backwardly also moves the isotope so that the isotope can be kept in its optimum position.

Fig.4 shows a tubular adaptor 70 comprising a tube with a retaining means at each end. The adaptor 70 is fitted into the aperture in the front end plate 22 in place of the boss 26 while an extension tube is fitted onto the free forward end of the adaptor 70. This arrangement allows the drive linkage 32 to be driven out of the container 10 through the adaptor 70 and thence into the extension tube. The retaining means may be threads or spring clips.

Claims

1. A container for a radio-active isotope, characterised by a shell for attenuating radiation from the isotope, a tube extending into the shell from a rear end, the tube being open at its rear end to allow the insertion of a support for the isotope, at least one opening in the side of the shell and a lining defining a passage from the outside of the shell to the tube, and means at the mouth of the passage for locating in the passage a fitting.

2. A container as claimed in claim 1, characterised in that the mouth of the passage is provided with means for retaining the fitting.

3. A container as claimed in claim 1 or claim 2, characterised in that a fitting is located in the passage.

4. A container as claimed in claim 3, characterised in that the fitting is either a collimator defining a passage for a radiation beam or a shielding member.

5. A container as claimed in any preceding claim, characterised in that the tube extends to an end shield at the front end of the shell, the end shield having a central aperture.

6. A container as claimed in claim 5, characterised in that a boss is secured in the central aperture and an adjuster is mounted in the boss and extends to the interior of the container.

7. A container as claimed in claim 5, characterised in that a panoramic collimator is mounted in the central aperture, the panoramic collimator comprising a pair of flanges defining the shape of a radiation beam, a passage passing through the collimator, and an adjuster at the end of the passage, projecting into the passage and operable from the exterior

of the collimator.

8. A container as claimed in claim 7, characterised in that the distance between the flanges is adjustable.

9. A container as claimed in claim 6, characterised in that a tubular adapter is mounted in the central aperture, the adapter having a free end to which an extension tube may be secured for driving the isotope outside the shell.

10. A container as claimed in any preceding claim, characterised by a drive linkage for mounting an isotope and means at the rear end of the container for moving the drive linkage into and through the tube.

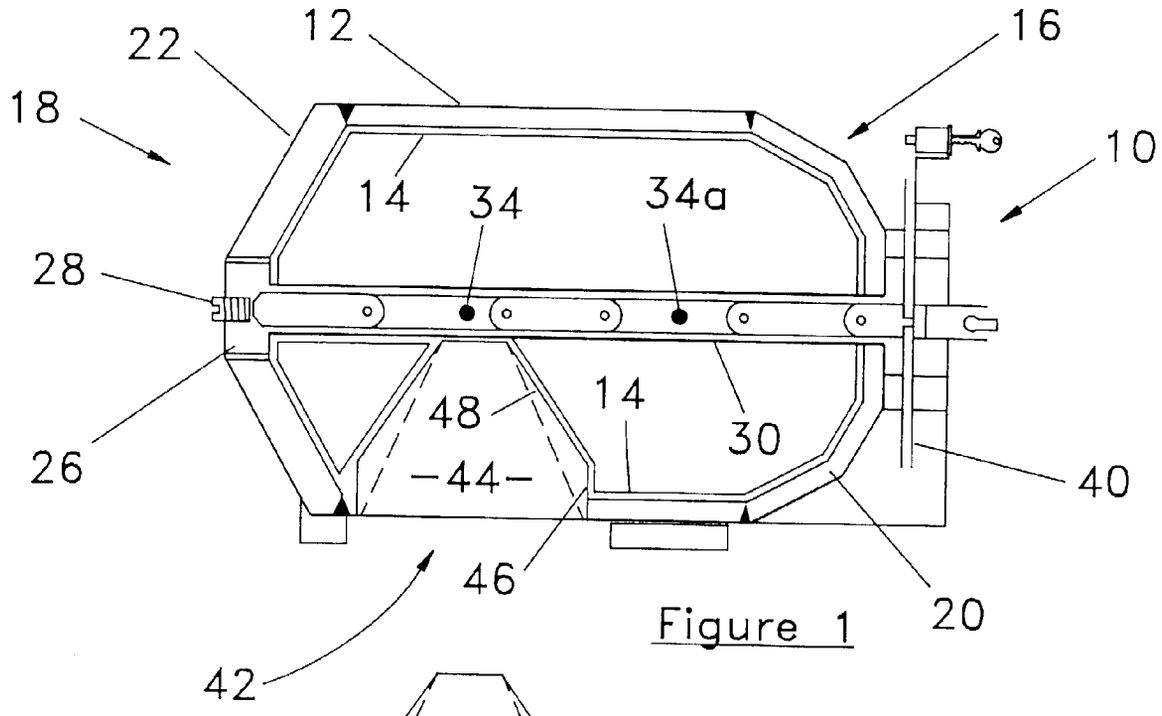

Figure 1

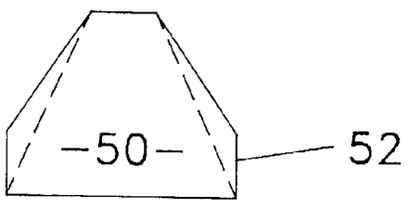

Figure 2

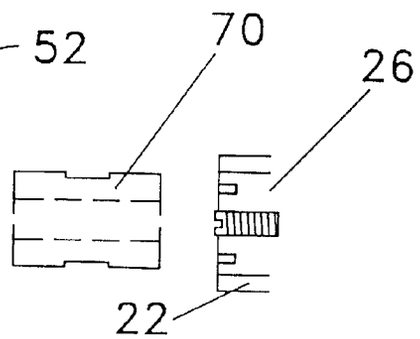

Figure 4

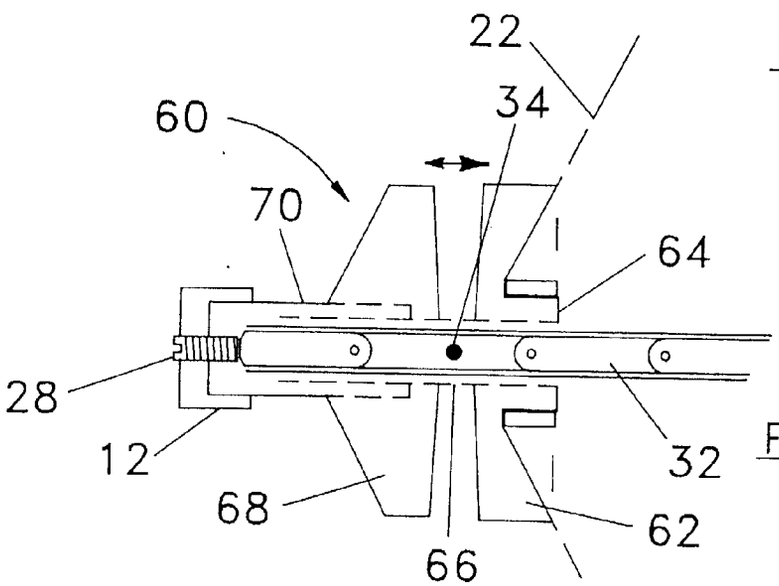

Figure 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 30 1024

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 3 655 983 A (FORRER GILBERT R) 11 April 1972 * claims 1-7; figures 1-7 *	1-10	G21F5/015 G21F5/02
A	GB 1 250 891 A (NATIONAL RESEARCH DEVELOPMENT CORPORATION) 20 October 1971 * page 1, line 69 - page 2, line 20; figures 1-3C *	1-6,8	
A	DATABASE WPI Section Ch, Week 8313 Derwent Publications Ltd., London, GB; Class K08, AN 83-31989K XP002064489 & ZA 8 201 625 A (KEMPKES H E) * abstract *	1-6	
A	GB 1 330 301 A (YOUNG S G) 19 September 1973 * page 1, line 49 - page 2, line 28; figures 1,2 *	1-6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	US 4 513 204 A (DOMNANOVICH JAMES R ET AL) 23 April 1985 * claims 1-4,8,11; figures 1-7 *	1-6	G21F
A	EP 0 314 570 A (COMMISSARIAT À L'ÉNERGIE ATOMIQUE) 3 May 1989 * claims 1,2; figure 1 *	1-6	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 May 1998	Deroubaix, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)