(12) UK Patent Application (19) GB (11) 2 103 989 A

(21) Application No **8121378**
(22) Date of filing **10 Jul 1981**
(43) Application published **2 Mar 1983**
(51) INT CL[3] **B25J 21/00 G21F 7/04**
(52) Domestic classification **B4Q 5B 5C 9**
(56) Documents cited
GBA 2044160
GBA 2028161
GB 1337069
GB 0995332
(58) Field of search **B4Q**
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(54) Posting system

(57) A posting system for the movement of equipment, such as a manipulator (3), into and out of an enclosure (1) e.g. a cell or glovebox, for toxic or radioactive materials has the manipulator (3) arranged within a collapsible bellows-like container (6) with an end of the container cooperating with a port entry (2) to the enclosure. The collapsible container (6) isolates the manipulator (3) from the environment outside the enclosure and allows the manipulator (3) to enter and leave the contaminated enclosure without breach of the containment. A particular construction of cell for use with radioactive material is described (Fig. 3), having a thick wall of shielding material such as concrete provided with a door normally closed by a Pb shutter and having a cylindrical gamma shield block located over the shutter on the exterior of the wall.

Fig.1.

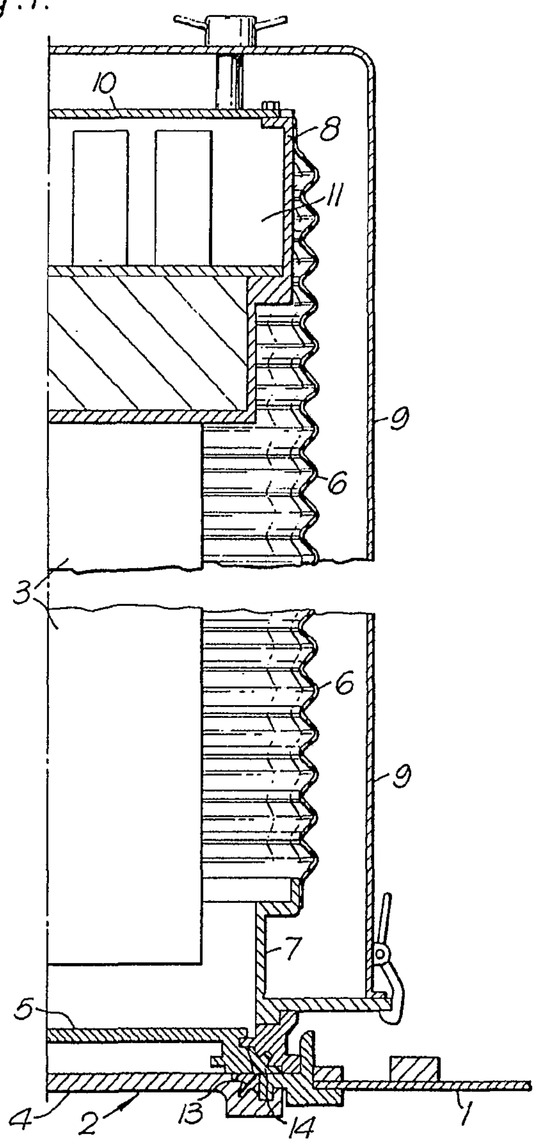

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Fig.1.

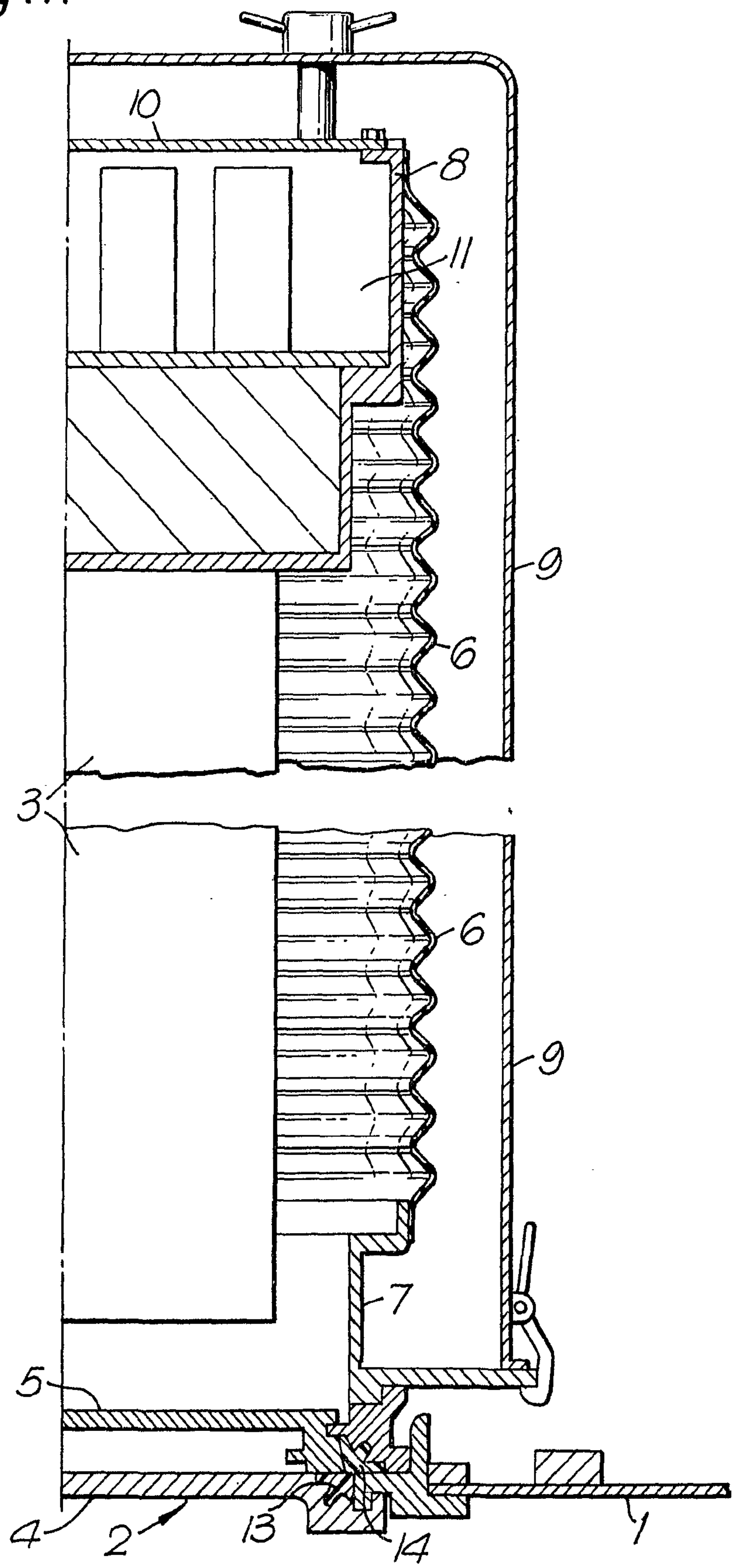

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Fig. 2.

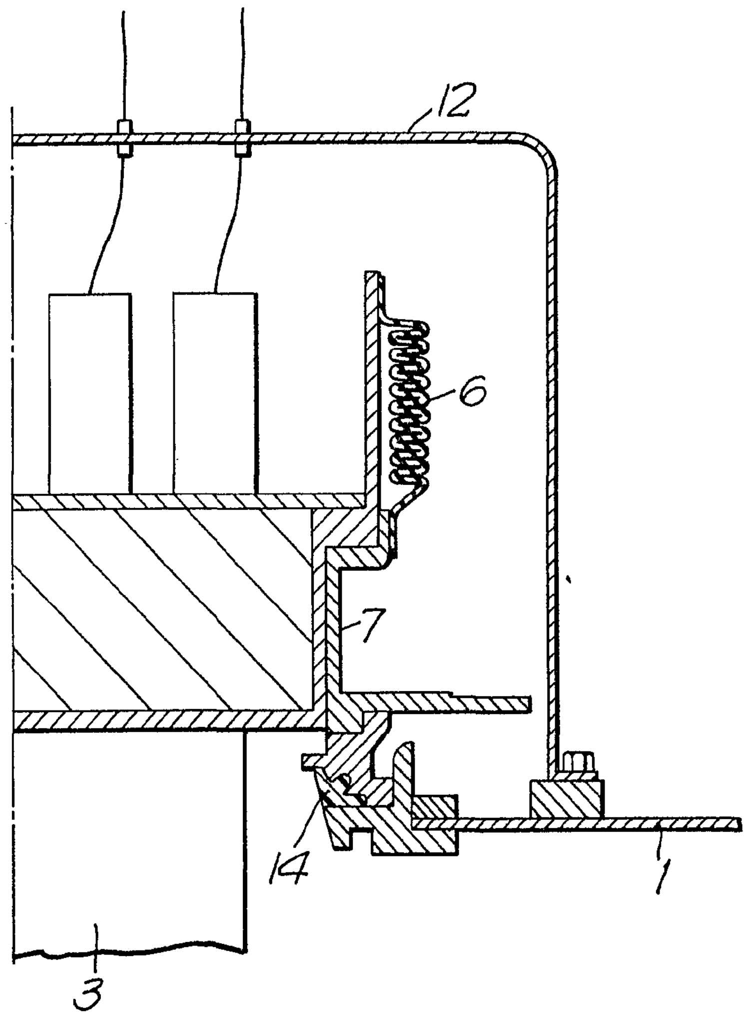

Fig. 3.

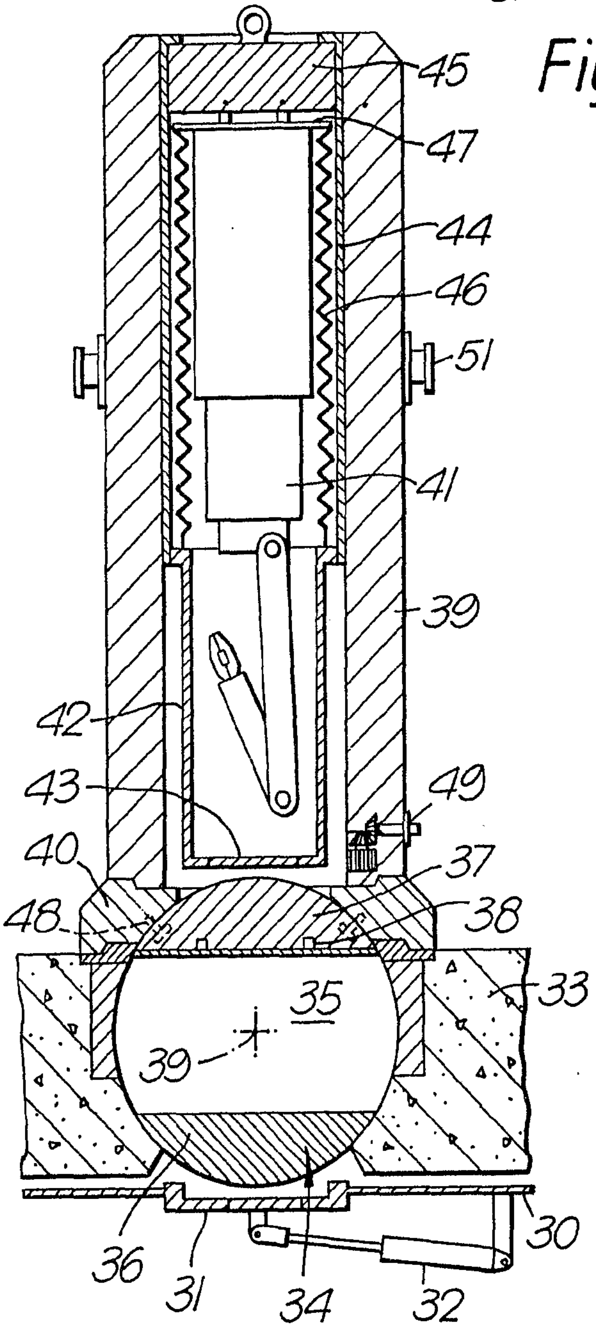
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Fig. 4.

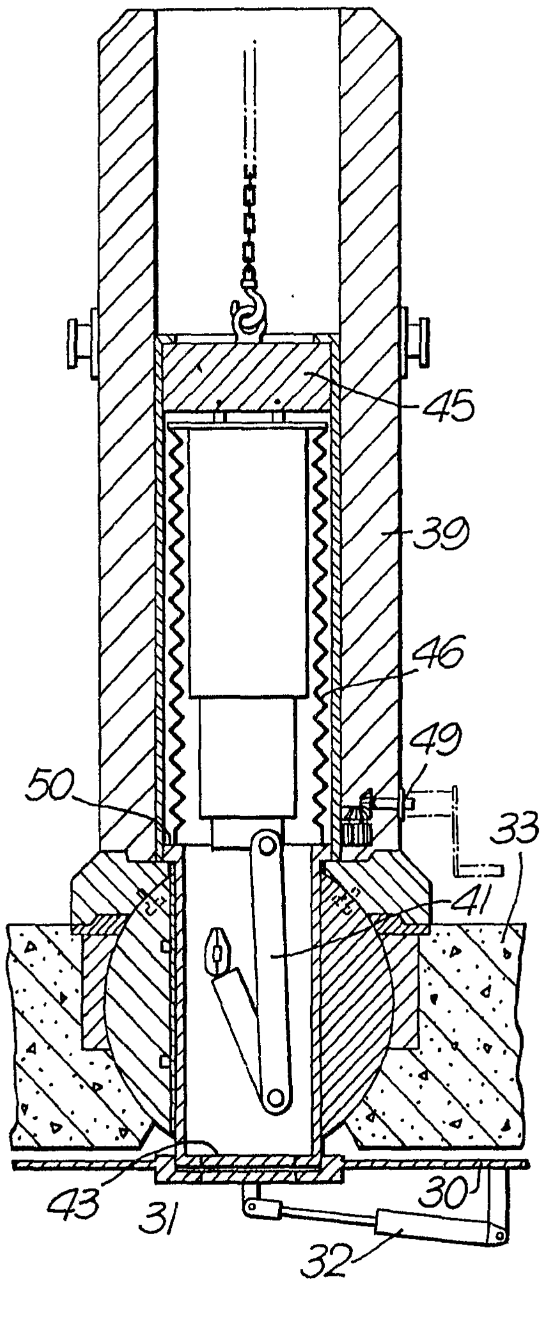
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Fig. 5.

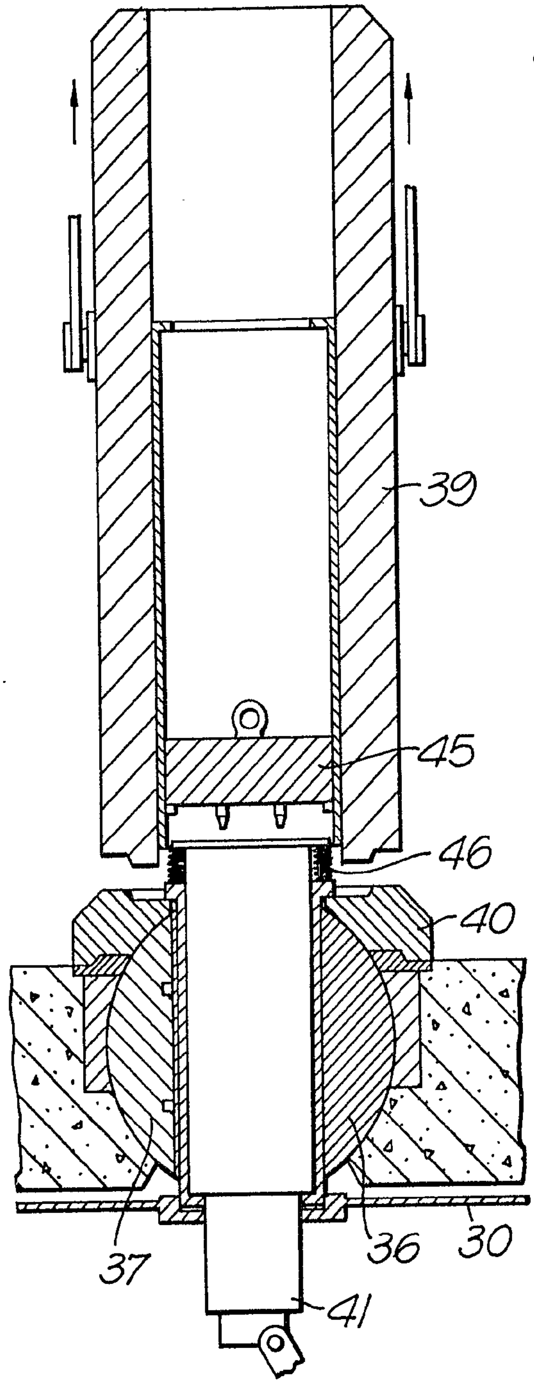
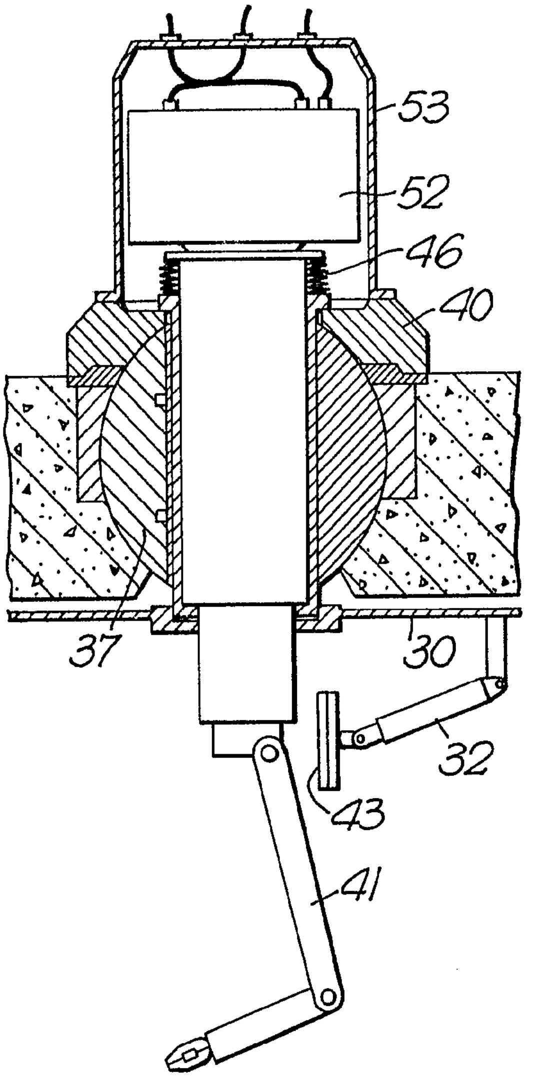


Fig. 6.



SPECIFICATION
An improved posting system

The present invention concerns a posting system for the introduction and removal of equipment into and out of a hostile environment.

The aim of the invention is to provide a posting system for a piece of equipment, for example a tool such as a manipulator, whereby the tool is at all times contained within shielding and can be transported between work stations and to maintenance and decontamination stations. Further when positioned at a workstation and not in use it is desirable that the tool can be withdrawn from the hostile environment without breaching the containment.

According to the present invention a posting system for the movement of equipment, such as a tool, into and out of an enclosure for hazardous materials comprises a container for the tool, one end of the container being attached to the tool and the opposite end of the container having a door cooperable with a door in a wall of the enclosure, the container having a bellows-like configuration for movement between extended and collapsed positions, whereby for introducing the tool into the enclosure the doors are coupled together and opened as a unit and the container is collapsed to urge the tool therein through the port into the enclosure and for withdrawal the container is extended to draw the tool out of the enclosure through the port.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a simplified diagrammatic sectional part view of one embodiment of a posting system according to the invention and showing a tool in a withdrawn position outside a work area;

Figure 2 is a view similar to Figure 1 and showing the tool in its operating position within the work area;

Figures 3, 4, 5 and 6 respectively are diagrammatic sectional views of a second embodiment of the invention showing a tool in different stages of posting into a work area.

The invention provides a posting system for posting a tool, such as a manipulator, into and out of an enclosed area containing a toxic or radioactive material. The tool is at all times isolated from the normal environment outside the work area.

In Figures 1 and 2, a wall 1 of a cell or glovebox to receive radioactive alpha (α) emitting material is provided with a posting port 2 through which a tool, such as a manipulator 3 for performing work operations within the cell can be advanced into and withdrawn from the cell. The port 2 is normally closed by a conventional double door arrangement, the individual doors being denoted by reference numerals 4 and 5. Door 4 is releasably engageable in an opening in the wall 1 of the cell and door 5 is releasably engageable in the end of a container 6 which is located about the manipulator 3. The wall of the container 6 is collapsible and conveniently it is formed as a bellows extending between and secured to a lower support ring 7 which cooperates with the door 5 and an upper support 8 which can carry drive means for the manipulator 3. The bellows material can be stainless steel or a heavy duty plastics material. The container 6 is supported against collapse in the position shown in Figure 1 by means of an outer cylindrical support cover 9. The lower end of the cover 9 can be releasably attached to the ring 7 at the lower end of the container 6. The upper end of the cover 9 can be releasably secured to a removable cover plate 10 for a compartment 11 within the upper support 8 housing the drive means for the manipulator.

In use, with the manipulator 3 within the expanded container 6 and the door 5 in position to close the lower end of the container 6, the assembly is positioned about the port 2 to interlock the doors 4 and 5 in a known manner. The arrangement is such that a rotary action will couple and lock the door 5 to the door 4 while releasing the door 5 from its support 7 and releasing the door 4 from the port 2. At the same time the support ring 7 is detachably coupled to the port opening. The doors 4 and 5 can now be opened as a unit, the unit being moved into the cell to enable the manipulator 3 to be advanced through the port opening 2 into the cell.

The manipulator can be advanced by removing the cover 9 and allowing the container 6 to collapse in a controlled manner to the position shown in Figure 2. The manipulator 3 is now within the cell and a removable cover 12 can be located about the collapsed container 6 and the drive means at the upper end of the manipulator. Electrical connections for the drive means can be passed through the cover 12.

To withdraw the manipulator 3 from the cell the procedure is reversed to return to the position depicted in Figure 1. The manipulator is at all times isolated from the natural environment outside the cell by means of the collapsible container 6. The exterior of the container 6 remains free from contamination. The manipulator 3 supported by the cover 9 can be transported to different work stations or to a decontamination facility, the end of the cover being closed by the door 5. Seals 13 and 14 are provided in the usual manner about the port opening and as shown in Figure 1. Although reference is made above to the upper and lower ends it will be realised that the posting system is not necessarily restricted to use in a vertical direction and that it can be adapted for reciprocable movement of the manipulator in any desired direction.

The embodiment illustrated in Figures 3 to 6 is for use with a cell enclosing alpha, beta and gamma (α, β, γ) activity. The cell wall 30 has a port opening which is normally closed by a door 31 of a conventional double door unit of the kind mentioned with reference to the embodiment of Figures 1 and 2 above. The door 31 is movable between open and shut positions by an operating mechanism 32 located within the cell. The cell is surrounded by a thick wall of shielding material 33 such as concrete. An opening in the shielding wall 33 to permit access to the door 31 is normally closed by a spherical or cylindrical shutter 34 formed from a material, for example lead, which is capable of attenuating γ radiation. The door 31 serves as an α gate and the shutter 34 serves as a gamma gate to prevent radiation escape through the opening in the shielding. The shutter 34 has a through bore 35 which in the closed position of the shutter is located normal to the axis of the opening in the wall 33 and as shown in Figure 3. Further the shutter 34 is formed in two releasably interconnected parts, namely a larger spherical or cylindrical segment 36 containing the bore 35 and a smaller segment 37 which can be positioned on the larger segment 36 by location means such as dowels 38 whereby the two parts 36 and 37 can be rotated as a unit about axis 39 to bring the bore 35 into the position shown in Figures 4 to 6. Drive means (not shown) can be provided in the shielding wall to effect rotation of the shutter 34.

Located over the shutter 35 on the exterior of the wall 33 is a cylindrical gamma shield block 39 having a detachable base 40 which latter is profiled to sit on the wall 33 about the protruding segment 37 as shown in Figure 3. A manipulator 41 is located within the shield block 39, the manipulator being partly housed with a guide tube 42 terminating in a door 43. The door 43 is the second door of the previously mentioned double door unit and cooperates in a known manner with the door 31. The guide tube 42 is supported by a carrier 44 which depends from a movable end plug 45 at the end of the shield block 39. The portion of the manipulator which extends out of the guide tube 42 is enclosed within a collapsible container formed as a bellows 46 which extends between the open upper end of the guide tube 42 and a closure plate 47 for the open upper end of the guide tube 42. The bellows material can be a stainless steel or a robust plastics material. In Figure 3 the bellows is in its extended condition.

To move the manipulator into the cell it is first necessary to rotate the shutter 34 through 90° from its position shown in Figure 3 to that shown in Figures 4 to 6. The shutter segment 37 is coupled to the base 40 of the gamma shield block 39 by means of keys 48 in the base engaging keyways in the shutter segment.

The manipulator is now lowered within its shielding block 39 to the position as shown in Figure 4 in which the guide tube 42 extends through the bore in the shutter 34 to bring the door 43 at the end of the guide tube into engagement with the door 31. The guide tube is dimensioned to be a sliding fit within the bore in the shutter 34. A drive mechanism 49 is arranged at the bottom of the shield block 39 to engage and cooperate with the flanged end 50 of the guide tube. The drive mechanism 49 imparts the required rotary motion to disengage the door 43 from the end of the guide tube 42 and to engage the door 43 to the door 31. Thereafter door 31 can be disengaged from the wall 30 and the now engaged double door unit can be opened by means of the operating mechanism 32.

Continued downward movement introduces the manipulator into the cell through the opened double door unit and as shown in Figure 5. During this stage, the guide tube 42 remains stationary within the shutter 34 and the end plug 45 moves down the carrier 44 to compress the bellows 46 between the flanged end 50 and the closure plate 47. In this position the end of the manipulator is a close fit within the guide tube 42 and serves to complete the seal at the shutter.

The shield block containing the end plug and carrier 44 can be removed as shown in Figure 5. Conveniently the shield block can be provided with trunnions 51 for lifting. A motor drive 52 can be positioned and supported on the base 40 and coupled to the manipulator and an operating cover 53 can be fitted for added security. The manipulator is then ready for operation as shown in Figure 6.

The removal of the manipulator from the cell is the reverse of the above outlined procedure. On withdrawal of the manipulator, those parts of the manipulator which have been exposed to the environment within the cell and are therefore contaminated are at all times contained within the compartment formed by the guide tube 42, the bellows and the end plate 47.

The invention therefore provides a posting system whereby tools and the like can be passed into and out of a hostile environment without breach of the containment. Any contamination withdrawn with the tool is isolated from the normal environment by the collapsible container provided about the tool and which allows the reciprocable movement of the tool into and out of the hostile environment. The tool isolated within its container, and shielded within the cylinder block 39 closed at opposite ends by the segment 37 and the plug 47 can be transported between work stations. It is anticipated that a posting system as shown in Figures 3 to 6 can be arranged to operate in a horizontal direction or at any required inclination and is not restricted to the vertical arrangement shown in the drawings.

It can be advantageous when working with hazardous materials to maintain the active volume of the cell as small as possible and to avoid any unnecessary equipment within the cell which could form obstructions to the movement of work pieces between work stations along the cell.

In the illustrated embodiments the double door operating mechanism is arranged within the cell. As an alternative and to reduce the overall cross-sectional size of the cell, on opening the double door unit the door can be withdrawn in a linear path across the interior of the cell to the opposite side wall. A withdrawal and advance mechanism for moving the door unit across the cell can be located in a shielded housing coaxial with the axis of the shield block 39 and at the opposite side of the cell to the shield block 39.

CLAIMS

1. A posting system for the movement of equipment, such as a tool, into and out of an enclosure for hazardous materials comprising a container for the tool, one end of the container being attached to the tool and the opposite end of the container having a door cooperable with a door in a wall of the enclosure, the container being collapsible for movement between extended and collapsed positions, whereby for introducing the tool into the enclosure the doors are coupled together and opened as a unit and the container is collapsed to allow the tool therein to pass through the port into the enclosure and for withdrawal the container is extended to draw the tool out of the enclosure through the port.

2. A posting system as claimed in claim 1 including a removable support for releasably holding the container in its extended position.

3. A posting system as claimed in claim 1 or 2 in which the container comprises a bellows.

4. A posting system as claimed in claim 3 in which the bellows material comprises stainless steel or a heavy duty plastics.

5. A posting system as claimed in claim 1 in which the container comprises a guide tube portion slidable within a bore in a shutter rotatably mounted in an opening in a shielding material.

6. A posting system for the movement of equipment into and out of enclosures for hazardous materials substantially as herein described with reference to and as illustrated in Figures 1 and 2 of the accompanying drawings.

7. A posting system for a movement of equipment into and out of enclosures for hazardous materials substantially as herein described with reference to and as illustrated in Figures 3 to 6 of the accompanying drawings.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1983. Published by the Patent Office 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.