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(54) Posting system

(57) A system for posting hazardous materials into and out of an enclosure, such as a glovebox, through a port 2 in a wall 1 of the enclosure. The port is normally closed by a door 10 which cooperates with a removable end closure 30, 31 on a container 27 or the like when the latter is presented to and secured at the port 2. The container 27 is secured in position at the port 2 by means of a rotatable coupling ring 38. A single interlock ensures that the door cannot be opened in the absence of a container at the port and also that the container cannot be removed from the port when the door is open. In place of the container 27, a glove secured to a rigid sleeve may be used to enable the operator to perform a work function within the glovebox.

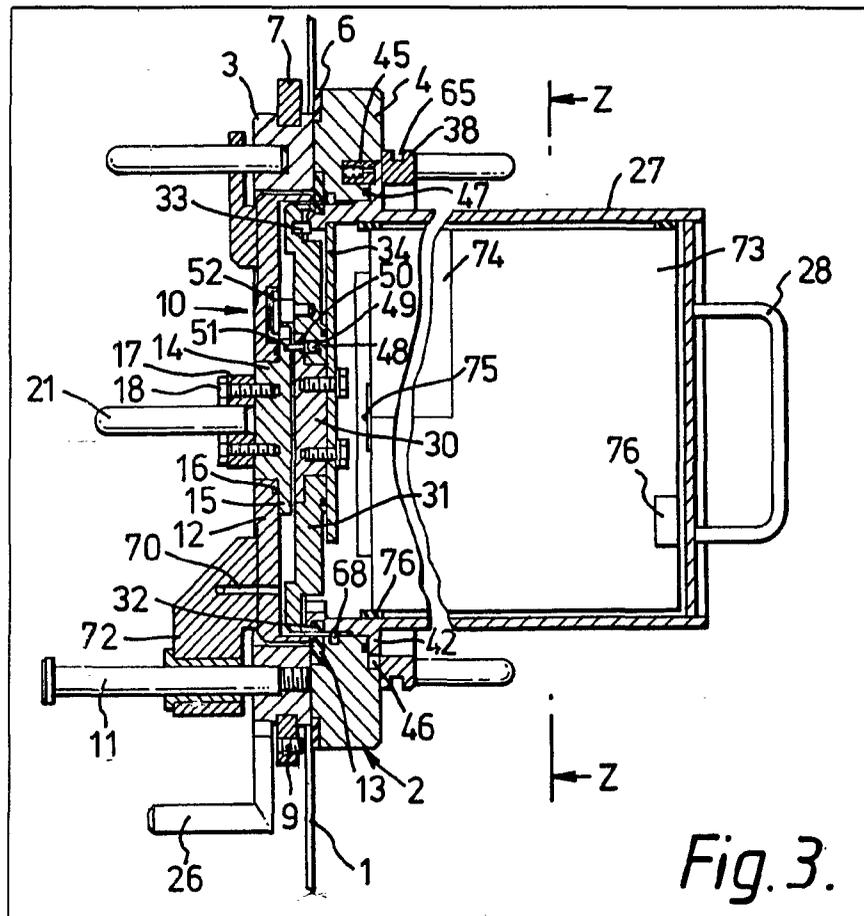
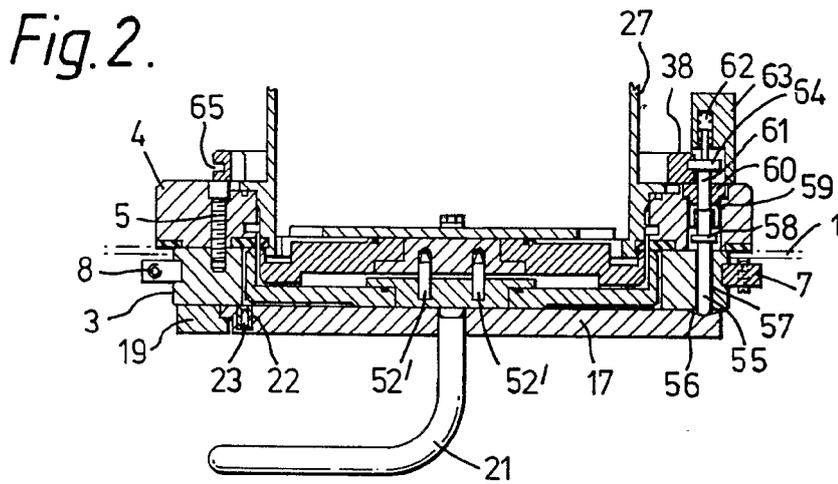
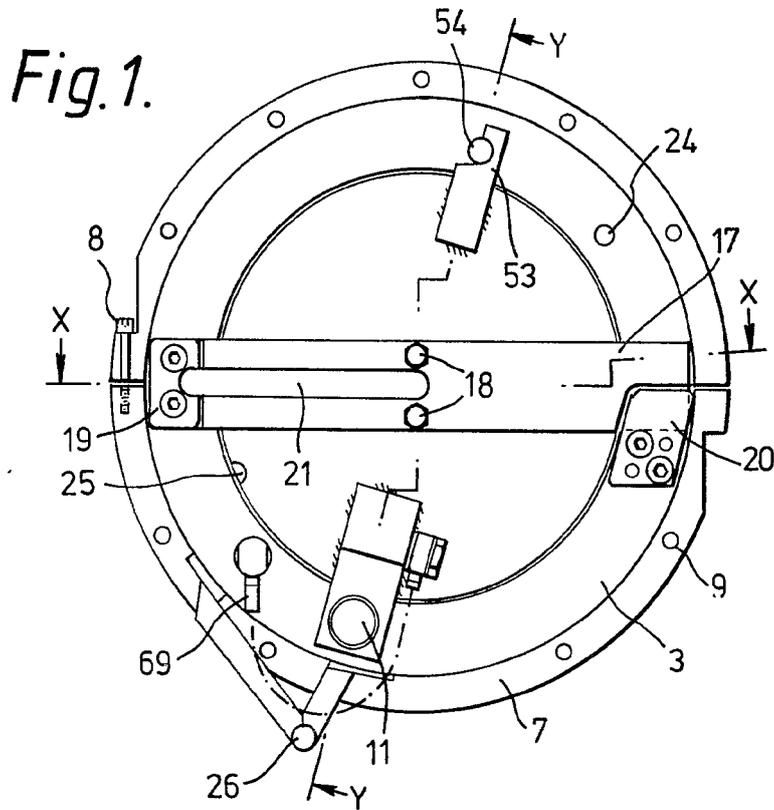


Fig. 3.

GB 2 102 719 A



2/4

Fig. 3.

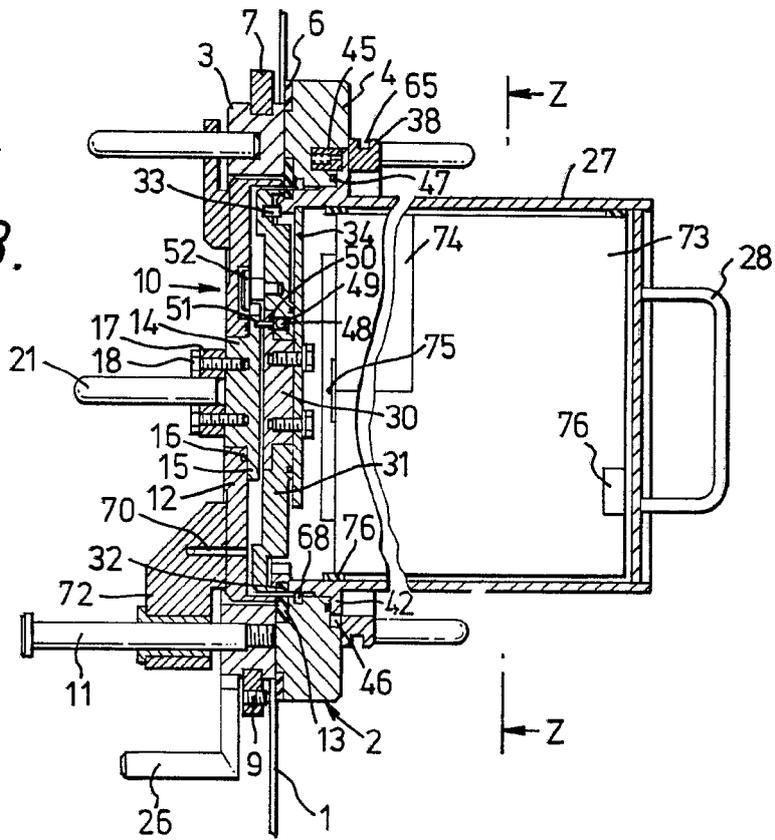
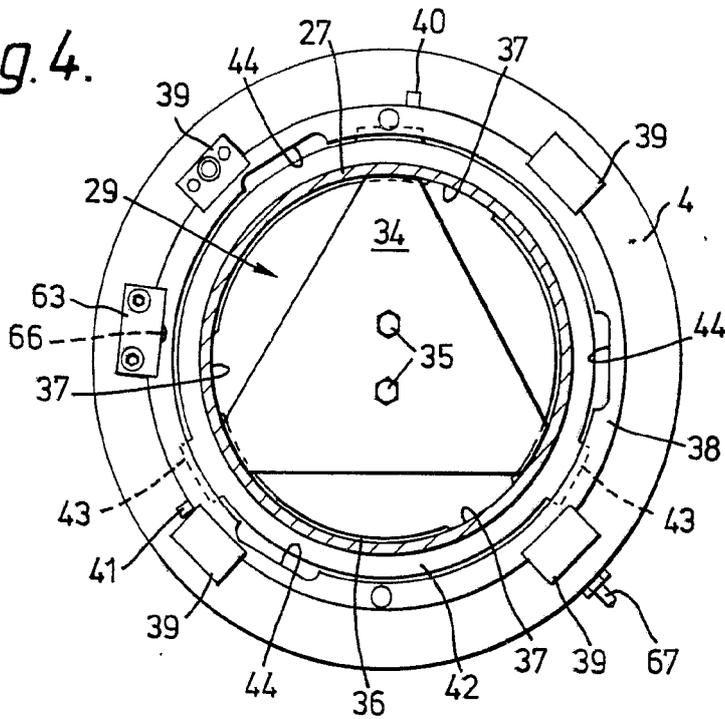
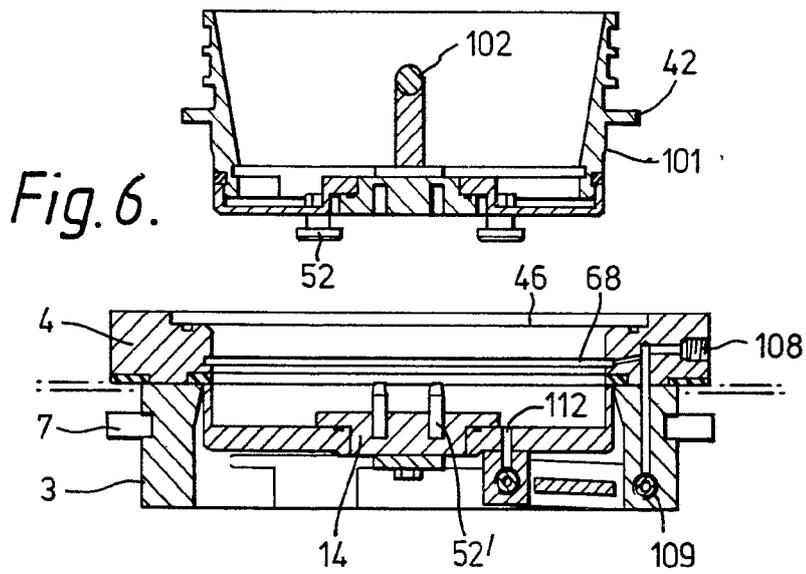
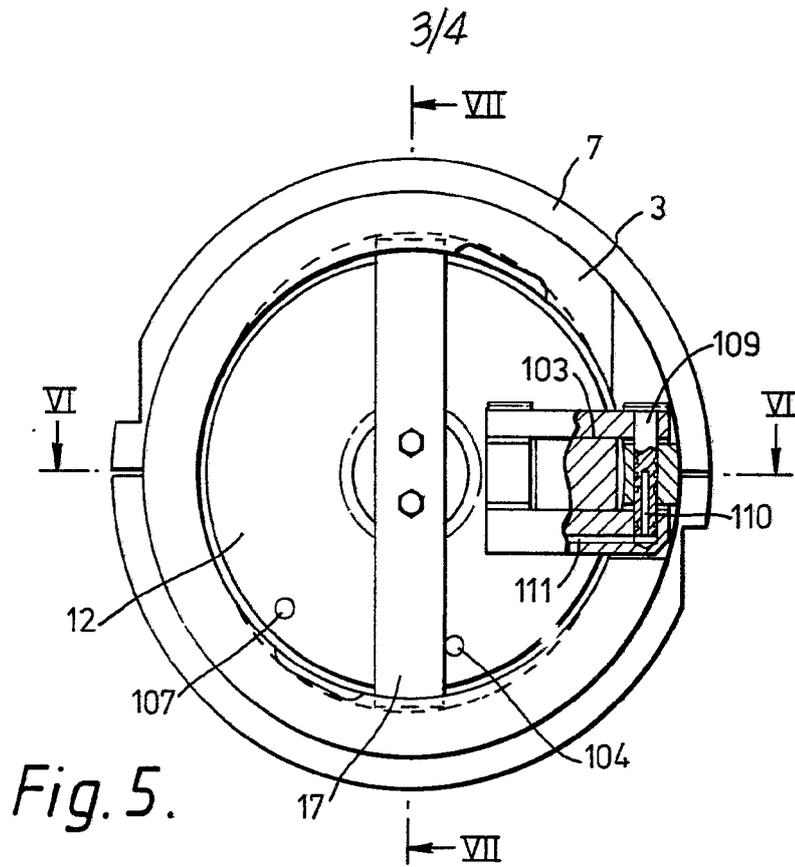
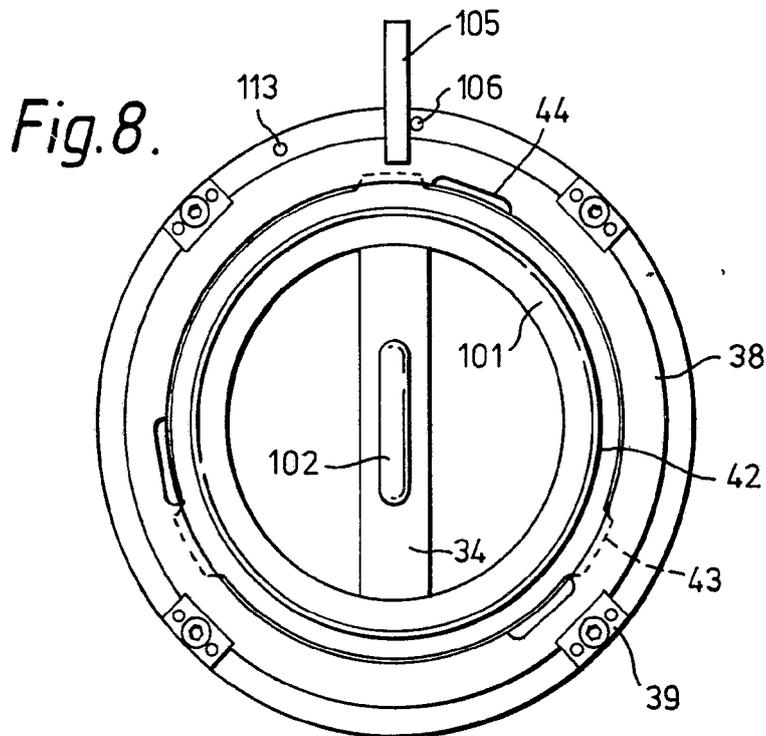
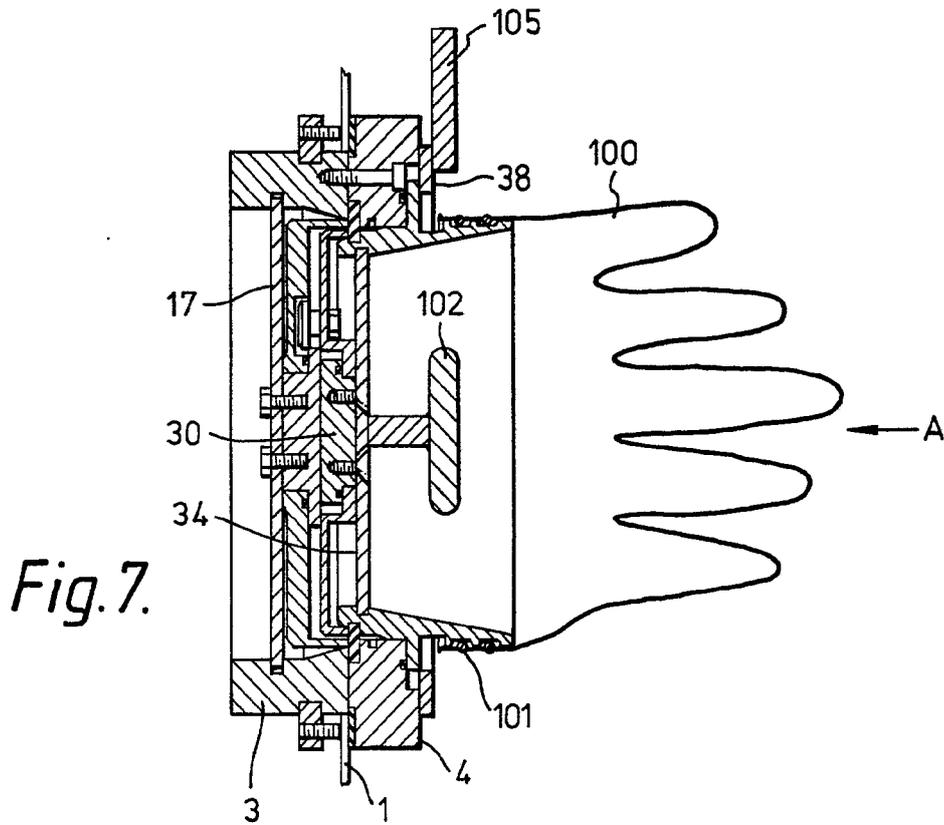


Fig. 4.







SPECIFICATION

An improved posting system

5 The present invention concerns a system for posting into and out of an enclosure such as a glovebox housing radioactive or other hazardous materials.

10 The invention is concerned with a posting system of the kind such as disclosed in the Applicants' Patent Specification number 79300824, which employs a so called "double-cover" arrangement in which material is transferred between a container and an enclosure through a port in a wall of the enclosure, the container being releasably attached to the port which is normally closed by a door. In the "double-cover" arrangement any part of the port or container which is exposed to the environment when the container is detached from the port is protected from exposure to the atmosphere within the enclosure.

20 According to the present invention a system for posting into and out of an enclosure through a port in a wall of the enclosure comprises a door for the port, the door being normally locked in a closed position to isolate the interior of the enclosure from the environment, a member having a detachable end closure co-operable with the port, co-operating means on the door and the end closure operable to releasably engage the door to the end closure when the member is presented to the port, rotatable coupling means on the port to releasably engage and retain the member at the port, the door and end closure being movable as a unit into the enclosure to permit communication between the enclosure and the container when the container is locked to the port and a gas supply for purging the surfaces of the door and the end closure which are exposed to the environment on removal of the container from the port.

45 The invention will be described, by way of example, with reference to the accompanying drawings; in which

Figure 1 is an end view of a first embodiment of a posting system, the view being from the interior of an enclosure and with the port closed;

Figure 2 is a section on line X-X in Fig. 1;

Figure 3 is a section on line Y-Y in Fig. 1;

Figure 4 is a section on line Z-Z in Fig. 3;

55 *Figure 5* is an end view similar to Fig. 1 of a second embodiment of the invention;

Figure 6 is a section on line VI-VI in Fig. 5 and showing a glove unit separated from a door unit;

60 *Figure 7* is a section on line VII-VII in Fig. 5; and

Figure 8 is an end view in the direction of the arrow A in Fig. 10.

65 A wall 1 of a glovebox or a cell for receiving radioactive or other hazardous material

has an opening forming a port for communication between the interior of the cell (to the left of the wall 1 as shown in Fig. 3) and the normal environment outside the cell (to the right of the wall 1 as shown in Fig. 3). The port 2 can be formed by separate inner and outer metal rings 3 and 4 respectively which are united by a plurality of angularly spaced apart bolts 5 passing through the outer ring 4 and engaging tapped bores in the inner ring 3. The outer diameter of the inner ring 3 is not greater than the diameter of the opening in the wall 1 and the outer diameter of the ring 4 is greater than the diameter of the opening in the wall whereby the portion of the outer ring 4 projecting radially outwardly beyond the inner ring 3 abuts against the outer surface of the wall 1. A sealing ring 6 is located in a groove in the outer ring 4 to engage the outer surface of the wall 1. A collar 7, conveniently formed in 2 semi-circular parts held together by bolts 8, is located in a groove in the radially outer surface of the inner ring 3. The collar is provided with a plurality of tapped bores to receive correspondingly threaded bolts 9. The bolts 9 engage the wall 1 and on tightening secure the port in position in the wall opening and compress the sealing ring 6 to effect a seal at the wall opening. Alternatively, the port can be fashioned from a unitary annular block so avoiding the use of separate inner and outer rings bolted together.

70 The inner ring 3 supports a port door 10, the door 10 being slidable and rotatably mounted on a spindle 11 extending from the ring 3. The door comprises an outer annular portion 12 which fits within the inner ring 3 and has a peripheral lip or rim which, in the closed position of the door, abuts against a sealing ring 13 arranged between the outer and inner rings. A centre plate 14 is rotatably mounted in the outer portion 12 of the door, the plate 14 having a flange 15 which abuts against the outer surface of the door portion 12, that is the surface remote from the interior of the cell when the door is in a closed position as shown in Fig. 3. A sealing ring 16 is located in a continuous groove in the outer portion of the door to engage the flange 15. A door latch 17 formed by an elongate rectangular bar is secured by bolts 18 to the centre plate 14. The latch 17 extends across the inner surface of the door portion 12, that is the surface facing the interior of the cell when the door is closed, and the free ends of the latch co-operate with and are received behind latch plates 19 and 20 mounted on the ring 3. The latch 17 is provided with an operator's handle 21.

115 With reference to Fig. 2, one end of the latch 17 has a blind bore to receive a plunger 22 which is urged by a spring 23 in a direction to project outwardly beyond the face of the latch 17 directed towards the door. As

seen from Fig. 2 the end of the plunger 22 overlaps both the ring 3 and the door and the plunger is held recessed within the latch by the ring 3.

5 When opening the door the latch 17 is rotated anticlockwise in Fig. 1, this also effecting rotation of the centre plate 14 of the door, such that the ends of the latch clear the latch plates 19 and 20. The extent of rotation is limited by a stop 24 on the ring 3. The latch is rotated to abut against the stop 24 (the annular portion 12 of the door does not rotate) and the door can then be axially moved from the port by sliding along the pin 11. When the latch 17 is against the stop 24 the spring loaded plunger 22 on the latch 17 is located opposite a semicircular recess 25 in the outer portion 12 of the door. Consequently, as the latch moves away from door the plunger 22 is urged into the recess 25 whereby to lock the latch (and hence the centre plate 14) to the outer portion of the door. On withdrawal from the port opening the door can be swung about the spindle 11 to rest against a stop 26 carried on the ring 3.

A cylindrical container 27 is releasably mounted on the exterior of the port, the container having a closed end which can be provided with a handle 28. A detachable lid 29 for the container has a centre plate 30 mounted in an annular outer portion 31, the outer edge of the portion 31 abutting against a sealing ring 32 at the end of the container and having a peg 33 which co-operates with a recess in the end of the container to prevent relative rotary movement between the portion 31 and the container. A triangular latch 34 is attached to the centre plate 30 by bolts 35 and the truncated apices of the latch 34 engage behind inwardly directed rim 36 at the mouth of the container. The rim 36 is formed with three notches 37 which are arranged to receive the truncated apices of the triangular latch 34 when the latter is turned to a position to release the lid from the container.

A coupling ring 38 is rotatably mounted on the outer face of the ring 4, the coupling ring being held in position by retainers 39 secured to the outer ring 4 of the port and overlapping the outer edge of the coupling ring 38. The coupling ring 38 is rotatable through an arc determined by stops 40 and 41 on the coupling ring and which co-operate with a pair of the retainers 39. In Fig. 4 the stop 41 abuts against its retainer 39 and in this position the coupling ring secures the container to the port. Rotation of the coupling ring 38 clockwise in Fig. 4 to bring stop 40 against its retainer brings the coupling ring to a position in which the container can be removed from or alternatively fitted to the port.

The container 27 is formed with a peripheral flange 42 which in turn has three

radially extending lugs 43 spaced at intervals to co-operate with three correspondingly spaced apart notches 44 in the coupling ring.

In the absence of a container at the posting port the coupling ring 38 is in a position in which the stop 40 abuts against its retainer 39 and the coupling ring is releasably locked against rotation in this position by a spring-loaded plunger 45 slidable in a bore in the ring 4 and engagable in a semicircular notch in the face of the coupling ring abutting against the ring 4. One of the lugs 43 on the container is provided with a semicircular groove to co-operate with the portion of the plunger 45 extending below the notch in the cutting ring. On presenting the container to the port the lugs 43 on the container are entered into the notches 44 in the coupling ring and the plunger 45 is thereby depressed to release the coupling ring. The flange 42 on the container is received in a recess 46 in the face of the ring 4 and a sealing ring 47 is provided at the abutting faces of the flange and the port. The coupling ring 38 can then be rotated to the position shown in Fig. 4 to lock the container in position and at which the stop 41 abuts against its retainer 39. On passing the lugs 43 into the notches 44 in the coupling ring to bring the flange into the recess 46 the container cannot be rotated as each lug is received between a pair of pins (not shown) projecting from the wall of the ring 4.

It is required to ensure that the centre plate 30 and hence the triangular latch 34 secured thereto cannot rotate relative to the outer portion 31 of the lid when the container is not positioned in the port. This is to prevent removal of the lid from the container when the container is not located in position at the port. For this purpose a ball 48 is located in a socket in the outer portion 31 of the lid, the ball being urged by a spring 49 to be received in a co-operating recess 50 in the abutting portion of the centre plate 30. When the ball 48 is urged by the spring to project into the recess in the centre plate the latter cannot be rotated relative to the outer portion of the lid. The ball 48 can be expelled out of the recess 50 and into the bore in the outer portion 31 by means of a peg 51 on the centre plate 14 of the door entering into the recess 50 when the container is presented to the port.

Dowels 52' extending from the centre plate 14 of the door engage bores in the centre plate 30 of the lid whereby the latter, and hence the triangular latch 34 secured thereto, can be rotated as a unit upon rotation of the centre plate of the door.

The outer portion 31 of the lid is provided with buttons 52, conveniently three in number at equi-angularly spaced locations. On presenting the container to the port the buttons pass through notches in the flange 15 of

the centre plate 14 and are received in recesses formed in the outer portion 12 of the door. When the centre portion 14 is rotated to open the door the flange 15 engages behind the buttons 52 to couple the container lid to the door. The combined door and lid assembly can then be moved as a unit to open the port. The assembly is displaced axially along the spindle 11 until the door and lid are clear of the ports. Thereafter the assembly is rotated (clockwise in Fig. 1) about the spindle 11 to clear the port and at which position the assembly is brought to rest against stop 26 secured to the ring 3. To close the port, the assembly is rotated anticlockwise about the spindle 11 to a position for return axial displacement into the port. The return rotational movement is governed by a bracket 53 on the door which abuts against a stop 54 on the ring 3.

For safe foolproof operation it is necessary to ensure that the door cannot be opened in the absence of a container at the port and that the container cannot be removed from the port when the door is in an open position. This requirement is achieved by means of an interlock which comprises a pin 55 slidable in a bore in the ring 3 with an end of the pin 55 engaging a chamfered recess 56 in the latch 17. The bore in the ring 3 is provided with a plastics liner 57 which facilitates the sliding action of the pin 55. The opposite end of the pin 55 is located in a larger diameter bore in the ring 4 and has a collar 58 which serves as a stop to retain the pin 55 within the bore when the latch 17 is moved away from engagement with the end of the pin 55. A sealing diaphragm 59 capable of accommodating axial displacement of the pin 55 is secured about the opposite end of the pin 55 by a bush 60 in threaded engagement with the end of the bore in the ring 4. A further pin 61 is slidable in the bush 60 to engage the diaphragm 59 at the end of the pin 55. The pin 61, and hence the pin 55, are urged in a direction towards the latch 17 by a spring 62 housed within a spring retainer 63 mounted on the ring 4.

A collar 64 on the pin 61 co-operates with a peripheral groove 65 in the coupling ring 38. The collar 64 is at all times retained in the groove 65, hence rendering the pin axially immovable except when the coupling ring 38 is rotated to the position to secure the container to the port with the stop 41 abutting retainer 39. At this position notches 66 in the walls of the groove 65 can receive the collar 64 to allow axial displacement of the pin 61. Consequently in this, and only this, position of the coupling ring 38 it is possible to rotate the latch 17 as the collar 64 can enter the notch 66 in the wall of the groove 65 remote from the ring 4 to allow the pin 55 to be displaced against the action of spring 62. As the latch 17 is rotated to clear the end

of the pin 55 the latter is urged outwardly by the spring 62 until the collar 58 abuts against the co-operating face of the ring 3. In this position the collar 64 engages the notch 66 in the wall of the groove 65 which is adjacent the ring 4 to effectively lock the coupling ring 38 in its position retaining the container.

The interlock is automatically released on returning the door to its closed position. The chamfered notch 56 in the door on contacting the projecting end of the pin 55 urges the pin 55 and the pin 61 against the action of the spring 62 to return the collar 64 into the groove 65. The ring 38 is then free to rotate on the ring 4.

It is important to keep clean all surfaces which may become contaminated by toxic or radioactive materials during a posting operation and which surfaces are exposed to the environment when the container is removed from the port. These surfaces are the outer surface of the container lid, the facing surface of the door, the internal surface of the port opening and the end of the container. An inlet 67 for a purge gas supply is provided in the ring 4. This inlet 67 communicates through bores in the rings 3 and 4 with an annular groove 68 formed in the radially inner surface of the ring 4 and a flexible pipe 69 (Fig. 1) on the cell side of the door. The flexible pipe 69 is connected to a duct 70 in door mounting bracket 72 and the duct 70 communicates through an aligned aperture in outer portion 12 of the door with the interspace between the door and the lid. When the interengaged door and lid are opened into the cell the purge gas sweeps through the interspace between the lid and door and the purge gas sweeps into the cell from the groove 68 through the annular gap between the end of the container and the surrounding port. The purge gas flows prevent the ingress of toxic or radioactive material into the interspace and the annular gap. The gas supply can be pressurised or in a cell which operate at sub-atmospheric pressures it may be sufficient to leave the inlet 67 open to the atmosphere to allow air to sucked into the cell.

A cylindrical tray 73 having a semi-cylindrical lid 74 to open about a hinge 75 at the end of the tray can be slidably located within the container 27. The tray is supported within the container on slides 76. The leading end of the tray can be provided with an actuating tool for for removing the tray the container and for opening the lid 74.

To obtain access to the cell or glovebox through the port which is normally closed by the door it is necessary to present a container at the port. In the absence of such a container the door is locked closed and cannot be opened.

The container fitted with the lid is introduced into the port opening to occupy the position shown in Fig. 2 and 3. In this

position the spring loaded plunger 45 is depressed out of engagement with the coupling ring by the lug on the flange of the container to thereby free the coupling ring for rotation to secure the container to the port. The dowels 52 in the door locate in the bores in the centre plate of the lid and the pin 51 projecting from the centre plate in the door rotates in the socket containing the ball 48 and depresses the ball against the action of the spring 49 to thereby release the centre plate 30 of the lid for rotation.

Rotation of the coupling ring 38 to bring the stop 41 against retainer 39 secures the cylinder in position at the port and brings the notches 66 in the coupling ring into alignment with the collar 64 on the interlock. The centre portions of the door and lid can be rotated as a unit, this operation being performed from within the cell or glovebox by means of the handle 21 on the door. The latch 17 is rotated against the stop 24, at which position the centre plate on the door engages the buttons 52 on the lid and the centre plate 30 of the lid rotates to release the latch 34. The combined door and lid can then be axially withdrawn along the spindle 11 and thereafter rotated about the spindle to bring the combined unit against the stop 26 and clear of the port opening.

The tray 73 can then be withdrawn from the container 27 and introduced into the cell or glovebox. The lid of the tray is opened and materials to be posted are introduced into or removed from the tray. The purge air supply maintains the interspace between the lid and the door clear of contamination.

When the combined door and lid unit is withdrawn from the port the spring loaded plunger 22 projects into the recess 25 in the door to prevent movement of the latch 17. This safeguard against separation of the door and lid when the combined unit is within the contaminated interior of the cell.

The embodiment illustrated in Figs. 5 to 8 is similar in construction and operation to the embodiment described with reference to Figs. 1 to 4. Accordingly, to avoid undue repetition, the same reference numerals have been used in Figs. 5 to 8 to denote parts identical to or similar to those appearing in Figs. 1 to 4 and reference should be made to the latter for a description of the working relationship between the various parts. Although not shown in Figs. 5 to 8 it should be understood that this embodiment can include the spring loaded plungers 22 and 45, the spring loaded ball 48 between the door and lid, the means to prevent relative rotation between the lid and the end of the container and also the interlock to prevent opening of the door in the absence of a container at the port and removal of a container from the port when the door is in an open position.

In the embodiment of Figs. 5 to 8 the

container of Figs. 1 to 4 is replaced by a glove unit comprising a glove 100 secured to a metal sleeve 101, the sleeve 101 corresponding to the leading end of the previously described container 27 and carrying a releasable lid or end. A handle 102, integral with centre plate 30 of the lid, is enclosed by the glove. The door is mounted to swing on a conventional type hinge 103 supported on the inner ring 3 of the port.

In operation the glove unit is presented to the port and is releasably retained in position by the coupling ring 38. In this position the respective centre plates 14 and 30 of the door and the lid of the glove unit are coupled together for rotation by means of the dowels 52' on the door centre plate projecting into corresponding bores in the lid centre plate. An operator inserts a hand into the glove 100 to grasp and rotate the handle 102 to open the port.

In a closed position shown in Figs. 5, 7 and 8 the door latch 17 abuts stop 104 on the door and an operating handle 105 on the coupling ring 38 abuts a stop 106 on the ring 4. On rotating the handle 102 the door latch 17 is rotated to abut against stop 107. In this position the ends of the latches 17 and 34 coincide with corresponding notches in the ring 3 and the sleeve 101 respectively. Also, rotation of the handle 102 causes the rim of the centre plate 14 in the door to engage behind the heads of the buttons 52. The door and lid can then be pushed open as a unit to swing about the hinge 103. The operator can then insert the gloved hand through the port to perform a work function within the glovebox, the containment being provided by the glove 100. Closure of the port and the removal of the glove unit is a reverse of the above operation. To release the glove unit from the port the coupling ring 38 is rotated to abut stop 113 to bring the notches 44 into alignment with lugs 43 on the flange 42.

As in the embodiment of Figs. 1 to 4 a supply of purge gas can be provided to prevent contamination of those surfaces which are exposed to the environment on the removal of the glove unit from the port. A purge gas supply at an inlet 108 in the ring 4 communicates with the duct or groove 68 at the port opening. The inlet 108 also communicates through the wall of the port opening with a circumferential groove in the stem of hinge pin 109. One end of an axial bore 110 in the hinge pin 109 communicates with the groove in the pin and the opposite end of the bore 110 communicates with a bore 111 in the hinge bracket, the bore 111 in turn communicating with bore 112 leading into the interspace between the door and the end of the glove unit.

A glove box can have a plurality of port openings with each opening being closed by a metal door which can, only be opened upon

insertion of a glove unit into the port opening. An operator or each operator can be provided with a personal glove unit which after removal from the port can be washed, dried, tested and stored for future use.

CLAIMS

1. A system for posting into and out of an enclosure through a port in a wall of the enclosure comprising a door for the port, the door being normally in a closed position to isolate the interior of the enclosure from the environment, a member having a detachable end closure cooperable with the port, cooperating means on the door and the end closure operable to releasably engage the door to the end closure when the member is presented to the port, rotatable coupling means on the port to releasably engage and retain the member at the port, the door and end closure being movable as a unit into the enclosure to permit communication between the enclosure and the member when the member is located at the port.

2. A posting system as claimed in claim 1 in which the member having said detachable end closure comprises a container and the detachable end closure forms a lid for the container.

3. A posting system as claimed in claim 1 in which the member comprises a glove unit having a glove secured to a rigid sleeve, the sleeve carrying said detachable end closure.

4. A posting system as claimed in any preceding claim including a single interlock operable to prevent both the opening of the door in the absence of said member and the removal of the member from the port when the door is in an open position.

5. A posting system as claimed in claim 4 in which the interlock comprises pin means slidably mounted at the port and urged by a spring to engage a recess in a latch for the door, a collar on the pin means cooperating with a peripheral groove in the rotatable coupling means to render the pin means axially immovable and opposing notches in the walls of the groove located to receive the collar when the coupling means is rotated to a position to secure the member at the port, at which position the pin means can be displaced axially away from the latch and against the action of the spring with the collar entering one of the notches to allow the release of the latch and thereafter the pin means is returned by the spring such that the collar enters the opposing notch in the other wall of the groove to thereby lock the coupling means against rotation to release the member.

6. A posting system as claimed in any preceding claim including means for introducing a purge gas supply between the facing surfaces of the door and the end closure when the door and the end closure are engaged, which surfaces are exposed to the environ-

ment on removal of the member from the port.

7. A system for posting into and out of an enclosure through a port in a wall of the enclosure constructed, arranged and adapted to operate substantially as herein described with reference to and as illustrated in Figs. 1 to 4 of the accompanying drawings.

8. A system for posting into and out of an enclosure through a port in a wall of the enclosure constructed, arranged and adapted to operate substantially as herein described with reference to and as illustrated in Fig. 5 to 8 of the accompanying drawings.

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