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(54) Posting apparatus.

(57) The difficulty of withdrawing an inner container, from inside an outer container (49) engaged with a port (20) in the wall (11) of a radioactive cell (12), into the cell, and the disadvantages of carrying a port door (25) on a swinging hinge arrangement inside the cell, are overcome by providing the inner container as a drawer (58) which slides on the outer container (49) to a cantilevered transfer disposition in which it protrudes into the cell. In its transfer disposition the cantilevered end of the drawer carries an end closure (54) of the container and the port door (25). A purging gas flow G can be used to keep clean the sealing surfaces (27,53) of the port and the container.

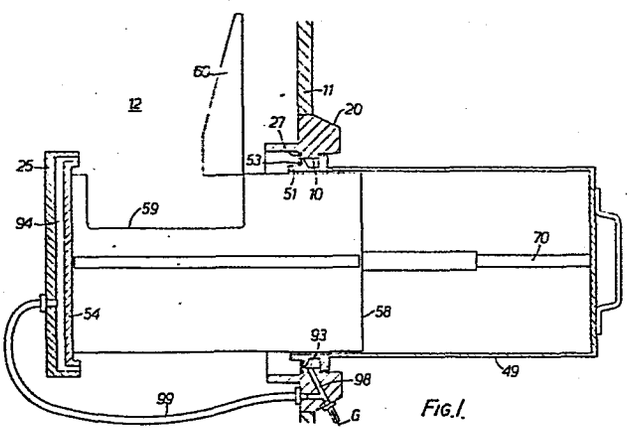

FIG. 1.

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POSTING APPARATUS

The present invention relates to a method of transferring an item between a portable container and a hermetic cell, the container having an opening which is hermetically closable by a closure and retained closed by a container/closure latch in a latching disposition of the latch, and the cell having a port which is hermetically closable by a port door and retained closed by a port/door latch in a latching disposition of the latch, the method comprising the steps of sealing the periphery of the opening to the periphery of the port, effecting mutual latching engagement of the closure and the door and moving the container/closure latch and the port/door latch to respective release dispositions.

The invention also relates to apparatus for transferring an item between a portable container having an opening and a hermetic cell having a port, the periphery of the opening being hermetically sealable to the periphery of the port by movement of a port/container latch from a release disposition to a latching disposition, the port being hermetically closable by a port door and retained closed by movement of a port/door latch from a release disposition to a latching disposition, the container being hermetically closable by a closure and retained closed by movement of a container/closure latch from a release disposition to a latching disposition, and the door and closure being mutually engageable through the agency of a door/closure latch, whereby for transfer of said item the door and closure are mutually engaged and the

container/closure latch and the port/door latch are in their release dispositions.

One form of such an apparatus is described in British Patent Applications Nos. 2030503A and 2102719A, in which the named inventor is also the present inventor. Many of the features described in these previous applications can be incorporated in the apparatus of the present invention. Indeed, the presently preferred embodiments of the present invention employ many of the design features of the previous applications.

There are, however, disadvantages with the apparatus described in the previous Application. Firstly, a relatively complicated and expensive hinge mechanism has to be provided within the ported chamber, to carry the port door and end closure away from the port prior to transfer of an item between the chamber and the container. Secondly, the space required by the hinge mechanism itself, and for the hinging movement of the door and end closure out of the way of the port makes inconvenient demands on the available space within the chamber. Thirdly, the inertia generated by swinging open and shut an assembly, of what can be considerable weight, is generally undesirable in case it brings about damaging impacts of components which must seal together with complete integrity. Fourthly, the need to specify whether the hinge mechanism is lefthand or righthand adds to the complexity and expense of the apparatus. Fifthly, the action of retrieving an inner container from its position fully inside the aforementioned container engaged with the port can be difficult and awkward, and is therefore better avoided.

It is an object of the present invention to overcome or mitigate some or all of the above-described disadvantages.

Apparatus according to the present invention is characterised by a drawer within the container and slidable between a storage position within the container and a transfer position in which it projects out of the opening, which carries the closure and which also carries the door for such time as it is latched to the closure, the drawer occupying the storage position when the port and closure make and break their mutual latching engagement and the transfer position when the item is moved between the drawer and the enclosure.

The method of the present invention is characterised by the steps of:

i. providing the container with an internal drawer which is slidable between a storage position within the container and a transfer position in which it projects out of the opening, and which carries the closure, and

ii. supporting the port door, during such period as it is unlatched from the port, on the container drawer, whereby the port door is carried with the drawer in movement between the storage position and the transfer position, the drawer being in the storage position when the port and closure make and break their mutual latching engagement, and in the transfer position when the item is moved between the drawer and the enclosure.

It will be appreciated that the hinge mechanism is replaced by the container itself as a means whereby the assembly of the port door and end closure is supported on the port body or chamber wall during the transfer or "posting" operation. Further, the only requirement for space within the chamber is for sufficient space immediately in front of the port to allow for the necessary translational movement defined above. As for inertia effects, it is considered that the likely momentum of the drawer and the components carried on it, attained during translational return movement towards the disposition in which the port door is sealed in the port, is likely to be less than any momentum gained by the port door and end closure on the prior hinge mechanism as it is swung from the open to the closed disposition and that, accordingly, the likelihood of damage to delicate seals will be correspondingly reduced. Finally, it is self-evident that the proposed substitution of the hinge mechanism avoids the need to choose a lefthand or righthand arrangement and that the translation of the inner container drawer immediately avoids any possible need for blind fishing with a gloved hand inside the outer container.

For a better understanding of the invention, and to show more clearly how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, which show a preferred embodiment of the invention, and in which:

Figure 1 is a schematic diametral section of a port with a container coupled to it, and a container drawer extended from the container into a hermetic cell;

Figure 2 is a diametral section of the port door, and part of the container coupled to the port door;

Figure 3 is an end view of the port, as seen from inside the cell;

Figure 4 is a scrap transverse section through part of the container;

Figure 5 is a longitudinal diametral section of a rodding system;

Figure 6 is an elevation of a key operated lock coupled to a lever and a peg which interlocks with the rodding system of Figure 5;

Figures 7 and 8 are schematic diagrams of a pneumatic latch actuating system, showing the system in the "latch closed" and "latch open" dispositions respectively; and

Figure 9 is a diametral section similar to that of Figure 2 but partly cut away in order to show both ends of a dummy container coupled to the port.

Referring in particular to the schematic Figure 1, the drawings show a port aperture 10 in the wall 11 of a containment cell 12 for radio-active material.

An unshielded container 49 has a drawer 58 which slides on runners 70 and carries an end closure 54 which seals against an annular seal 53 in a flange rim 51 of the container. A port door 25 seals against a seal 27 in a port ring 20. The container is inserted into the port 20 and it or a latch (not shown) is rotated to engage the container and port ring. This allows the port door 25 to be released from the port ring 20 (for example, by manual manipulation of a latch within the cell (12), with the aid of a glove), the end closure 54 to be released from the container 49 and the door 25 and closure 54 to be coupled together. Purge gas G is fed along flow passages (98,99) to cavities 93 and 94 in a manner familiar to those skilled in the art. With the container in the transfer disposition shown, a lid 60 can be raised as shown to allow transfer of items in and out of the drawer 58 through the hatch aperture 59. Although not shown in the drawings the assembly of end closure 54 and port door 25 cantilevered from the container 49 can be given further support by members cantilevered out from the port ring 20, at the periphery of the port aperture 10. For example, the port door 25 can be provided at its lowermost point with a roller, and a run way for the roller, mounted on the port ring 20, can support the roller as the port door moves between the transfer disposition shown and its disposition engaged with the port, corresponding to a storage disposition of the container.

Figure 2 shows a detailed arrangement broadly in accordance with what is described with reference to Figure 1 but in a system where flask-shielded containers are used.

In a stepped recess 13 in the port aperture 10 is housed an O-ring 14 and spacer ring 15, held in place by four steel port ring segments 16, themselves bolted to the cell wall 11 by bolts 17. A machined port guide tube 20 fits snugly within the port aperture 10 and against the O-ring seal 14 and is held to the port ring segments 16 by fastening bolts 21.

The guide tube 20 and the seal and latch ring 23 are held in position by the bolts 21 and bush 22 (see Fig. 9) with an O-ring 24 between the ring and the guide tube 20. A port door 25 has a rim surface 26 which abuts an O-ring 27 in an end surface 28 of the ring 23. A latch plate 30 is mounted by pins 42 on the rear surface of the door 25 for rotation between a latched disposition as shown in Figures 2 and 3, where four latch blades 31 on the latch plate 30 engage with corresponding latching recesses 32 in the guide tube 20, and an unlatched disposition in which the blades 31 are aligned with cut-away release portions 33 in the end wall 34 of the guide tube 20. An indent spring 34 engages with a recess 35 in a contamination guard sleeve 36 which is slidable on the cylindrical part 37 of the port door 25 between the recessed position shown in the drawing and an extended, guarding disposition in which a shoulder 38 on the inward facing surface of the sleeve 36 butts against a corresponding shoulder 39 on the outward facing surface of the cylindrical part 37. In the centre of the door 25 is a door handle assembly 40 and the pair of pins 41, the purpose of which is explained below.

The container 49 which mates with the port has a cylindrical part 50 to which is welded a machined flange rim 51 which has a sealing surface 52 carrying an O-ring 53 and a plurality of latching studs 43 which engage on rotation of the container with recesses 44 in the port ring 23. A container end closure 54 has a rim surface 55 which abuts the rim surface 52 where a seal is provided by the O-ring 53.

Bolted to the end closure 54 by bolts 56 is the end plate 57 of a drawer 58 which is slidable lengthwise within the cylindrical part 50 of the container, as explained below. The drawer has a hatch aperture 59 closable by a hinged lid 60. Sandwiched between the end plate 57 of the drawer and the end closure 54 of the container is a closure latch plate 61 which is rotatable between a latched disposition as shown in Figure 2 in which latch fingers 62 of the plate 61 engage with corresponding latching recesses 63 in the rim flange 51 of the container, and an unlatching disposition in which the latching fingers 62 do not so engage, and the end closure 54 and drawer 58 can be withdrawn as a unit, lengthwise with respect to the cylindrical part 50 of the container, from right to left in Figure 2, to assume the fully extended disposition of Figure 1.

A hub 64 is fastened by bolts 64A to the central part of the latch plate 61 and has two recesses 65 which receive the pins 41 on the port door 25. The effect of this engagement is to prevent relative rotation of the port door 25 and the closure latch plate 61. A further O-ring 66 seals between the end closure plate 54 and

the hub 64. When the container rotates to bring the latching studs 43 into engagement with the recesses 44, undercut surfaces 45 and 46 on the door 25 and closure 54 respectively, come into mutual engagement to latch together the door and closure.

The way in which the drawer 58 slides in the cylindrical part 50 of the container is shown more clearly in Figure 4. At each end of a horizontal diameter of the cylindrical part 50, there is located a sliding double channel member 70. In a first one 71 of its channels is a rail 72 mounted to the container 50 by bolts 76 with sealing washers 77 and dome-headed nuts 78. In the second 73 of its channels is accommodated a rail 74 fixed by bolts 75 and dome-headed nuts 79 to the side surface of the drawer 58. The arrangement allows relatively sliding of the drawer within the container, in an arrangement commonly used to support the drawers of office filing cabinets. The use of dome-headed nuts 78 and sealing washers 77 provides sufficient sealing through the container wall and the nuts 79 cover the otherwise sharp ends of the bolts 75 in the drawer 58.

Figure 3 shows a pneumatic actuator 80 connected at one end by a pin 81 to the port door 25 and at the other end by a pin 82 to the port door latch 30. Figure 3 shows the latch in its latched disposition, but actuation of the actuator 80 will drive the latch plate 30 clockwise as seen in Figure 3 until the position of the latch blades 31 corresponds with the release portions 33. Figure 3 also shows three safety

interlock devices for preventing unintended release of the port door latch 30.

A first interlock 83 prevents relative rotation of the port door latch 30 on the port door 25 until the mushroom head 84 of a sensor pin (not shown) has been pushed up out of a recess 85 in the latch plate 30, against the biasing action of a spring plate 86, by pressure of the container end closure 54 on the end surface of the sensor pin. Thus, the interlock 83 prevents opening of the port door except when a container is safely engaged with the port.

A second interlock 87 comprises a pin 88 mounted on a spring plate 89. When the port door 25 is fully engaged with the port guide tube 20, the pin 88 is held above a receiving bore (not shown) in the underlying port door 25 by pressure on the cantilevered end 90 of the spring plate 89 from the guide tube 20. At all times when the port door 25 is out of full engagement with the guide tube 20, the pin 88 is engaged with the port door 25 so as to prevent relative rotation of the door 25 and its latch 30.

A third interlock is provided by a key 91 mounted on the port door 25 and which engages with a corresponding recess 92 in the guide tube 20. This engagement prevents rotation of the port door 25 relative to the guide tube 20, at all times when the port door 25 is sealing the port 10.

Those skilled in the art will recognise the illustrated embodiments as being of the "purged port" system

described in the above-mentioned prior patent applications. Gas for purging around the sealing surfaces is introduced into a first clean cavity 93 between the container flange rim 51 and the seal ring 23, and into a second clean cavity 94 between the port door 25 and the end closure 54. The same gas which is used to operate the actuator 80 is also used for flow through the first clean cavity 94. In Figure 3, connections 95 and 96 are for admission of pressurised gas to the actuator 80 to move its piston within its cylinder, and connection 97 is for passing gas from the actuator 80 to the clean cavity 94.

In Figures 2,3 and 4 the port and container are "shielded" by a substantial thickness of radiation-absorbing material. The material which shields the container during its transport is generally known as a "flask". In such applications, it is necessary to have some means of manipulating from outside the transport flask the container shielded within it.

One way of achieving this is illustrated in the accompanying drawings. The container 50 is provided on its external cylindrical surface with slide pads 101 for sliding movement within the flask on a steel guide tube (not shown). The guide tube in the flask, however, has the same internal diameter as that of the guide tube 20 of the port, and the arrangement is such that the two guide tubes abut at their end surfaces so the container can slide on its pads 101 freely between the guide tube in the flask and the one on the port. A manipulation rod system for coupling a shielded

container with a port, as described above, is shown in Figures 5 and 6, and described below.

Referring now to Figure 5, a transport flask 110 contains the steel cylindrical container 50 of radioactive material, which container has an end surface 112 which carries a pair of locating pins 113 and, on its axis 114 a latching stub 115.

An actuating rod assembly 120 has a manipulation tube 121, at the driving end of which there is a plate 122 which has within it apertures 123 in which the locating pins 113 are a snug fit. At the periphery of the plate 122 there is a support pad 124 (Fig. 9) which fits between the cylindrical wall of the container 50 and the surface 125 of the guide tube of the flask 110 or the port 20 within which the container 50 is housed. The manipulation tube 121 extends through a bore 127 in the wall of the flask 110 to a driven end 128, external of the flask 110, where it engages with the driving end 180 of an extension manipulation tube 181. At the driven end of the extension tube 181 there is a manipulation handle 129. Movement of the manipulation tube 121 relative to the flask 110 is prevented by the engagement with the tube 121 of a detent pin 130 pivotally mounted to the external surface of the flask 110, as will be described below.

The driving end of the manipulation tube 121 is latched to and unlatched from the container 50 by the engagement and disengagement of a latching formation 131 on the driving end of a latching rod 132 which is a snug fit within the manipulation tube 121, and

corresponding latching surfaces 160 and 161 on the stub 115. The engagement and disengagement of these latching surfaces is accomplished by a rotation of 90° of the latching rod 132 within the manipulation tube 121.

The driven end 140 of the latching rod 132 includes an axially extending slot 133 into which fits a blade 134 at the driving end 135 of an extension latching rod 136 mounted within the extension manipulation tube 181. The driven end 137 of the extension rod 136 includes an axially extending slot 141 with a widened base 142 into which extends a pair of opposed, spaced apart blades 143 and 144 of a withdrawing tool 145. In the absence of a wedging blade 146 in the space between the blades 143 and 144, they can move together to enable their respective widened end portions 147 and 148 to pass along the length of the slot 141 into the widened end zone 142. The blades 143 and 144 are then locked in this disposition by moving the wedging blade 146 along the space between the two blades, so that they can no longer move towards one another. The movement of the wedging blade 146 is accomplished by axial movement of a latching handle securing screw 149, and the rotational movement of the latching rod 132 between the latching and disengagement dispositions is accomplished by manual manipulation of the handle bars 150.

The manipulation handle 129 is provided in the form of two separate handle bars 151 and 152 clamped together around the tube 181 by a pair of clamping screws 153 and 154. These screws extend across a chord of the circle defined by the internal surface of the tube 181

and thereby hold the latching rod 136 captive within the manipulation tube 181 by their engagement with a reduced diameter portion of the length of the rod 136.

A similar trapping function is discharged by the pair of pins 162 connecting the latching rod 132 and manipulation tube 121. A ball and spring location aid 190 which engages with a first depression 191 in the internal surface of the manipulation tube 121 when it is in the latching disposition, and a second depression (not shown) 90° from 191 when in the disengagement disposition.

Figure 6 shows an interlock device (described further below) which comprises a bell crank 170 which pivots about a pin 171 secured to the flask 110. A first arm 172 of the crank carries the detent pin 130 which extends into a bore in the cylindrical wall of both the manipulation tube 121 and the latching rod 132 to restrain both translational and rotational movements of the rod assembly relative to the flask. The other arm 173 of the crank is held fast against a stop 174 by a bolt 175 of a lock 176. When the lock is released, the bell crank can move anticlockwise (with reference to Figure 6) to release the rod assembly for movement.

Figures 7 and 8 show the electrical and pneumatic actuation and safety interlock systems of the shielded system of Figures 2 to 6. Figure 7 shows a "port closed" disposition and Figure 8 a "port open" disposition.

The key operated lock 176 can be turned only when the pin 130 is engaged in the bores in the latching rod 132 and manipulation tube 121 to retain the container in the flask, or in corresponding bores in the latching rod 136 and manipulation tube 181 (not shown) to retain the container 150 engaged with the port. Once the key has been turned, it can be removed from the lock 176 and inserted in a port actuation lock 200. Turning the key in the lock 200 makes a switch 201 in an electrical circuit 202 which includes an actuating switch 203 and a solenoid switch 204 biased by a spring 205 to the position shown in Figure 7. The solenoid switch 204 moves a rotary pneumatic valve member 206 with four switching channels 207, 208, 209 and 210 between the "latch closed" position of Figure 7 and the "latch open" position of Figure 8.

Switching channel 207 delivers supply air 211 to either input 96 of the actuator 80 (Fig. 7) or to input 95 of the actuator (Fig. 8).

Switching channel 208 allows to exhaust 212 either air from a pneumatic piston and cylinder interlock jack 213 (Fig. 7) or from line 96 from the actuator 80. The jack 213 moves between the position shown in Fig. 7 where it exposes the interlock 200 for key manipulation and the Figure 8 position where it covers the key aperture of the interlock 200 preventing its actuation. While the key is so covered it is not available for freeing the pin 130 from the manipulation tube 181.

Channel 209 receives supply air from line 95 and delivers it to the interlock jack 213 either along line

214 (Figure 7) to expose the key aperture, or along line 215 (Figure 8) to cover the key aperture.

Channel 210 allows to exhaust 216 air from the interlock jack 213, permitting supply air in line 215 to move the jack to the "key aperture covered" disposition of Figure 8.

Thus, in use of the apparatus, the flask 110 is brought into engagement with the periphery of the port 10 and the container 50 in the flask is brought into engagement with the port 20 in the cell 12 by translation of the manipulation tube assembly 120, so that the pins 41 engage with the bores 65. Then, upon rotation of the tube assembly 120, the container 50 is rotated to bring the latching studs 43 on its flange rim 51 into engagement with the recesses 44 on the seal ring 23, i.e. the port/container latch to its latching disposition. Further, because the drawer 58 cannot rotate relative to the container 50, and the bolts 56 cause the end closure 54 to rotate with the drawer, rotation of the container 50 causes the end closure 54 to rotate by the same amount. Such rotation brings the latching undercuts 46 of the end closure 54 into engagement with the corresponding latching undercuts 45 provided in the door 25, i.e. the door/closure latch to its latching disposition.

Further, the flange rim 51 rotates relative to the latching plate 61, which is held from rotation by its engagement with the port door 25. This relative rotation brings the latching fingers 62 on the periphery of the plate 61 out of engagement with the

recesses 63 in the flange rim 51, i.e. the container/closure latch moves to its release disposition.

Thus, it can be seen that the aforesaid rotation of the container 50 has the effect of latching it to the port, and of transferring control of the end closure 54 from the flange rim 51 to the port door 25. When this transfer of control has been effected, the key is turned in the lock 176 so as to bring the pin 130 into engagement with the tube 181, the key is removed from the lock and is inserted in the lock 200.

When the lock 200 is turned (anticlockwise in Figure 7) the movement makes the circuit 202 so the solenoid 204 is actuated upon pressing the "latch open" buttons 203. This causes the pneumatic channels 207 to 210 to move to their Figure 8 positions.

The immediate effect is to shift the supply of pressurised air to the opposite end of the actuator 80. Air is expelled from it to exhaust along line 96 and after the actuator has moved to its "latch open" position, i.e. to the release disposition of the port/door latch, the supply air is admitted along line 97 to the clean cavity 94 for purging.

Meanwhile the supply air also flows along line 217 through channel 209 and along the line 215 to push the piston of the actuator 213 from right to left to cover the key hole of the lock 200.

With the latch blades 31 moved by the actuator 80 the positions corresponding to the release portions 33, the port door 25, end closure 54 and container drawer 58 can be pulled from inside the cell 12 into the transfer disposition of Figure 1. Movement of the container drawer to the transport disposition is achieved by reversing the above-described steps.

Use of a shielding flask also enables the fitting of a complete port assembly, including the guide tube 20, in an existing port aperture 10 in the wall 11 of a cell. The procedure is described below with reference to Figure 9.

Figure 9 shows a dummy container 109 latched to the seal ring 23 of a complete new port assembly. The largest radial dimension of the assembly is that of the outside diameter of the guide tube 20, and the assembly is housed within the bore of a shielding flask (not shown) which is hermetically fitted around the port aperture 10 in the cell wall 11. Once the flask is so fitted, the existing port assembly is removed from within the aperture in the cell wall 11, inwardly into the cell 12, by use of a manipulator within the cell. Using the manipulation rod 120, the dummy container 109 and port assembly is slidably moved along the bore in the flask until it is in the desired position within the aperture in the cell wall 11. At this stage, the manipulator within the cell 12 is used to secure the bolts 17 and 21, mentioned above. Temporary grub screws (not shown) used for the purpose of retaining the seal ring until it is engaged by the bolts 21 are then removed by the manipulator. Then, again using the

manipulation rod 120, the dummy container 109 is rotated within the guide tube 20 so as to release it and allow it to be withdrawn up the bore in the shielding flask, to leave the new port assembly in position and ready for use.

The same procedure is used to replace the seal assembly 23, for example, when it has been in position for such a time that the radiation will have hardened the material of the O-ring 24. In this case bolts 21 are removed by the manipulator leaving the port retained by the bush 22 (Fig. 9).

CLAIMS

1. A method of transferring an item between a portable container and a hermetic cell, the container having an opening which is hermetically closable by a closure and retained closed by a container/closure latch in a latching disposition of the latch, and the cell having a port which is hermetically closable by a port door and retained closed by a port/door latch in a latching disposition of the latch, the method comprising the steps of sealing the periphery of the opening to the periphery of the port, effecting mutual latching engagement of the closure and the door and moving the container/closure latch and the port/door latch to respective release dispositions: the method being characterised by the steps of:

i. providing the container with an internal drawer which is slidable between a storage position within the container and a transfer position in which it projects out of the opening, and which carries the closure, and

ii. supporting the port door, during such period as it is unlatched from the port, on the container drawer, whereby the port door is carried with the drawer in movement between the storage position and the transfer position, the drawer being in the storage position when the port and closure make and break their mutual latching engagement, and in the transfer position when the item is moved between the drawer and the enclosure.

2. A method as claimed in claim 1 characterised by the steps of moving the port/container latch between

its release and latching dispositions is effected by a rotation of the container relative to the periphery of the port, and transmitting during said rotation a torque between the container and the drawer whereby said rotation of the container serves to rotate the drawer and move the door/closure latch between its release disposition and its latching disposition.

3. A method as claimed in claim 2 characterised by the step of holding the container/closure latch against rotation with the container relative to the periphery of the port when said torque is being transmitted whereby the relative rotation of the container and the periphery of the port moves the container/closure latch between its latching and release dispositions.

4. A method as claimed in any one of the preceding claims including the step of flowing purge gas over the sealing surfaces of the port and port door, and the container and closure, for such time as they are uncovered during the transfer of the item.

5. Apparatus for transferring an item between a portable container (49) having an opening and a hermetic cell (12) having a port (10), the periphery (51) of the opening being hermetically sealable to the periphery (20) of the port by movement of a port/container latch (43,44) from a release disposition to a latching disposition, the port being hermetically closable by a port door (25) and retained closed by movement of a port/door latch (30-33) from a release disposition to a latching disposition, the container

being hermetically closable by a closure (54) and retained closed by movement of a container/closure latch (61-63) from a release disposition to a latching disposition, and the door and closure being mutually engageable through the agency of a door/closure latch (45,46), whereby for transfer of said item the door and closure are mutually engaged and the container/closure latch (61-63) and the port/door latch (30-33) are in their release dispositions: the apparatus being characterised by a drawer (58) within the container and slidable between a storage position (Fig. 2) within the container and a transfer position (Fig. 1) in which it projects out of the opening, which carries the closure (54) and which also carries the door (25) for such time as it is latched to the closure, the drawer occupying the storage position when the port and closure make and break their mutual latching engagement and the transfer position when the item is moved between the drawer and the enclosure.

6. Apparatus as claimed in claim 5 characterised in that the drawer is fixed (70) against rotation relative to the container and the closure (54) is non-rotatably mounted on the drawer (58), the container is coupled and uncoupled to the port periphery (23) by rotation on the port periphery and the closure (54) is coupled and uncoupled to the port door (25) by a relative rotation, whereby a rotation of the container on the port periphery simultaneously moves the port/container latch (43,44) and the door/closure latch (45,46) from their release disposition to their latching disposition.

7. Apparatus as claimed in claim 6 characterised in that the closure (54) is coupled and uncoupled to the container (49) by a rotation of a container/closure latch plate (61) relative to the container and closure, and in that sealing abutment of the container (51) with the port periphery (23) puts the container/closure latch plate (61) in non-rotatable engagement with the port door (25), whereby the relative rotation of the closure (54) and port door (25) which occurs upon said rotation of the container (49) moves the container/closure latch plate (61) between its release and latching dispositions.

8. Apparatus as claimed in any one of claims 5,6 and 7 including purge gas flow passages (93,94) between the container and the port periphery, and between the port door and container closure, for flowing a purge gas over the sealing surfaces (27,53) thereon, for such time as said sealing surfaces are uncovered during the transfer of the item.

9. Apparatus as claimed in any one of claims 5 to 8 characterised by a contamination guard sleeve 36 on the peripheral surface of the port door, which is slidable between a retracted position which it occupies when the door is sealed to the port, and an extended position when the door is spaced from the port, in which extended position the sleeve guards the sealing surface on the port door from accidental contamination by physical contact with a contaminated object.

10. Apparatus as claimed in claim 9, characterised in that the container is shielded within

a flask and manipulated from outside the flask by a device which includes a key-operated lock (176) of which the key can be withdrawn from the lock only when the port/container latch (43,44) is in its latching disposition; in that the port/door latch (30-33) is releasable from its latching disposition to its release disposition only with the aid of the key withdrawn from the said key-operated lock (176); and in that the key is captivated (200,213) during its use to release the port/door latch (30-33) and thereby not available for re-insertion in the key-operated lock (176) until the port/door latch (30-33) is returned to the latching disposition.

11. Apparatus as claimed in any one of claims 5 to 10, characterised by an interlock (87) which prevents movement of the port/door latch (30-33) from out of its release disposition except when the port door (25) is in sealing abutment with the port (20).

12. Apparatus as claimed in any one of claims 5 to 11, characterised by an interlock (83) which prevents movement of the port/door latch (30-33) out of its latching disposition except when the port door (25) is in sealing abutment to the port (20) and the container (49) is engaged with the port (20).

13. Apparatus as claimed in any one of claims 5 to 12, characterised by a sleeve (20) which extends through the wall (11) of the cell (12) at the port aperture (10) and which carries within its diameter the port door (25), and means (23,44) for receiving said container in latching engagement.

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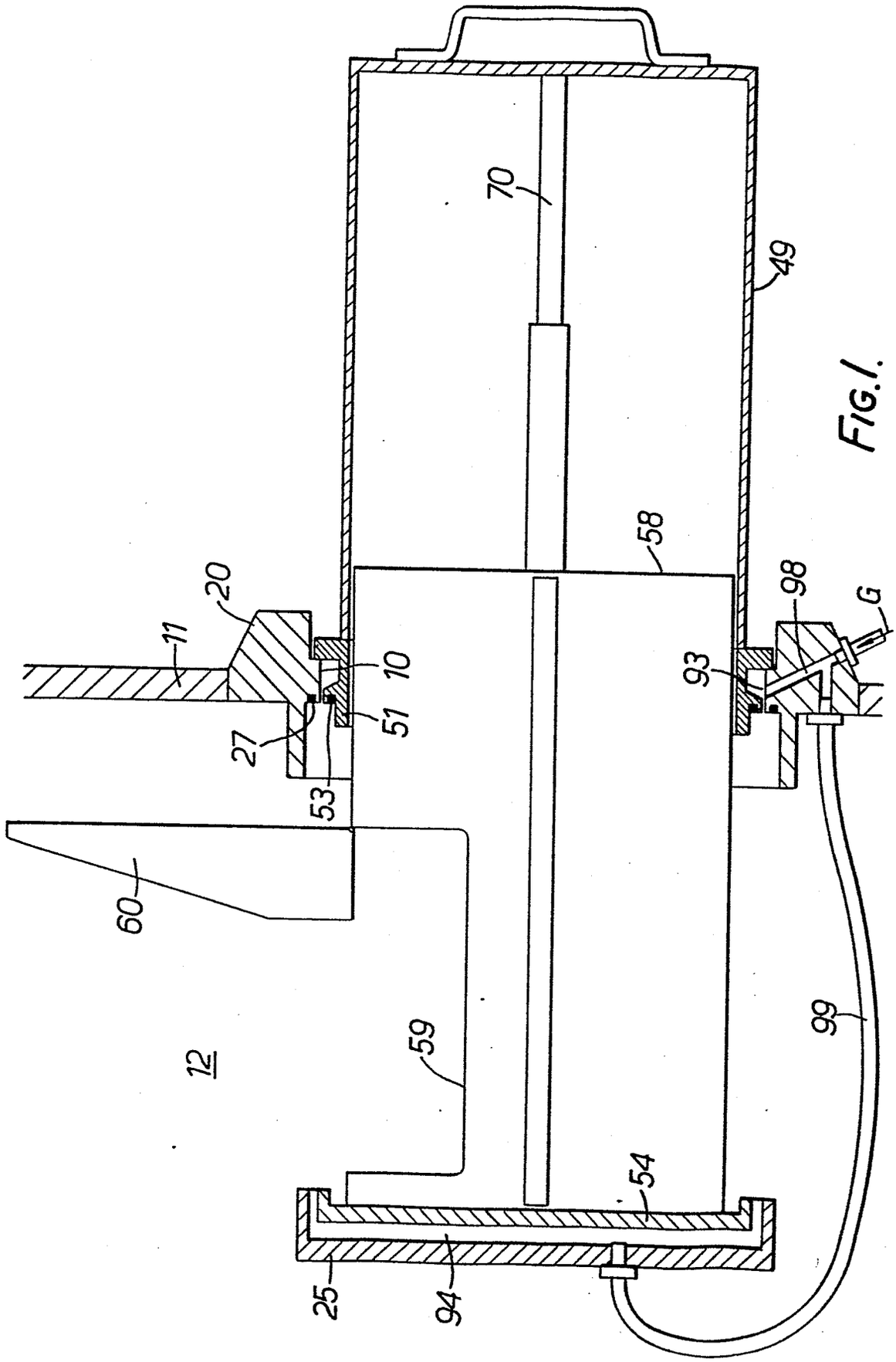

FIG.1.

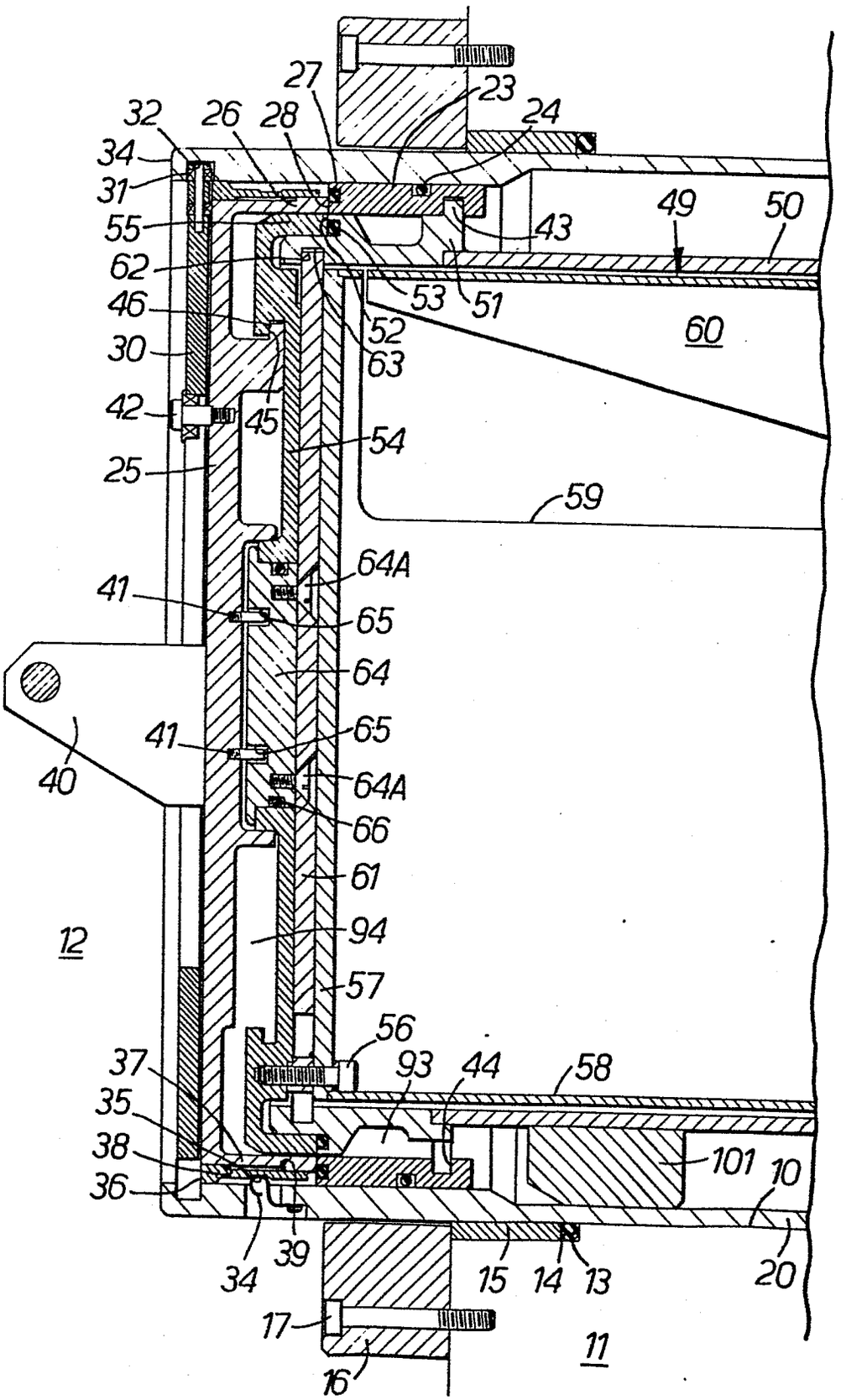
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FIG. 2.

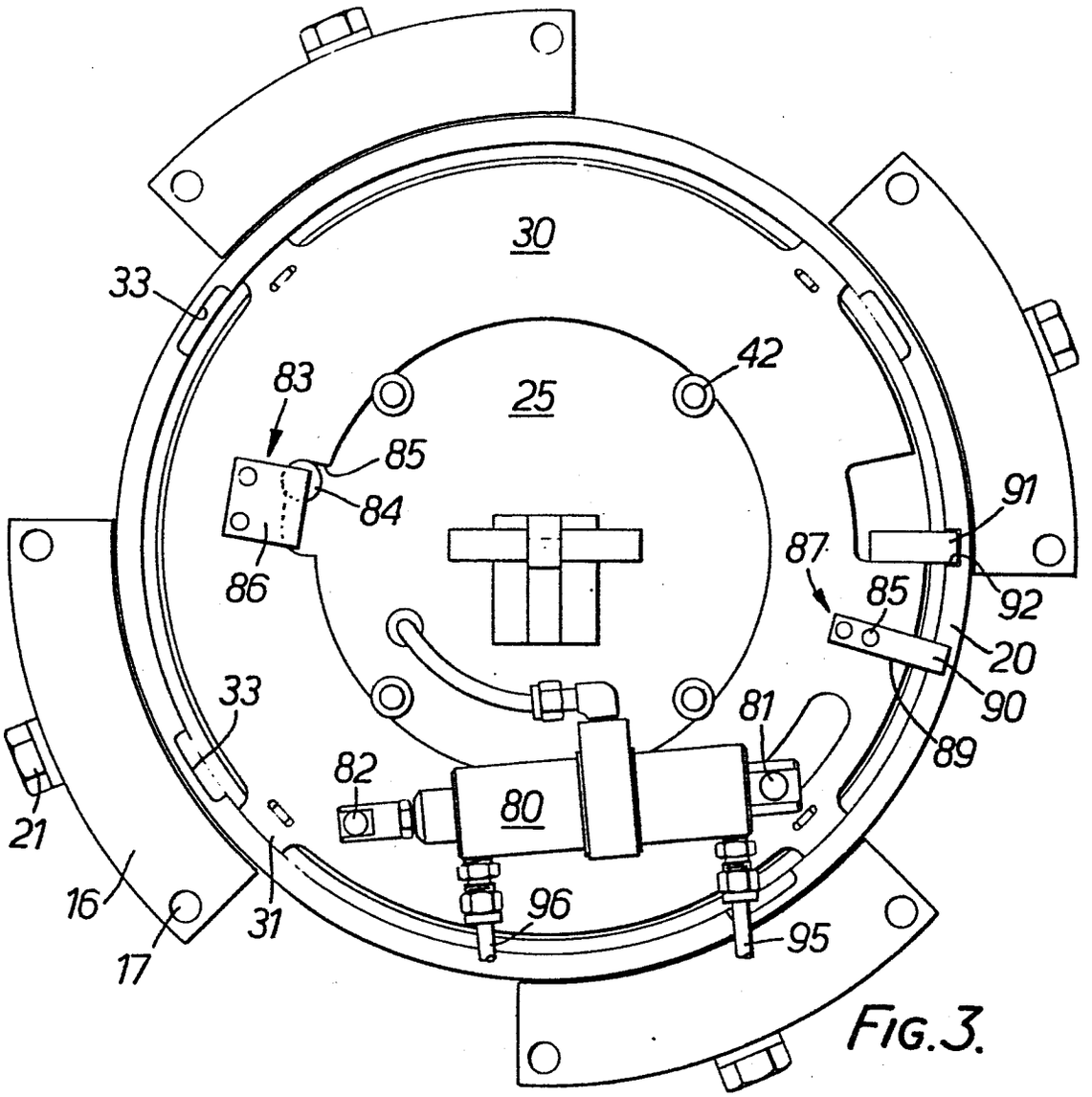
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FIG.3.

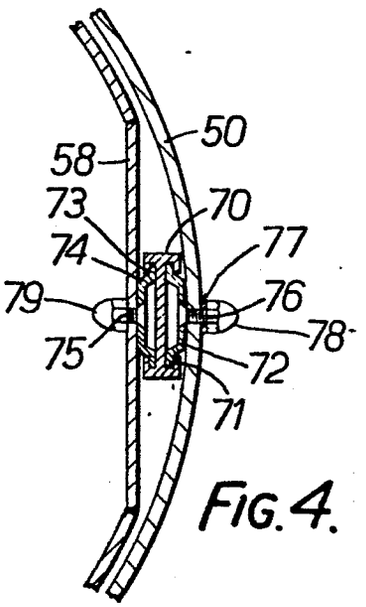
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FIG.4.

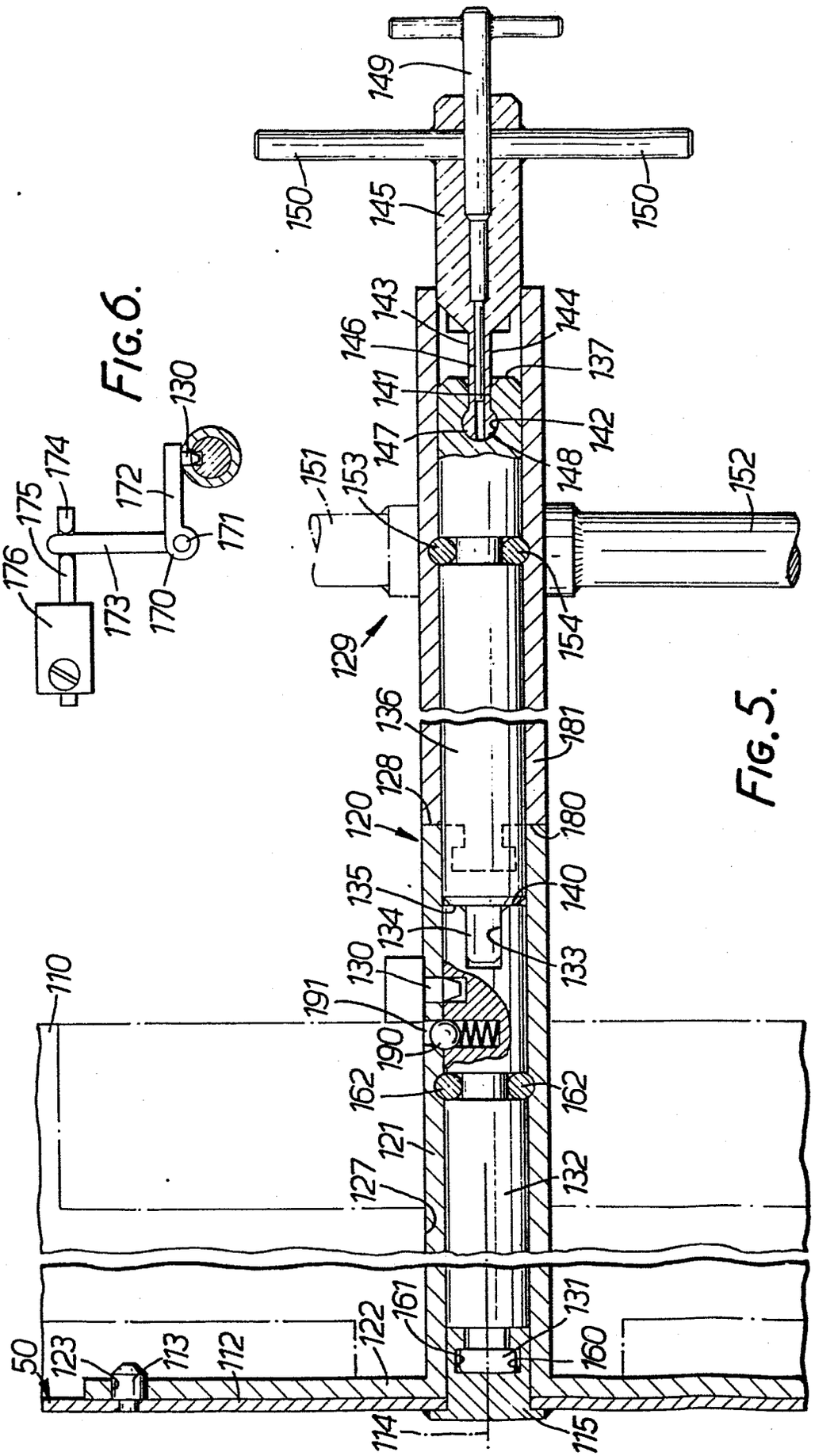
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FIG. 5.

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FIG. 6.

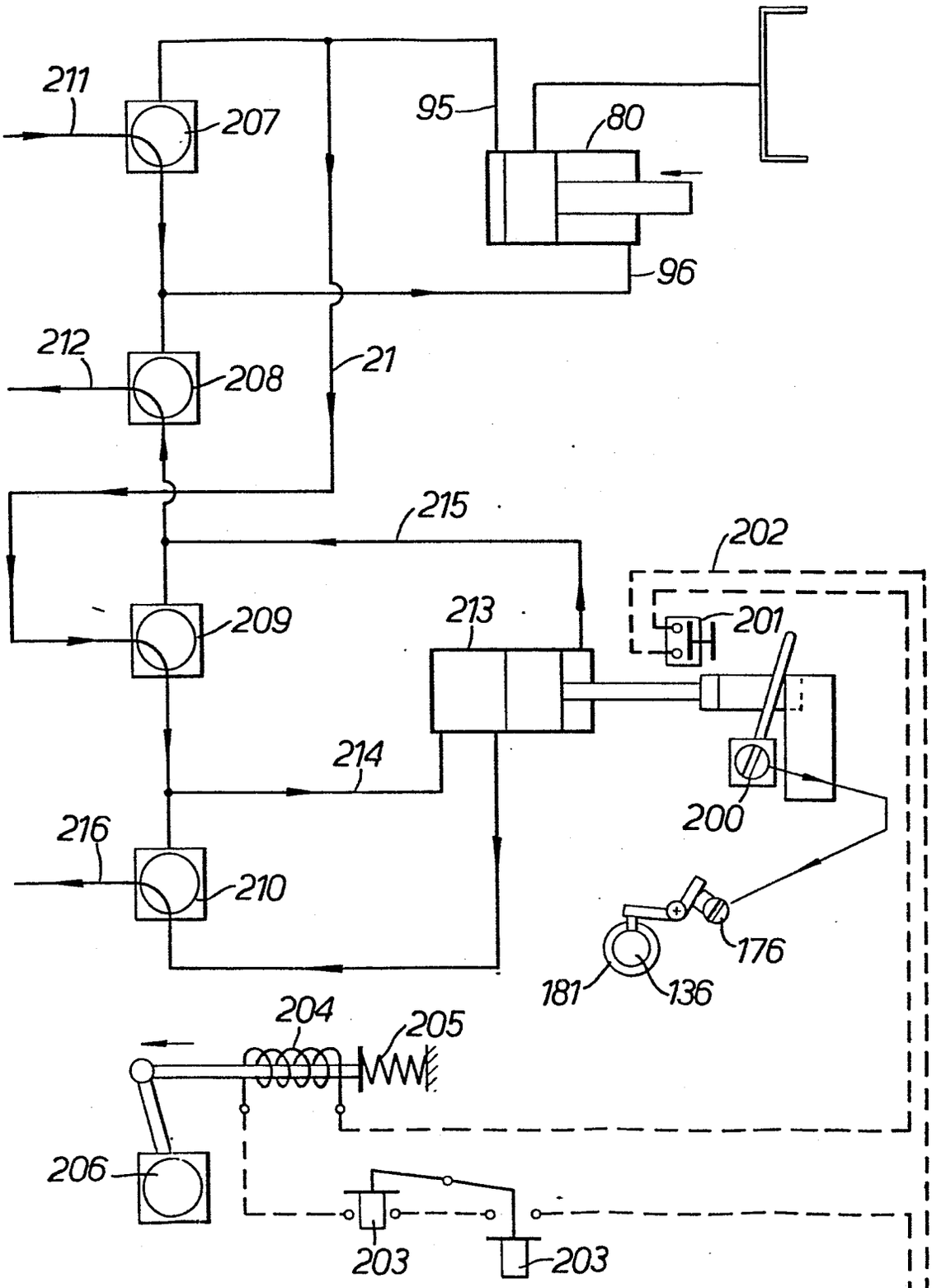
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FIG. 7.

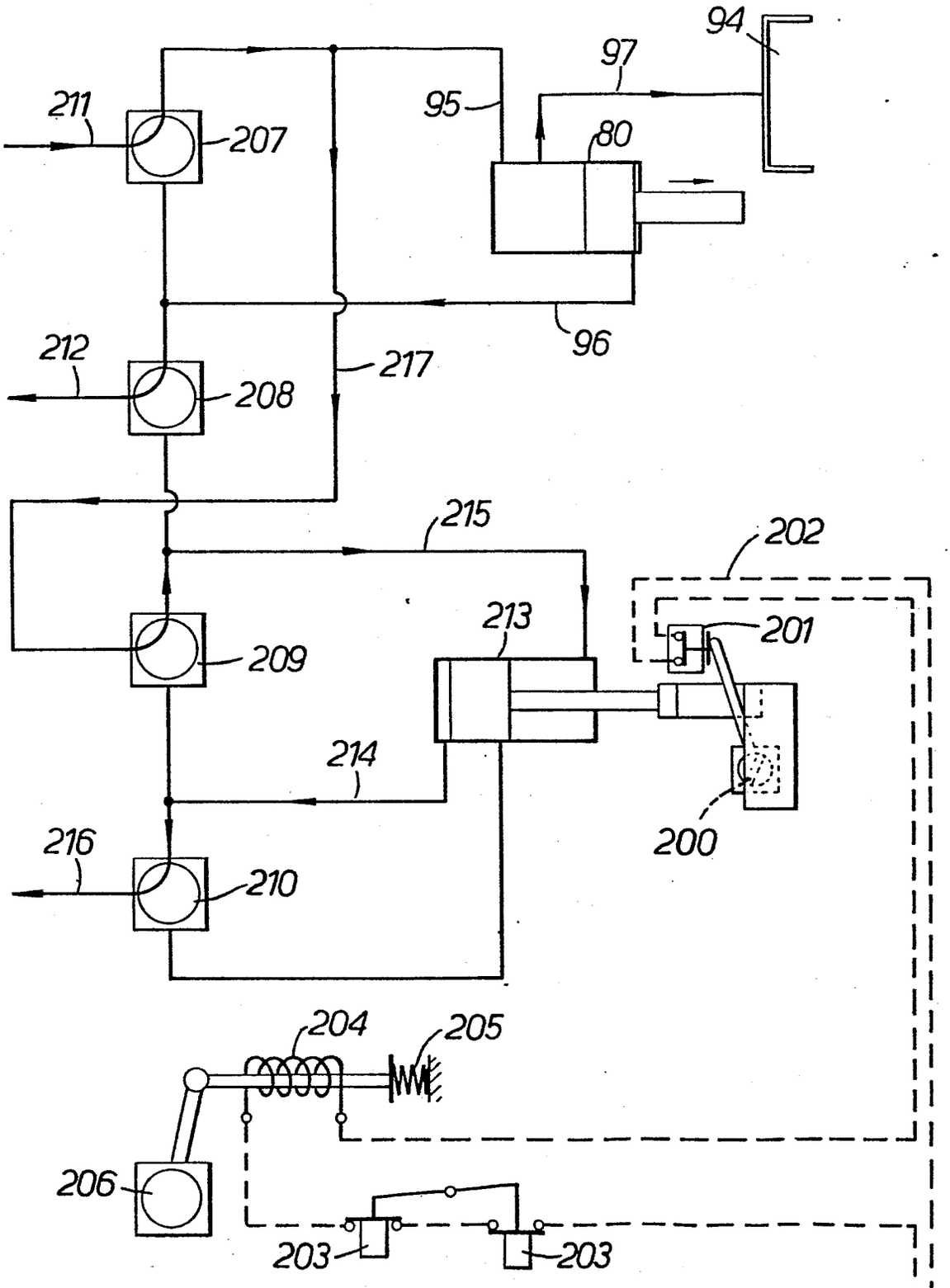
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FIG.8.

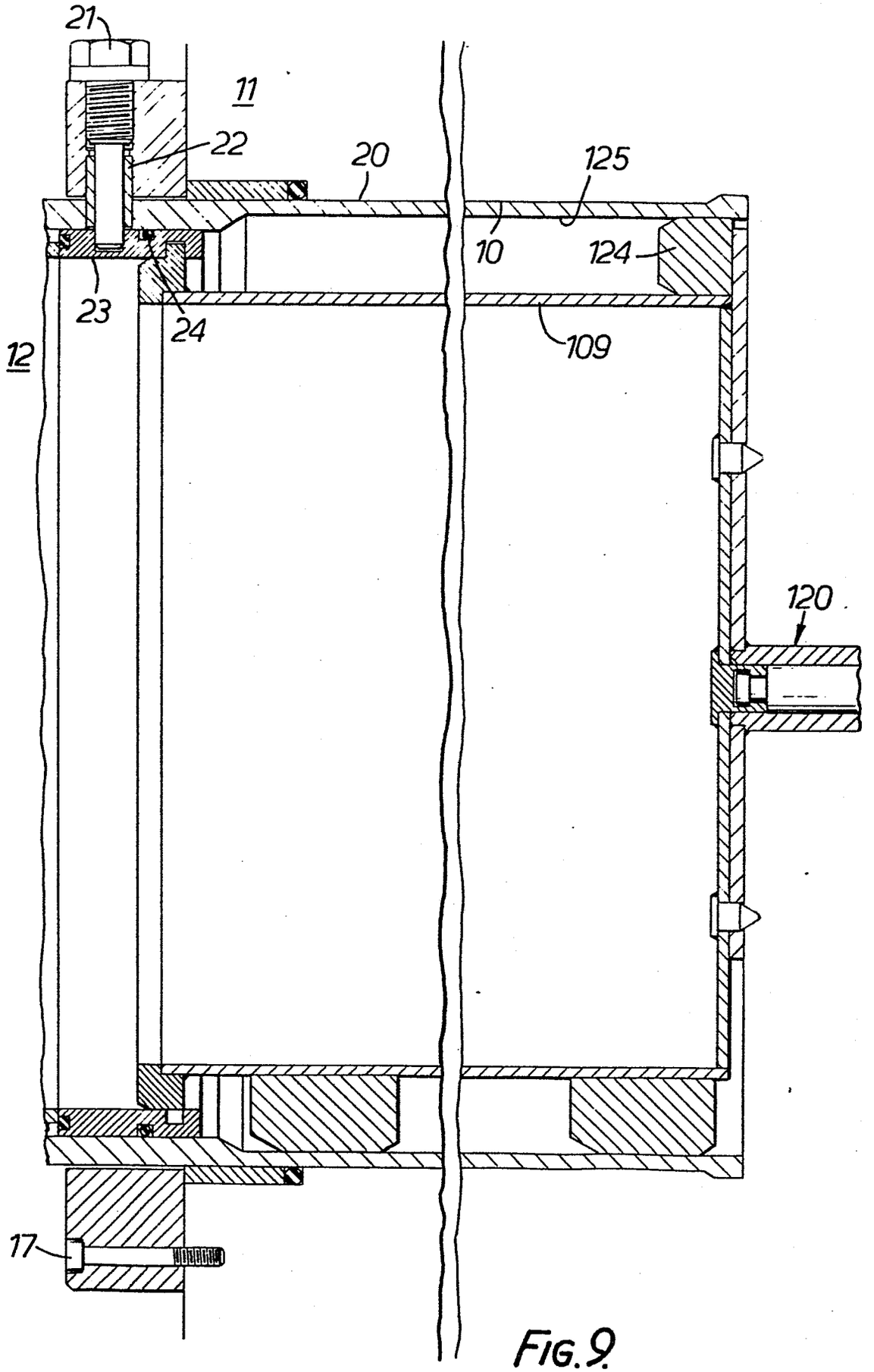

FIG. 9