

Lid System

This invention relates to a double lid system whereby a first container may be sealed to a port of a second  
5 container, the first container and the port each having a respective lid, and means being provided to clamp the two lids together.

Double lid systems are often used where hazardous  
10 materials are being handled, for example to enable a hazardous material in a drum to be transferred into a glove box or vice versa; the hazardous material might be radioactive or might include pathogenic micro-organisms. Such systems are described for example in UK Patents GB 1  
15 270 069 and GB 1 553 887, and in European Patent EP 0 054 494. However currently known double lid systems have been found to suffer various problems or inconveniences.

According to the present invention there is provided a  
20 double lid system comprising a first cylindrical container, open at one end, a first lid for the first container, means defining a port for a second container, and a second lid for the said port, the first container having a peripheral seal for sealing to the port means and to the first lid,  
25 and the second lid having a peripheral seal for sealing to the port means and to the first lid; wherein the first lid incorporates a first rotary catch mechanism for securing the first lid to the first container, the first container incorporating means with which the first rotary catch  
30 mechanism may engage; the second lid incorporates a rotary shaft extending therethrough, means for turning the shaft, and a second rotary catch mechanism operable by the shaft for securing the first lid to the second lid, the first lid incorporating means with which the second rotary catch  
35 mechanism may engage; and the system incorporates a dog clutch mechanism which engages when the first lid is

adjacent to the second lid such that rotation of the shaft causes rotation of both the first and the second rotary catch mechanisms simultaneously; each said rotary catch mechanism comprising a boss rotatable through no more than  
5 quarter of a revolution and not axially movable relative to the respective lid, and a plurality of latch means pivotally connected directly or indirectly to the respective boss and arranged to undergo a displacement at least partly in a radial direction when the boss is  
10 rotated.

The double lid system of the invention is particularly simple to operate, as a single turn of the shaft through an angle typically of no more than 60° both locks the two lids  
15 together and disengages the first lid from the first container, or disengages the two lids and locks the first lid to the first container.

Preferably the shaft carries a rotary cam, and a pin  
20 extends through the second lid being resiliently urged into engagement with the cam to prevent rotation of the cam and the shaft, the arrangement being such that if the first lid is placed adjacent to the second lid the pin no longer engages the cam. This ensures that only if the first lid  
25 is indeed adjacent to the second lid, can the second rotary catch mechanism be rotated into the position in which the two lids are secured together. Desirably means are provided to secure the second lid to the port means, and the cam prevents release of this securing means until the  
30 first lid and the second lid have been secured together by rotation of the shaft.

In the preferred embodiment the means on the first container with which the first rotary catch mechanism may  
35 engage comprises a circumferential groove around the inside of the wall of the first container near the open end, while

the means on the first lid with which the second rotary catch mechanism may engage comprises an inturned flange on the outside of the first lid. Desirably the system also includes a rotary clamp mechanism for securing the first container to the port means.

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

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Figure 1 shows a sectional view through a double lid system (on the line I-I of Figure 2);

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Figure 2 shows an elevation view in the direction of arrow A of Figure 1;

Figure 3 shows a sectional view along the line III-III of Figure 1;

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Figure 4 shows a sectional view along the line IV-IV of Figure 1; and

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Figure 5 shows a view to a larger scale of the part of the system of Figure 1 indicated by letter B.

Referring primarily to Figure 1, a double-lidded system 10 is shown connected to a wall 11 of a glovebox 12 to enable material to be transferred between the glovebox 12 and a cylindrical drum 14. A circular port is defined by an annular door frame 16 which extends through a corresponding circular hole in the wall 11 and has a flange sealed by an O-ring seal 15 to the inner face of the wall 11. The frame 16 is clamped to the wall 11 by six bolts 17 extending through threaded holes in an internally notched clamping ring 18 (see Figure 3) and pressing onto a

pressure ring 20 up against the wall 11; an angled surface 19 on the clamping ring 18 presses against pins 22 located in correspondingly angled recesses in the outer cylindrical surface of the frame 16. (The pins 22, although one is  
5 shown in Figure 1, are in reality at positions 15° around the ring 18 from the bolts 17). A circular door 24 with a peripheral moulded-in seal 26 is pivotally connected by a hinge 28 to the flange of the door frame 16, and when the door 24 is closed, as shown, the seal 26 seals against the  
10 frame 16 (see Figure 5).

The drum 14 is of 1.5 mm thick stainless steel and is of cylindrical shape except for a circumferential internal groove 30 (or external ridge) near the open end, and for an  
15 L-shaped flange 32 around the open end. A rubber seal 34, secured to the flange 32, is of generally rectangular cross-section protruding slightly above the end of the drum 14, and has a thin lip 35 around its inside edge (see Figure 5). The drum 14 has a lid 36, also of 1.5 mm  
20 stainless steel, with a double-walled base part 37, a side wall 38 with an inturned flange 39, and an external flange or rim 40 of external diameter slightly less than the internal diameter of the port defined by the door frame 16.

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When the lid 36 is inserted into the drum 14, the lip 35 is deformed inwardly; the lid 36 seals with the lip 35 abutting the side wall 38 and also with the rim 40 abutting an inner annular region of the seal 34. When the drum 14  
30 is inserted into the frame 16 as shown, the seal 26 on the door 24 seals to the upper surface of the rim 40 of the lid 36 (see Figure 5). The drum 14 is clamped in this position by three equally spaced pegs 42 (only one is shown in Figure 1) which extend through radial holes in the frame 16  
35 to fit under the flange 32. Each peg 42 is approximately L-shaped, and its other end engages in a groove 44 in a ring 46 rotatably clamped by a back plate 47 onto the frame

16; the ring 46 can be turned by means of a handle 48, and, since each groove 44 extends along an arc of a spiral, rotation of the ring 46 moves the pegs 42 in or out of the position shown supporting the drum 14 (see Figure 4).

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Within the base part 37 of the lid 36 is a first mechanism (described later) for securing the lid 36 to the drum 14, and between the lid 36 and the door 24 is a second mechanism (described later) for securing the lid 36 to the door 24, both mechanisms being operated by rotation of a shaft 50 which extends through a hole in the centre of the door 24, and is sealed by an O-ring 52. On the glove-box 12 side of the door 24 the shaft 50 is rigidly secured by a screw (not shown) to a generally cylindrical boss 60, which defines a twenty-four toothed dog 62 around an outer annulus of its lower face.

Referring now to Figures 1 and 3, three rotary wedge catches 64 are pivotally secured to the door 24 by bolts 66, one end of each catch 64 being linked to the boss 60 by a link arm 68 pivoted at each end. Rotation of the boss 60 by about 45° turns the catches 64 so that one end of each catch 64 engages under the inturned flange 39 of the lid 36 (the catch 64 in Figure 1 and on the right hand side in Figure 3 is shown in this turned position, with the link arm 68 chain dotted; in reality it is in the same position as the other two catches 64). These components (60, 64, 66, and 68) constitute the second of the above-mentioned mechanisms.

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Referring now to Figures 1 and 4, the first of the above-mentioned mechanisms includes a rotatable, generally cylindrical boss 70 located centrally within the base part 37 of the lid 36, sealed by an O-ring 72. The upper surface of the boss 70 defines a central recess 73 into which the end of the shaft 50 extends, and also defines,

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around an outer annulus, a twenty-four toothed dog 74 which engages as shown with the dog 62. The boss 70 incorporates a peripheral flange 75 approximately triangular in plan, to which are linked three bolts 76 by pivot pins 77. In the position as shown these bolts 76 extend radially through apertures 78 in the side of the base part 37 to engage with the groove 30 of the drum 14. Rotation of the boss 70 through 45° retracts the bolts 76 out of the groove 30 (into the position shown chain-dotted for one bolt 76), further rotation of the boss 70 then being prevented by a stop 79.

Referring now to Figures 1 and 2, the door 24 is held closed by a bolt 80 which engages with a socket 82 fixed to the door frame 16. The bolt 80 has an operating handle 84 (broken off in Figure 2 for clarity) and is located in a guide 86 fixed to the door 24; within the guide 86 is a spring mechanism (not shown) urging the bolt 80 outwardly, into engagement with the socket 82.

The double-lidded system 10 is provided with interlocks to prevent accidental operation of the handle 56 and the handle 84 when such operation might be dangerous. A pin 90 with a conical head 92 extends through the door 24, being sealed by an O-ring 93. A spring 94 urges the tip of the pin 90 downwards (as shown in Figure 1) into contact with the lid 36; in the absence of the lid 36 the pin 90 would move further in that direction and the head 92 would locate in a corresponding notch 95 on the side of the cam 54. Hence in the absence of the lid 36, the shaft 50 cannot be turned. Around a portion of the cam 54 adjacent to the bolt 80 there is a gap between the edge of the cam 54 and the surface of the door 24, and on the underside of the cam 54 is defined a cam groove 96 (shown dotted in Figure 2). A rod 88 fixed to the bolt 80 extends under this gap, and the end of the rod 88 extends upwards to locate in the groove 96. The groove 96 has a first acute

portion 97, and a second arcuate portion 98 wider than the first portion 97, the wall of the groove 96 hence defining a radially inward step and a radially outward step 99 at the transition between the two portions 97 and 98.

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Operation of the system 10 will now be described, starting from the situation with the door 24 closed and with the handle 56 in the orientation shown but without the drum 14. The door 24 cannot be opened, as engagement of  
10 the end of the rod 88 with the inner wall of the groove portion 97 prevents movement of the bolt 80. All three of the catches 64 are in the inward turned position.

Initially the pin 90 protrudes from the door 24, engagement of the head 92 with the notch 95 preventing rotation of the  
15 handle 56. The drum 14 with its lid 36 secured by the bolts 76 is then brought up to the port, and is secured into the position shown by turning the handle 48, so the pegs 42 locate under the flange 32. The pin 90 is pushed up by the lid 36, so the handle 56 is free to turn; the two  
20 dogs 62 and 74 come into engagement with each other, any misalignment of the teeth being accommodated by a small rotation (no more than  $7\frac{1}{2}$  degrees either way) of the shaft 50.

25 Turning the handle 56 through  $45^\circ$  turns the boss 60 so that the catches 64 engage under the inturned flange 39 of the lid 36 (securing the lid 36 to the door 24) and simultaneously turns the boss 70 so the bolts 76 are retracted out of the groove 30 (so releasing the lid 36  
30 from the drum 14). The end of the rod 88 is now in the wider groove portion 98, so that the bolt 80 can be retracted from the socket 82 by means of the handle 84, and the door 24 can be swung open with the lid 36 still secured to it. Materials may then be transferred between the  
35 glovebox 12 and the drum 14. When the handle 84 is released with the door 24 open, the spring mechanism

in the guide 86 moves the bolt 80 radially outwards beyond its initial position, so that the end of the rod 88 is in the outermost part of the groove portion 98. Engagement of the end of the rod 88 with the outward step 99 in the wall of the groove 96 prevents accidental rotation of the handle 56 (with consequent release of the lid 36 from the door 24) until the door 24 has again been closed. After closing the door 24 the handle 54 can be turned back through 45°, returning the system 10 to the situation as shown.

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It will be appreciated that the system 10 may be modified in a variety of ways, while remaining within the scope of the present invention. For example the cam 54 might be provided with a cam groove on its upper surface to be engaged by a rod extending from the bolt 80, instead of the groove 96 on its lower surface as described.

Where a particularly inexpensive drum assembly is required for example for waste storage, and especially where the port is in a floor of an enclosure rather than a wall 11, it is possible to omit the rotary mechanism from the lid 36; it has been found that the lip 35 holds the lid 36 to the drum 14 adequately securely at least while the drum 14 remains upright. After releasing such a drum 14 from the port, a simple flat cap (not shown) with a short peripheral sidewall can be placed over the lid 36, and the sidewall spot-welded to the flange 32 outside the drum 14.



Claims

1. A double lid system comprising a first cylindrical container, open at one end, a first lid for the first  
5 container, means defining a port for a second container, and a second lid for the said port, the first container having a peripheral seal for sealing to the port means and to the first lid, and the second lid having a peripheral seal for sealing to the port means and to the first lid;  
10 wherein the first lid incorporates a first rotary catch mechanism for securing the first lid to the first container, the first container incorporating means with which the first rotary catch mechanism may engage; the second lid incorporates a rotary shaft extending therethrough, means  
15 for turning the shaft, and a second rotary catch mechanism operable by the shaft for securing the first lid to the second lid, the first lid incorporating means with which the second rotary catch mechanism may engage; and the system incorporates a dog clutch mechanism which engages  
20 when the first lid is adjacent to the second lid such that rotation of the shaft causes rotation of both the first and the second rotary catch mechanisms simultaneously; each said rotary catch mechanism comprising a boss rotatable through no more than quarter of a revolution and not  
25 axially movable relative to the respective lid, and a plurality of latch means pivotally connected directly or indirectly to the respective boss and arranged to undergo a displacement at least partly in a radial direction when the boss is rotated.
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2. A double lid system as claimed in Claim 1 including means to prevent operation of the second rotary catch mechanism if the first lid is not adjacent to the second lid.



3. A double lid system as claimed in Claim 1 including means to prevent operation of the second rotary catch mechanism if the second lid is not sealed to the port means.

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