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(54) **Improved adaptor**

(57) An adaptor is provided which is suitable for fitting to a container closure. The adaptor comprises a central spigot, a first sleeve, and a second sleeve. The first sleeve fits around the central spigot to define at least one first longitudinal conduit therebetween. The second sleeve fits around the first sleeve to define at least one second longitudinal conduit therebetween.

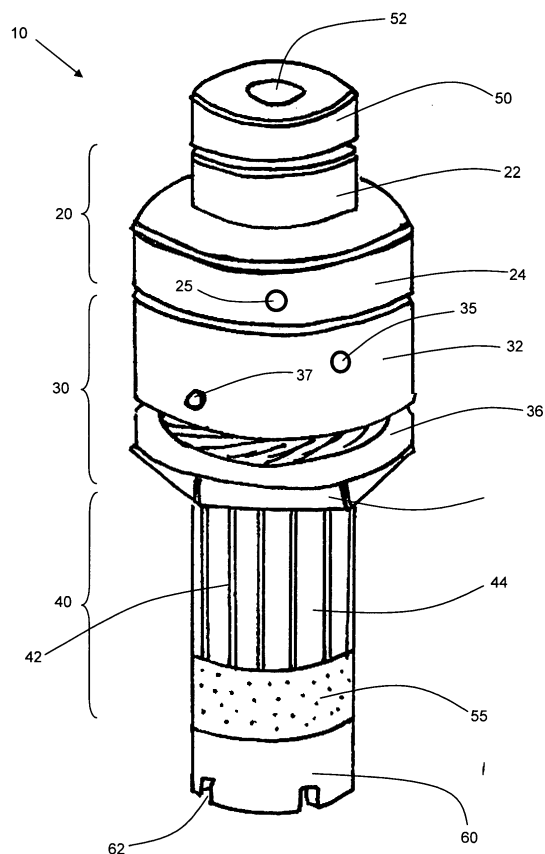


Figure 1

## Description

**[0001]** The invention relates to an improved adaptor. Such adaptors may be fitted to containers, such as for example to the lids of containers. In particular, the adaptors may be fitted to scientific apparatus.

**[0002]** In research or educational laboratory experimental investigations, it is often necessary to create a controlled environment within a container, and to be able to monitor one or more conditions within the container. For example, in tissue culture experiments, it may be necessary to monitor the temperature within the container, the pH of the culture medium, or the composition of any gases produced by the culture. It is often desirable to be able to measure such factors whilst causing minimum disruption to the environment within the container and avoiding contamination of its contents.

**[0003]** In educational establishments, and particularly in secondary-level schools, it is essential that the equipment needed for laboratory experimental investigations be available at low cost. The typical budget per student of such establishments is often very low (especially where the establishment is entirely state-funded), and so expensive equipment is unlikely to be approved for purchase. Furthermore, it is greatly advantageous if such equipment can be reused by many students over its lifetime, as this will reduce the relative cost per student of the equipment. Such reuse requires both that the equipment can be readily cleaned after each use, and also that the equipment is sufficiently versatile to be employed in many different experiments.

**[0004]** Commonly used apparatus for tissue culture (and other) experiments in educational establishments consists of a glass conical flask fitted with a rubber bung. One or more holes are bored in the rubber bung, and glass tubes forced therethrough, to enable fluids (such as culture medium, nutrients, or gases) to be added to or removed from the culture broth whilst causing minimum disruption to the environment within the container and avoiding contamination of its contents. Multiple glass tubes can be used (through multiple holes in the rubber bung) to transfer different fluids. For example, a first tube might open into the culture medium itself to allow sampling of the medium; a second tube open into the atmosphere above the medium to allow sampling of any gases produced by the culture; and a third tube open into the atmosphere above the medium to allow delivery of nutrients to the culture broth.

**[0005]** Whilst all components of this apparatus are relatively inexpensive, it can be extremely difficult to remove glass tubes from a bung following use, and to effectively clean the glass tubes. Thus, both the bung and the glass tubes are difficult to reuse, particularly in other experimental procedures, and must frequently be replaced. Furthermore, there is a significant danger that, during assembly of such apparatus, a glass tube will break and cause injury to the user. In particular, during insertion of the glass tube into the bung, breakage of the glass tube

can cause serious hand injury. As a result, the extent to which students are able to assemble their own apparatus may be severely limited for safety reasons, requiring the use of laboratory technical staff to prepare sufficient apparatus for use by all students. Additionally, the number of practical experiments requiring such apparatus may be limited.

**[0006]** The present inventors have previously described (in UK Patent No. 2 411 167) an adaptor which provides a single aperture (through a central spigot) through a screw cap for a container. This allows a single tube (such as for example a thermometer, as shown in Figure 1 of the patent) to be inserted into culture medium within the container. Since the tube is held in place in the adaptor by means of an adjustable nut at the lower end of the spigot, rather than by friction (as is the case with a rubber bung), there is no need to force the tube into position, and hence the risk of injury is greatly reduced. Furthermore, since the adaptor can be readily disassembled for cleaning, it provides increased opportunities for reuse.

**[0007]** However, there remains a need for an improved adaptor which allows multiple fluid transfers therethrough whilst causing minimum disruption to the environment within the container and avoiding contamination of its contents. It is of further benefit if such an adaptor minimises the risk of injury during assembly, is readily cleaned and reusable, and can be cheaply manufactured. The present invention has been conceived with these issues in mind.

**[0008]** According to the present invention, there is provided an adaptor for fitting to a container closure, the adaptor comprising a central spigot, a first sleeve, and a second sleeve, wherein the first sleeve fits around the central spigot to define at least one first longitudinal conduit therebetween, and the second sleeve fits around the first sleeve to define at least one second longitudinal conduit therebetween.

**[0009]** As used herein, 'container closure' is intended to refer to any part which may be fitted over, or in, an opening in a container in order to impede or prevent transfer of material through the opening. Such container closures include internally screw-threaded lids adapted to fit over openings having corresponding external screw threads, and bungs which are simply forced into place within an opening. The exact nature of the container closure is not material to the present invention, and indeed it is anticipated that a given adaptor could fit in any number of closures, provided that they each have an appropriately-sized aperture to receive the adaptor.

**[0010]** It will be understood that the spigot, first sleeve and second sleeve generally define a longitudinal axis for the adaptor, such that the interfaces between the first sleeve and the central spigot, and between the first and second sleeve are generally parallel to this longitudinal axis. However, it is not essential for any part of the adaptor to be symmetrical about a longitudinal axis, nor is it necessary for the central spigot, first sleeve and second

sleeve to all be centred about the same axis, although this may be the case in some embodiments.

**[0011]** As used herein, 'longitudinal conduit' is intended to refer to a passage which allows for the transmission of fluid between two locations longitudinally spaced along the adaptor. It will be understood that each conduit should generally be in fluid communication with an external surface of the adaptor at each end. It is not necessary for the conduit to be parallel to the longitudinal axis of the adaptor for the entirety, or even any, of the length of the conduit, although that may be the case in at least some of the conduits in many embodiments of the invention.

**[0012]** It will further be understood that it is not necessary for all three of the central spigot, the first sleeve and the second sleeve to extend the full length of the adaptor. In particular, it is not necessary for the first conduit and the second conduit to overlap along the length of the adaptor. However, each of the first and second conduits will generally be part of a fluid pathway between (in use) the interior and exterior of a container, and so it will be apparent that there must be some longitudinal overlap between the respective fluid pathways.

**[0013]** Without wishing to be bound by theory, it is believed that the provision of at least one first conduit between the spigot and the first sleeve, and at least one second conduit between the first sleeve and the second sleeve, allows greater flexibility in use of the adaptor. For example, the provision of two distinct conduits allows the addition or removal of separate fluids to/from the container. In particular, a first fluid (such as a reagent or a biochemical nutrient) may be added to the container via (for example) a first conduit, whilst a second fluid (such as a sample of the atmosphere inside the container) is removed from the container via (for example) a second conduit. Since the first and second conduits are separated at radially by the first sleeve, it is possible to provide constructions of adaptor in which the relative angular orientation of the spigot, and first and second sleeves is not crucial, thereby simplifying construction.

**[0014]** Thus, in some embodiments, the first conduit forms at least part of a first fluid pathway between (in use) the interior and exterior of the container, and the second conduit forms at least part of a second fluid pathway between (in use) the interior and exterior of the container, wherein the first and second fluid pathways are independent.

**[0015]** Where the adaptor comprises more than one first conduit or more than one second conduit, each first conduit or each second conduit may be independent from one another. Alternatively one or more first conduits, or one or more second conduits, may be in fluid communication.

**[0016]** Furthermore, since the first and second conduits are each defined between two components (namely, the spigot and first sleeve, in the case of the first conduit, and the first and second sleeves in the case of the second conduit), separation of these two components exposes the surfaces of the conduit in each case, allow-

ing the conduit to be thoroughly cleaned. The adaptor can then be reused in other experimental setups without fear of cross-contamination. Furthermore, since each conduit is defined by a solid component designed for disassembly and reuse, and not (for example) a fragile glass tube, the risk of personal injury during assembly of the adaptor is lessened.

**[0017]** In some embodiments, the central spigot further comprises at least one longitudinal conduit therethrough. In some further embodiments, the central spigot has a central longitudinal conduit extending therethrough, such as for example an axial conduit. In some further embodiments, the longitudinal conduit forms at least part of a third fluid pathway independent from the first and second fluid pathways. The longitudinal conduit through the central spigot may be used to add or remove fluids to/from the container, independently from any fluid transfer via the first or second conduits. Alternatively or additionally, the longitudinal conduit through the central spigot may allow for the insertion of a measurement device, such as a thermal probe or pH meter, into the container. Thus, in some embodiments, the longitudinal conduit through the central spigot provides a linear passageway through the adaptor. This allows for the insertion of a rigid measurement device into the container.

**[0018]** In some embodiments, the adaptor further comprises means for connection to a container closure in some further embodiments, the means for connection to a container closure is provided on the second sleeve. In some further embodiments, the means for connection to a container closure comprises an externally threaded portion. It will be understood that the externally threaded portion may be screwed into a corresponding internally threaded aperture in the container closure to connect the adaptor to the container closure. Alternatively, the externally threaded portion may pass through a suitably-sized aperture (such as an unthreaded aperture) in the container closure and may be secured in position with a nut.

**[0019]** In some embodiments, the interface between the central spigot and the first sleeve is generally cylindrical.

**[0020]** In some embodiments, the or each at least one first conduit is arcuate in cross-section. In some further embodiments, the first conduit is generally circular in cross-section. For example, the outer surface of the central spigot and the inner surface of the first sleeve may both be cylindrical and coaxial, with differing radii defining a cylindrical first conduit.

**[0021]** In some embodiments, the interface between the first sleeve and the second sleeve is generally cylindrical.

**[0022]** In some embodiments, the at least one second conduit is at least partially defined by a groove in the outer surface of the first sleeve. In some further embodiments, the outer surface of the first sleeve comprises a plurality of grooves. In some still further embodiments, the plurality of grooves are distributed evenly around the outer surface of the first sleeve. In particular, the plurality

of grooves may be distributed such that, whatever the relative rotational orientation of the first and second sleeves, at least one groove in the outer surface of the first sleeve is aligned with the second sleeve so as to define a second conduit.

**[0023]** In some embodiments, the at least one second conduit is at least partially defined by a groove in the inner surface of the second sleeve. In some further embodiments, the inner surface of the second sleeve comprises a plurality of grooves. In some still further embodiments, the plurality of grooves are distributed evenly around the inner surface of the second sleeve. In particular, the plurality of grooves may be distributed such that, whatever the relative rotational orientation of the first and second sleeves, at least one groove in the inner surface of the second sleeve is aligned with the first sleeve so as to define a second conduit.

**[0024]** In some still further embodiments, the second conduit is defined by a combination of at least one groove in the outer surface of the first sleeve and at least one groove in the inner surface of the second sleeve.

**[0025]** In some embodiments, the adaptor further comprises a diffuser in fluid communication with at least one of a first conduit and a second conduit. In some further embodiments, the diffuser is in fluid communication with a first conduit.

**[0026]** As used herein, the term 'diffuser' refers to a device capable of separating a flow of gas into a plurality of distinct flows. Typically, the plurality of distinct flows will each have a significantly reduced flow compared to that through the first conduit. This promotes mixing of a fluid supplied through the first conduit with a fluid inside the container. In some embodiments, the diffuser comprises a material having a thickness provided with a plurality of apertures therethrough, each aperture having a cross-sectional area smaller than the cross-sectional area of the first conduit. In some further embodiments, the total cross-sectional area of the apertures in the plate is not significantly more than the cross-sectional area of the first conduit. It will be understood that the total cross-sectional area of the apertures here refers to those apertures in fluid communication with the first conduit. For example, the diffuser may comprise a number of apertures, of which only a proportion are in fluid communication with the first conduit for a given arrangement of the diffuser with the central spigot and/or first sleeve. Such a construction allows the diffuser to be connected to the central spigot and/or first sleeve without requiring a specific relative arrangement. Thus, assembly of the adaptor is simplified.

**[0027]** In some further embodiments, the diffuser is annular and connects to the first sleeve. Such connection may be by means of a friction fit. In some further embodiments, the diffuser does not significantly extend beyond the outer cross-sectional area of the first sleeve. Thus, the diffuser does not significantly impede assembly or use of the adaptor.

**[0028]** In some embodiments, the central spigot com-

prises an outwardly-directed flange located at a first end of the first and second sleeves. Such a flange may prevent the insertion of the central spigot into the first and/or second sleeve beyond a certain depth, and thereby helps to ensure correct assembly of the adaptor. In some further embodiments, the adaptor further comprises a retaining member connected to the central spigot at a second end of the first and second sleeves. Thus, the first and second sleeves are retained between the central spigot flange and the retaining member, preventing accidental disassembly of the adaptor. An exemplary retaining member is a nut threaded onto an externally-threaded portion of the central spigot.

**[0029]** In some embodiments, the first sleeve comprises one or more apertures therethrough linking the internal and external surfaces of the first sleeve. In particular, the one or more apertures may be in fluid communication with a first conduit. Such apertures may form part of a fluid pathway between a first conduit and an external surface of the adaptor. In some further embodiments, the one or more apertures may be isolated from the at least one second conduit. Such isolation may be by means of a sealing member provided on at least one of the first sleeve and the second sleeve. An exemplary sealing member is a rubber O-ring provided on the first sleeve.

**[0030]** In some embodiments, the second sleeve comprises an inwardly-directed flange at one end thereof. The internal dimensions of the annular flange may be substantially the same as an external dimension of the central spigot, such that the second sleeve is able to form a seal directly against the central spigot. Thus, in some embodiments the second sleeve may be connected independently to the central spigot and the first sleeve. Where the second sleeve is provided with means for connection to a container closure, this provides the adaptor with flexibility use, since either the first sleeve or central spigot may be omitted from a particular assembly of the adaptor desired. In some further embodiments, at least one of the central spigot and the second sleeve is provided with a sealing member at the interface of the annular flange with the central spigot. An exemplary sealing member is a rubber O-ring provided on the central spigot.

**[0031]** In some embodiments, the second sleeve comprises one or more ports located in an outer surface and in fluid communication with at least one of the first conduit and the second conduit. In some embodiments, the one or more ports are adapted for connection to a connector. Such adaptation may for example take the form of a screw thread. Alternatively or additionally, the adaptor may additionally comprise at least one connector for attachment to at least one port. In the case where the one or more ports are not adapted for connection to a connector, the connector may simply be received in the port by means of a friction fit.

**[0032]** In some further embodiments, the second sleeve comprises a first series of ports in fluid communication with one or more first conduit and a second series of ports in fluid communication with one or more second

conduit. Each series of ports may comprise one or more ports. Where the adaptor comprises more than one first conduit or more than one second conduit, each port in the respective series may be in fluid communication with all such conduits. Alternatively, each port in the series may be in fluid communication with a separate conduit.

**[0033]** An embodiment of the invention is described below by way of example only, and with reference to the accompanying Figures, in which:

Figure 1 shows a perspective view of an adaptor according to an embodiment of the present invention;

Figure 2 shows a vertical section through the adaptor of Figure 1 installed within a container;

Figure 3 shows a perspective view of the central spigot of the adaptor of Figure 1; and

Figure 4 shows a perspective view of the first sleeve of the adaptor of Figure 1.

**[0034]** Referring to Figure 1, an adaptor 10 consists generally of a central spigot 20, a second sleeve 30 and a first sleeve 40.

**[0035]** The adaptor is generally cylindrical, and comprises three distinct sections along the longitudinal axis: an upper section, comprising an upper portion 22 of the central spigot 20 and a probe retaining piece 50; a middle section, comprising a middle portion 24 of the central spigot 20 and the main body 32 of the second sleeve 30; and a lower section, comprising the first sleeve 40, a diffuser 55 and a retaining piece 60. The middle section has a diameter larger than that of the upper and lower sections, which have similar diameters.

**[0036]** The probe retaining piece 50 has a central aperture 52 in the upper surface thereof.

**[0037]** The second sleeve has an outwardly threaded section 34 located below the main body 32 and of smaller diameter. A nut 38 is threaded onto the outwardly threaded section (but as shown is not fully tightened) and an annular seal 36 is disposed around the outwardly threaded section between the nut and the main body. An aperture 37 is located in the side wall of the main body of the second sleeve.

**[0038]** The first sleeve 40 has a number of longitudinal ribs 42 on the outer surface thereof, dividing the surface into a number of longitudinal grooves 44.

**[0039]** The retaining piece has a number of notches 62 in the lower edge thereof.

**[0040]** Referring to Figure 2, the internal structure of the adaptor 10 can be seen. The adaptor is shown fitted through a lid 72 of a container 70 (shown in schematic form). The container holds a liquid 74.

**[0041]** It can be seen that the central aperture 52 in the probe retaining piece 50 continues linearly through the whole length of the adaptor. The lower portion of the probe retaining piece is a narrower, externally threaded portion 54 which is engaged with a corresponding internally threaded portion 23 in the upper portion 22 of the

central spigot 20. A rubber O-ring 56 surrounds the interface of the probe retaining piece and central spigot at the central aperture.

**[0042]** Within the middle portion 24 of the central spigot 20, a first radial aperture 25 connects the central aperture 52 with an outer edge of the middle portion.

**[0043]** The central spigot 20 also has a lower portion 26, of narrow diameter, which extends along the axis of the adaptor 10 to the lower end thereof. The central aperture 52 is thus surrounded by this lower portion of the central spigot. At the lowest extremity of the lower portion 26 is an externally threaded portion 27 which is engaged with a corresponding internally threaded portion 64 of the retaining member 60. The interface between the central spigot and the retaining member is sealed with a rubber O-ring 28 immediately above the externally threaded portion.

**[0044]** The uppermost region of the main body 32 of the second sleeve 30 is formed by an inwardly projecting flange region 31 which surrounds the lower portion 26 of the central spigot 20, immediately below the middle portion 24 of the spigot. The interface between the flange region of the second sleeve and the lower portion of the spigot is sealed with a rubber O-ring 27. The remainder of the main body of the second sleeve is cylindrical, and is separated from the lower portion 26 of the central spigot by the first sleeve 40.

**[0045]** Two further radial apertures pass through the main body 32 of the second sleeve 30. A second (upper) radial aperture 35 extends from the outer wall of the main body through both the second sleeve and the first sleeve 40 to the interface between the first sleeve and the central spigot. A third, lower radial aperture 37 extends from the outer wall of the main body through the second sleeve only, to the interface between the second sleeve and the first sleeve. The interface between the first sleeve and second sleeve is sealed by a rubber O-ring 33, between the second and third apertures.

**[0046]** The outwardly threaded section 34 of the second sleeve 30 passes through an opening in the lid 72 of the container 70, such that the main body 32 of the second sleeve lies outside the container, whilst the nut 38 lies inside the container.

**[0047]** The diffuser 55 surrounds the lowermost section of the first sleeve 40. A fourth radial aperture 46 passes through the first sleeve from the interface with the diffuser to the interface with the central spigot 20. The interface between the diffuser 55 and the first sleeve 40 is sealed by two rubber O-rings 48, above and below the fourth radial aperture.

**[0048]** The lowermost regions of the adaptor 10, including the diffuser 55 and retaining member 60, are submerged beneath the surface of the liquid 74 in the container 70.

**[0049]** The first sleeve 40 fits loosely around the lower portion 26 of the central spigot 20, so that there is a cylindrical gap defining a first conduit A at the interface of the first sleeve and the central spigot. This gap is sealed

at the upper end by the rubber O-ring 27 between the flange 31 of the second sleeve and the lower portion of the central spigot, and at the lower end by the rubber O-ring 28 between the lower portion of the central spigot and the retaining member 60. The first conduit is in fluid communication with the liquid 74 in the container 70 by means of the fourth radial aperture 46 in the first sleeve, and the diffuser 55. The first conduit is in fluid communication with the exterior of the container by means of the second radial aperture 35 extending through the second sleeve and the first sleeve. The first conduit A therefore allows a fluid to be passed into the liquid in the container, and dispersed by means of the diffuser. Alternatively, the first conduit allows samples of the liquid to be taken, with the diffuser serving to prevent any suspended solids being drawn up into the adaptor.

**[0050]** The groove(s) 44 in the first sleeve adjacent to the third radial aperture 37 through the second sleeve 30, defines a second conduit B bounded by the adjacent ribs 42 on the first sleeve. The second conduit is in fluid communication with the atmosphere above the liquid 74 in the container by means of the opening where the groove extends beyond the lower edge of the outwardly threaded section 34 of the second sleeve 30. The second conduit is in fluid communication with the exterior of the container by means of the third radial aperture. The second conduit B therefore allows a fluid to be added into the container, or a sample of the atmosphere to be withdrawn, independently of any fluid transfer via the first conduit.

**[0051]** The central aperture 52 allows a probe, such as a thermometer, to be inserted into the liquid 74 in the container 70. The probe is held in place by the probe retaining piece 50, with rubber O-ring 56 providing an airtight seal. In the event that a probe is not required, it may be replaced by a rod of similar size. This can help to reduce the presence of unnecessary 'dead space' within the adaptor. In addition, the central aperture is in fluid communication with the exterior of the container by means of the first radial aperture 25. This therefore provides a further pathway for the addition or removal of fluid to/from the container.

**[0052]** Referring to Figure 3, the features of the central spigot 20 can be more clearly seen.

**[0053]** Referring to Figure 4, the features of the first sleeve 40 can be more clearly seen. In particular, it can be seen that the first sleeve is generally cylindrical. The portion 35b of the first radial aperture 35 opens at the external surface of the first sleeve into a circumferential channel 45, in which are located several, regularly-spaced, such apertures. This ensures that, regardless of the relative orientation of the first and second sleeves, there is at least one first radial aperture portion 35b in the first sleeve in easy fluid communication with the first radial aperture portion in the second sleeve.

**[0054]** Similarly, there are several third radial apertures 46 in the lowermost section 47 of the first sleeve, to allow fluid communication between the first conduit

(between the first sleeve and the central spigot) and the diffuser 55.

**[0055]** The adaptor is assembled by inserting the first sleeve 40 (with the diffuser 50 attached) into the second sleeve 30. The lower portion 26 of the central spigot 20 is then inserted through the second and first sleeves, and secured with the retaining piece 60. The notches 62 in the retaining piece may be used to retain a rod positioned radially for tightening of the retaining piece, if additional torque is required.

**[0056]** The adaptor 10 may be made from any suitable resilient material, but it preferably made from a thermostable polymeric material with good chemical resistance. This allows sterilisation in an autoclave (e.g. for use with microbiological experiments) and/or cleaning with appropriate solvents (e.g. for use with chemical experiments).

**[0057]** The length of the adaptor may be selected to operate with a particular container size. For example, the length of the central spigot (and optionally the first sleeve) could be selected from different variants. Alternatively or additionally, one or more extension pieces could be used to extend the length of the central spigot and/or first sleeve. For example, an extension to the central spigot could be attached to the externally threaded portion 27 of the central spigot 20 in place of the retaining piece 60. The retaining piece would then attach to the extension.

**[0058]** The central spigot 20 may be manufactured in different variants having different diameters for the central aperture 52. This allows the use of different probe diameters with the adaptor 10. The variant central spigots may all have the same external dimensions, and the first and second sleeves may be sized appropriately to accept all such central spigots. In this manner, the adaptor provides flexibility without unnecessary duplication of parts. It is therefore envisaged that an aspect of the invention relates to a kit comprising a first sleeve, a second sleeve, and a plurality of central spigots, each central spigot having the same external dimensions but having a central longitudinal aperture of different diameter. Other features of the kit may be as described above.

## Claims

1. An adaptor for fitting to a container closure, the adaptor comprising a central spigot, a first sleeve, and a second sleeve, wherein the first sleeve fits around the central spigot to define at least one first longitudinal conduit therebetween, and the second sleeve fits around the first sleeve to define at least one second longitudinal conduit therebetween.
2. The adaptor of claim 1, wherein the first conduit forms at least part of a first fluid pathway between, in use, the interior and exterior of the container, and the second conduit forms at least part of a second fluid pathway between, in use, the interior and exte-

rior of the container, and the first and second pathways are independent.

3. The adaptor of claim 1 or claim 2, comprising more than one second conduit, wherein the second conduits are independent. 5
4. The adaptor as claimed in any one of claims 1 to 3, wherein the central spigot further comprises a longitudinal conduit therethrough. 10
5. The adaptor as claimed in claim 4, wherein the longitudinal conduit provides a linear passageway through the adaptor. 15
6. The adaptor as claimed in any one of claims 1 to 5, further comprising means for connection to a container closure.
7. The adaptor as claimed in claim 6, wherein the means for connection to a container closure comprises an externally threaded portion provided on the second sleeve. 20
8. The adaptor as claimed in any one of claims 1 to 7, wherein the first conduit is generally circular in cross-section. 25
9. The adaptor as claimed in any one of claims 1 to 8, wherein the interface between the first sleeve and second sleeve is generally cylindrical. 30
10. The adaptor as claimed in any one of claims 1 to 9, wherein the at least one second conduit is at least partially defined by a groove in the outer surface of the first sleeve. 35
11. The adaptor as claimed in claim 10, wherein the outer surface of the first sleeve comprises a plurality of grooves distributed evenly around the first sleeve. 40
12. The adaptor as claimed in any one of claims 1 to 11, wherein the at least one second conduit is at least partially defined by a groove in the inner surface of the second sleeve. 45
13. The adaptor as claimed in claim 12, wherein the inner surface of the second sleeve comprises a plurality of grooves distributed evenly around the second sleeve. 50
14. The adaptor as claimed in any one of claims 1 to 13, further comprising a diffuser in fluid communication with at least one of a first conduit and a second conduit. 55
15. The adaptor as claimed in any one of claims 1 to 14, wherein the central spigot comprises an outwardly-

directed flange at a first end of the first and second sleeves, and the adaptor further comprises a retaining member at a second end of the first and second sleeves.

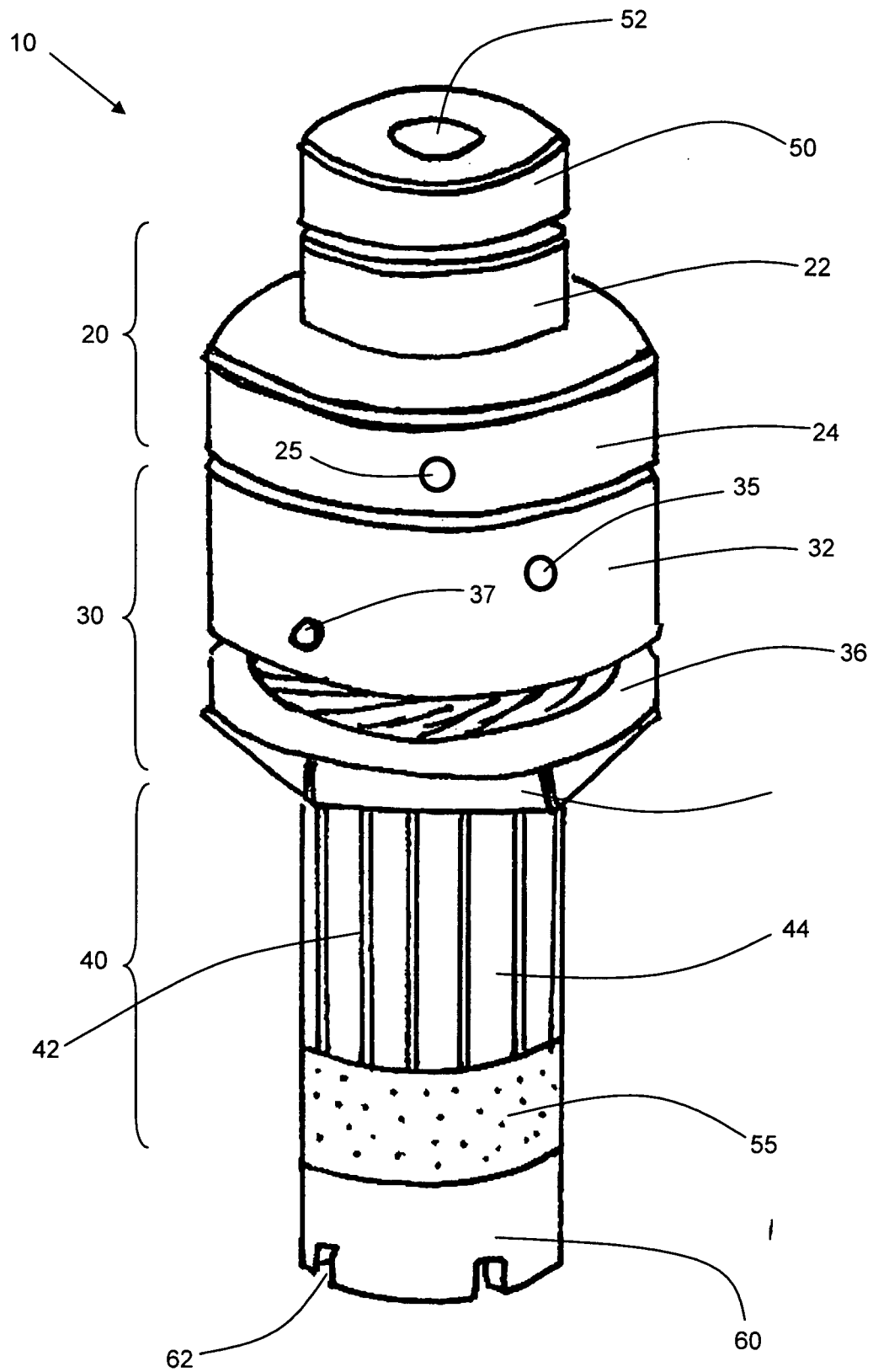


Figure 1

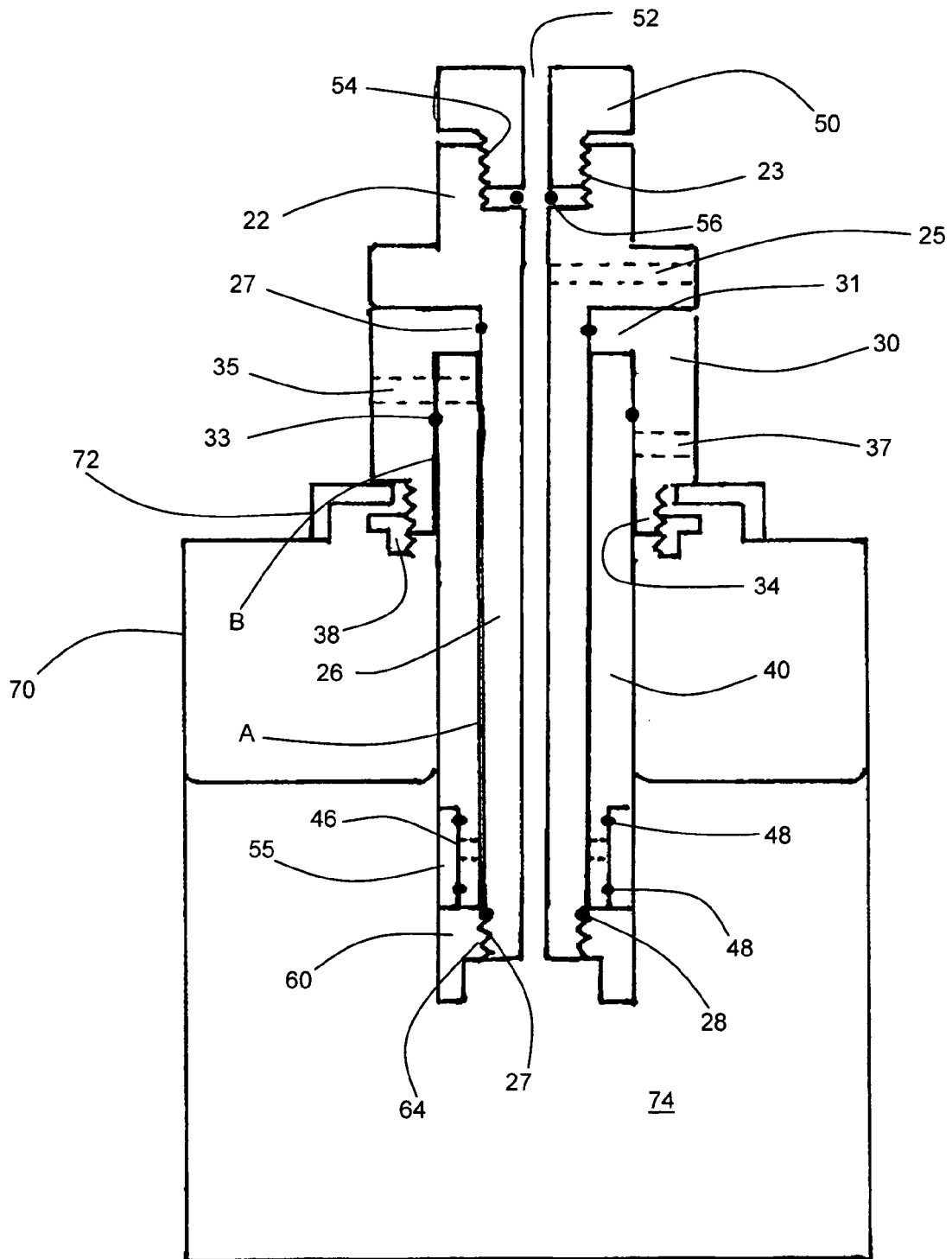


Figure 2

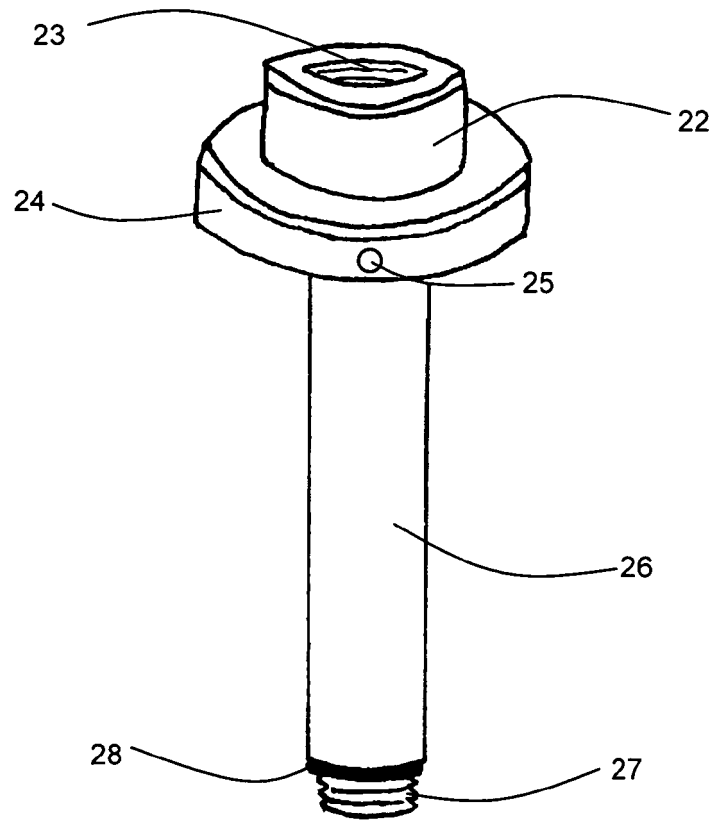


Figure 3

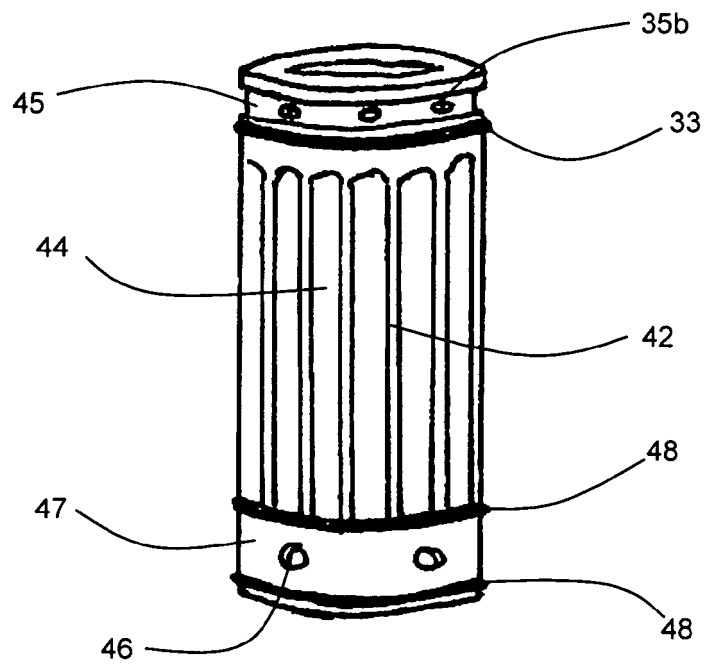


Figure 4



## EUROPEAN SEARCH REPORT

Application Number  
EP 10 25 2238

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                          |                                                 |                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Citation of document with indication, where appropriate, of relevant passages                                                                                            | Relevant to claim                               | CLASSIFICATION OF THE APPLICATION (IPC) |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | WO 2007/071287 A1 (PENTACORE INTERNAT HOLDING BV [NL]; MENCHEL YARIV [BE]; MENCHEL LYRON) 28 June 2007 (2007-06-28)<br>* paragraphs [0036] - [0041]; figure 2 *<br>----- | 1-4                                             | INV.<br>B01L3/00<br>B65D51/16           |
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