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(54) **Core container and method**

(57) A core barrel (10) for receiving and retaining a sample from a subterranean formation, wherein the container (10) is arranged to be removably accommodated within a coring assembly. The container (10) comprises a receptacle (26), formed from at least two receptacle portions (20,21) and a connector for connecting each receptacle portion (20,21) to the adjacent receptacle portion (20,21), such that the receptacle portions (20,21) are

separable on disconnection of the connector. The receptacle portions (20,21) can be complementary to form a receptacle (26) in the shape of a substantially hollow cylinder. A cylinder axis can be defined by the long axis extending through the cylinder. The receptacle portions (20,21) can be connectable along a line parallel to the cylinder axis of the receptacle (26) such that at least one of the receptacle portions (20,21) is movable radially away from the sample on disconnection of the connector.

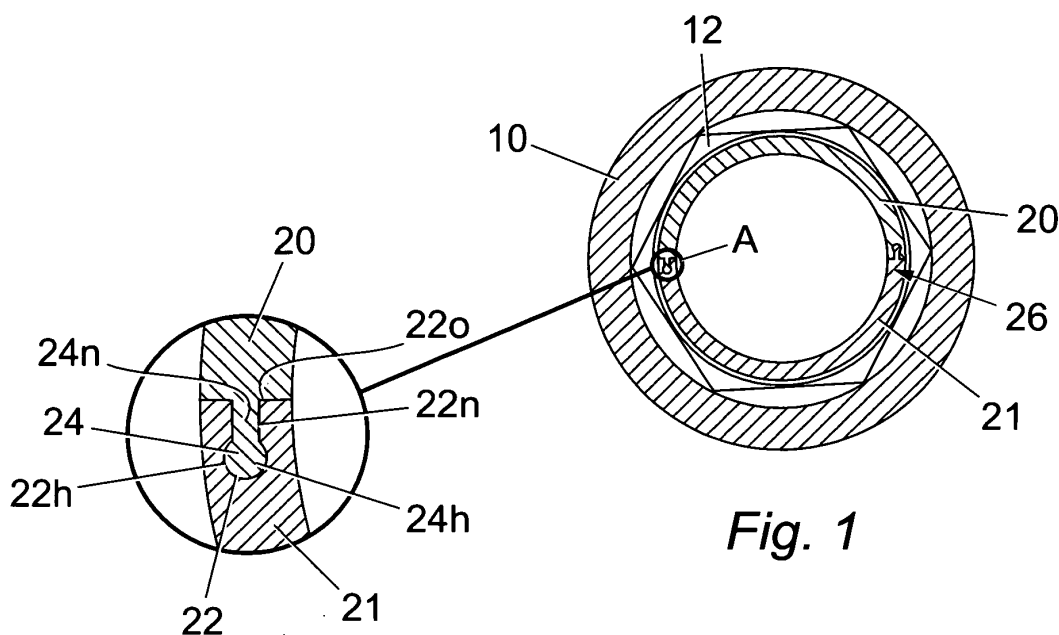


Fig. 1a

Fig. 1

Description

[0001] The present invention relates to a container and a method of receiving, retaining and accessing a sample, such as a core sample from a subterranean formation.

[0002] Extracting core samples from subterranean formations is an important aspect of the drilling process in the oil and gas industry. The samples provide geological and geophysical data enabling a reservoir model to be established. Core samples are typically retrieved using coring equipment, which is transported to a laboratory where tests can be conducted on the core sample. However, on occasion it is advantageous if a core sample can be inspected on-site after retrieval.

[0003] Core samples are conventionally collected in aluminium tubes. In order to view the sample on site it would be necessary to withdraw the sample axially from the tube or to make a longitudinal cut along the tube. Both of these methods of sample extraction have the potential to damage the sample.

[0004] According to a first aspect of the invention, there is provided a container for receiving and retaining a sample from a subterranean formation, wherein the container is arranged to be removably accommodated within a coring assembly, the container comprising at least one receptacle, wherein the or each receptacle is arranged to receive and retain a sample and wherein the or each receptacle has at least two receptacle portions and a connecting means for connecting each receptacle portion to the adjacent receptacle portion, such that the receptacle portions are separable on disengagement of the connecting means.

[0005] According to a second aspect of the invention, there is provided a method of receiving, retaining and accessing a sample from a subterranean formation, comprising the steps of:

- a) forming a receptacle by providing at least two receptacle portions and connecting each receptacle portion to the adjacent receptacle portion using a connecting means;
- b) accommodating the receptacle within a coring assembly;
- c) receiving and retaining a sample within the receptacle;
- d) removing the receptacle from the coring assembly; and
- e) accessing the sample by disengaging the connecting means and removing one or more of the receptacle portions.

[0006] According to a third aspect of the invention, there is provided an apparatus for receiving, retaining and accessing a sample from a subterranean formation, wherein the apparatus comprises a container arranged to be removably accommodated within a coring assembly, the container comprising at least one receptacle, wherein the or each receptacle is arranged to receive

and retain a sample and wherein the or each receptacle has at least two receptacle portions and a connecting means for connecting each receptacle portion to the adjacent receptacle portion, and wherein the apparatus further comprises a tool for disengaging the connecting means to separate the receptacle portions.

[0007] Removal of one or more of the receptacle portions provides easy access to the sample after recovery and the connecting means allow the receptacle portions to be separated with minimal or no damage to the sample. Provision of the receptacle portions is advantageous since the sample does not then have to be withdrawn axially from the receptacle for analysis, which generates friction and could result in the sample being damaged. Rather, the sample can be accessed and exposed by disengaging the connecting means to enable one or more of the portions to be lifted away from the sample without direct manipulation of the sample.

[0008] The method can include providing a tool and accessing the sample by disengaging the connecting means using the tool.

[0009] Each receptacle portion can have two long edges and two short end edges. The long edges of each receptacle portion can be arranged to connect with the long edge of the adjacent receptacle portion.

[0010] The tool of the third aspect of the invention is usable with the container of the first aspect of the invention to disengage the connecting means and separate at least one of the receptacle portions. The tool can be provided to force the connecting means to disengage.

[0011] The tool can comprise a bar having a pointed or bevelled end for insertion between the receptacle portions. Movement of the bar, following insertion of the end between the receptacle portions, can act to disengage the connecting means and force at least one of the receptacle portions away from the other receptacle portion(s).

[0012] The end of the bar can be inserted between the two long edges of the receptacle portions. An outer portion of the or each long edge of the or each receptacle portion can be chamfered to facilitate access of the tool to the join between the long edges.

[0013] The or each receptacle can be substantially cylindrical. Preferably, the receptacle portions and the connecting means are complementary to form a receptacle in the shape of a substantially hollow cylinder. According to the embodiment where the receptacle is substantially cylindrical, a cylinder axis can be defined by the long axis extending through the cylinder. The receptacle portions can be connected along a line parallel to a cylinder axis of the receptacle.

[0014] The two or more receptacle portions can be separable along the line extending between the two ends of the portions, typically substantially parallel to the cylindrical axis, so that the two or more receptacle portions can be separable laterally from one another. Preferably at least one of the two or more receptacle portions are movable radially away from the sample on disengage-

ment of the connecting means.

[0015] Typically, each receptacle comprises two receptacle portions and the receptacle portions are in the form of half-shells.

[0016] The connecting means are typically arranged to maintain the long edges of each receptacle portion in contact with one another when the container is receiving a sample.

[0017] The connecting means can be integral with the or each receptacle portion. The connecting means can comprise moulded long edges of the receptacle portions.

[0018] According to one embodiment, the connecting means can comprise a shaped recess disposed on at least a part of the long edge of a receptacle portion and a shaped protrusion disposed along a corresponding part of the long edge of an adjacent receptacle portion wherein the shaped protrusion can mate with the shaped recess. Each receptacle portion can have a protrusion disposed along one long edge and a recess disposed along the other long edge. The protrusion can be formed with a head having a width greater than an opening of the recess. Both the recess and the protrusion can be shaped to have a neck and a wider diameter head portion in section.

[0019] Alternatively, the connecting means can comprise a separate shaped insert and each receptacle portion can be provided with recesses disposed along the long edges for receiving the shaped insert. The long edges of the receptacle portions can be formed with recesses shaped to securely receive the inserts. The recesses can have an opening that widens to an enlarged portion. The insert can have a head portion that is oversized relative to the width of the opening. The inserts can be substantially dumb-bell shaped.

[0020] According to an alternative embodiment of the invention, the connecting means can comprise long edges of the receptacle portions having a centrally disposed recess such that the long edges of adjacent receptacle portions can be aligned to form one or more apertures between adjacent receptacle portions. The apertures can extend along the connection between the receptacle portions. The aperture can be filled with fluid.

The fluid is typically air. The aperture can be sealed to restrict fluid communication between the aperture and the ambient environment. A length of sealing material can be provided parallel to and adjacent each side of the aperture. Typically, a change in hydrostatic pressure occurs during transit from the subterranean formation (with a high ambient hydrostatic pressure) to the surface (with a relatively lower atmospheric pressure) and thus the fluid trapped in the aperture can cause a pressure differential to exist between the recess and the ambient environment thereby urging the portions into sealing engagement.

[0021] The above-described embodiments of the connecting means have the advantage that each receptacle portion can be manufactured from the same pattern and therefore a universal mould can be used. Shaping each

long edge of the receptacle is simple to achieve by adding a shape to the mould through which the receptacle portions are extruded during manufacture. Thus the cost of manufacture of the receptacle portions is maintained at a low level. The receptacle portions can be manufactured from aluminium.

[0022] The connecting means can comprise a weakened region. The weakened region can include an area of reduced wall thickness. Preferably, the region of reduced wall thickness is spaced away from an inner surface of the receptacle portions.

[0023] The connecting means can comprise at least one binding member arranged to apply a radial compressive force to the receptacle portions. Each binding member can comprise a sleeve arranged to circumscribe the circumference of the receptacle portions. The sleeve can be of a length less than the length of the receptacle portions. The sleeve can be formed from a polymer such as a heat-shrinkable polymer or any other heat shrinkable fabric. According to this embodiment, the sleeve can be heated to cause shrinkage and apply a radial compressive force to the receptacle portions. Disengagement of the connecting means can be achieved by cutting along the binding member to relieve the compressive force applied by the binding member to the receptacle portions.

[0024] The binding member can be used in conjunction with any other connecting means where suitable.

[0025] Alternatively, the tool can comprise a cutting means for making a cut through the weakened region and/or the binding member of the or each receptacle portion.

[0026] The sample can be a core sample.

[0027] The or each receptacle can be disposable. According to some embodiments, use of the tool to disengage the connecting means is likely to damage the receptacle and thus render the receptacle unsuitable for reuse. The or each receptacle can be reconfigured prior to reuse. Alternatively, the or each receptacle can be recycled and reformed.

[0028] The container is preferable sealed to prevent fluid ingress and egress. The container can comprise seal means to provide a fluid tight seal across the container. Each long edge of the receptacle can be provided with a line seal. The or each short edge can also be provided with seals therealong. Alternatively, or additionally, an inner surface of the or each receptacle towards each end can be provided with an annular seal means. The annular seal means can include O-rings, lip-type seals and seals containing a fluid pocket to cause selective dilation of the seal in response to a pressure differential. Preferably the ends of the container are also sealed. The seal means can be elastomeric.

[0029] The container can comprise a plurality of receptacles and wherein the short end edge of each receptacle is arranged to be coupled to the short end edge of the adjacent receptacle by a joining member.

[0030] The joining member can be arranged to engage adjacent receptacles to couple the receptacles to one

another.

[0031] An outer surface of each receptacle can comprise a recess and the joining member can be provided with at least two keyed parts, wherein each keyed part is arranged to engage the respective receptacle.

[0032] A securing means can be provided for securing the joining member in position for engaging with adjacent receptacles.

[0033] The securing means can comprise two securing members arranged to abut the joining member on either side thereof and retain the joining member in its position. The securing members can be provided with corresponding threads.

[0034] According to another embodiment, the joining member can comprise a threaded connector and the receptacle can be provided with a partially threaded outer surface towards each end for engaging with the connector.

[0035] Alternatively, the receptacle can have threaded end regions. A first end region having a reduced diameter relative to the remainder of the receptacle can have threads on an outer surface and a second end region can have threads on an inner surface such that the first end of one receptacle can be received within and threadedly coupled to the second end of an adjacent receptacle.

[0036] Embodiments of the invention will now be described with reference to and as shown in the following drawings, in which:-

Fig. 1 is a sectional view of a receptacle within a core barrel;

Fig. 1a is a sectional view of detail A;

Fig. 2 is a sectional view of an alternative receptacle in a core barrel;

Fig. 2a is a sectional view of detail B;

Fig. 3 is a sectional view of another receptacle within a core barrel;

Fig. 3a is a sectional view of detail C;

Fig. 4 is a sectional view of another receptacle within a core barrel;

Fig. 4a is a sectional view of detail D;

Fig. 5 is a sectional view of another receptacle within a core barrel;

Fig. 5a is a sectional view of detail E;

Fig. 6 is a sectional view of another receptacle within a core barrel;

Fig. 6a is a sectional view of detail F;

Fig. 7a is an end view of the receptacle of Fig. 2;

Fig. 7b is a side view of the receptacle of Fig. 7a;

Fig. 8 is an exploded perspective view of two receptacles similar to that of Fig. 7b arranged end to end with a joining and securing assembly therebetween;

Fig. 9 is a sectional view of the assembled container of Fig. 8;

Fig. 9a is a part-sectional, part-side view of the section A-A of the container of Fig. 9.

Fig. 9b is a view of detail B from Fig. 9a;

Fig. 10a is an end view of another receptacle;

Fig. 10b is a side view of the receptacle of Fig. 10a; and

Fig. 11 is an exploded perspective view of two receptacles similar to that of Fig. 10a arranged end to end with a joining and securing assembly therebetween.

[0037] Fig. 1 is a sectional view of a receptacle shown generally at 26. The receptacle 26 is constructed from two receptacle portions 20, 21 that are semi-cylindrical and hollow in shape. Each receptacle portion 20, 21 has two long linear edges and two semicircular end edges. The long edges of the portion 20 are arranged to contact the long edges of the portion 21 to form a hollow cylinder joined by a connecting means along a line parallel to an axis of the cylinder. The join between the two portions 20, 21 is preferably provided with a line seal (not shown) to prevent ingress of muds in the receptacle 26.

[0038] The receptacle 26 of Fig. 1 is shown housed within and co-axial with a core barrel 10 from a core barrel assembly (not shown). The receptacle 26 is centralised within the barrel 10 by a hexagonal centraliser 12. Similarly, each receptacle described and shown with reference to Figs. 2-6 is centralised within the core barrel 10 by the centraliser 12.

[0039] According to this embodiment, the connecting means comprise mating portions integrally formed along the long edges of the receptacle portions 20, 21. A centrally disposed recess 22 extends along one of the linear long edges of each portion 20, 21. A centrally disposed protrusion 24 extends along the other linear long edge of each portion 20, 21. The centrally disposed recess 22 has an opening 22o and a narrow portion 22n leading away from the opening 22o to an enlarged portion 22h, wherein the enlarged portion 22h has a greater maximum width than the narrow portion 22n. Similarly, the centrally disposed protrusion 24 has a neck 24n and an enlarged head 24h. The detail A of Fig. 1 a shows the protrusion 24 disposed on the long edge of the portion 20 and the recess 22 disposed on the long edge of the portion 21. The dimensions of the enlarged head 24h of the protrusion 24 are selected such that it can be forced through the opening 22o and the narrower portion 22n that must part slightly to allow passage of the head 24h there-through. The enlarged head 24h can then be retained within the enlarged portion 22h of the recess 22.

[0040] Fig. 2 shows a receptacle 36 comprising two receptacle portions 30, 31 that are hollow and semi-cylindrical in shape. Each portion 30, 31 has two long linear edges provided with seals and two circular end edges. The long edges of the portion 30 are arranged to contact the long edges of the portion 31 to form a hollow cylinder and join along a line parallel to an axis of the cylinder. Each long edge of the portions 30, 31 has a recess 32 with a narrow opening 32o leading to an enlarged portion 32h.

[0041] An insert 34 has a central neck portion 34n and two wider diameter end portions 34h. The end portions

34h of the insert 34 can be forced through the narrower opening 32o of the recess 32 to nest within the enlarged part 32h of the recess 32 to thereby retain the portions 30, 31 into engagement to form the receptacle 36.

[0042] Fig. 3 shows a receptacle 46 constructed from two hollow semi-cylindrical portions 40, 41 each having two long linear edges and two semi-circular end edges. The portions 40, 41 are generally hollow and semi-cylindrical in shape and arranged to engage one another along adjacent long edges as previously described in connection with the first and second embodiments. The long edges of the portions 40, 41 have centrally disposed semi-cylindrical recesses 42 and one long edge of each portion 40, 41 has lengths of seal 44 arranged parallel and on both sides of the recess 42. Thus, when the portions 40, 41 are positioned to form a receptacle 46, the long edges of the portions 40, 41 engage and are arranged so that the corresponding recesses 42 form a cylindrical air pocket 48 that is sealed on either side by the seals 44.

[0043] The air pockets 48 will also need to be sealed at each end. Lengths of air pockets 48 can be laid end to end by joining a plurality of receptacles 46 end to end as described hereinafter. However, the outermost regions of the air pockets are required to be sealed. This can be achieved by plugging the outermost ends with sealing material. The seals 44 and sealing material preferably isolate the air pocket 48 and prevent fluid communication between the interior of the air pocket 48 and the ambient environment. The seals 44 and sealing material can be any type of seal able to withstand the temperatures and pressures associated with the downhole environment in which they are used. Elastomeric seals are useful in this regard. The seal means can be manufactured from rubber or plastics material or the like and some useful embodiments can be formed from Viton™.

[0044] Fig. 4 shows a receptacle made from two semi-cylindrical hollow portions 50, 51 having two long linear edges provided with seals and two end edges. The portions 50, 51 are generally hollow and semi-cylindrical in shape as previously described in connection with the foregoing embodiments. The portions 50, 51 join along their long edges parallel to an axis of the cylinder. One long edge of each portion 50, 51 is provided with a protruding barb 54 having a neck 54n leading to a head 54h with a pointed end 54p and a secondary point 54b. The other long edge has a recess 52 with a narrow opening 52o that is slightly wider than the neck 54n of the protruding barb 54. The recess 52 is shaped corresponding to the form of the barb 54. The narrow opening 52o of the recess 52 is sufficiently deformable to allow the head 54h of the barb 54 to be forced therethrough. Thereafter, the barb 54 is retained within the recess 52 to secure the portions 50, 51 to one another and form a cylindrical hollow receptacle 56.

[0045] Fig. 5 shows a receptacle 66 having two semi-cylindrical hollow portions 60, 61 that are integrally formed with a waisted bridging portion 64 therebetween.

The waisted bridging portion 64 has a reduced wall thickness compared with the wall thickness of the portions 60, 61. The bridging portion 64 is recessed away from an inner surface of the portions 60, 61 as shown in detail E, so that the inner diameter of the bridging portion 64 is wider than the inner diameter of the portions 60, 61.

[0046] Fig. 6 shows a receptacle 76 comprising two semi-cylindrical hollow portions 70, 71, each portion having two long edges provided with seals and two end edges. The long edges of each portion 70, 71 are arranged to align and engage one another to form a hollow cylindrical receptacle 76. An outer part of the portions 70, 71 in the region of the long edge is provided with an L-shaped recess 72 facing towards the long edge. The L-shaped recess 72 creates a shoulder 73. A length of spring clip 74 having inwardly protruding ends 75 is removably accommodated within the L-shaped recess 72 and retained therein by the shoulder 73, as shown in detail F.

[0047] According to another embodiment, the connecting means comprise a heat shrinkable sleeve formed from any suitable polymer such as a polyolefin, PVDF (polyvinylidene difluoride), PTFE (polytetrafluoroethylene) and FEP (fluorinated ethylene propylene). The sleeve is selected to be of a length slightly less than that of the end to end length of the receptacle portions. The shrink ratio can be varied depending on the required amount of compressive force. The sleeve is fed over the sealed receptacle portions and heated such that the sleeve shrinks around the exterior of the receptacle portions to apply a radial compressive force thereto. The sleeve can also be used in addition to the various connecting means described with reference to Figs. 1 to 6a.

[0048] Fig. 7a is an end view of the portions 30, 31 of Fig. 2 prior to assembly. Fig. 7b shows each portion 30, 31 having an end region 38 with a recessed circumferential band 37. The portions 30, 31 can be connected using the insert 34 such that a recessed annular band 37 is formed at each end region 38.

[0049] The exploded view of Fig. 8 shows another receptacle 136 arranged to be joined end to end with the receptacle 36. The receptacle 136 is similar to the receptacle 36 and like parts of the receptacle 136 have been allotted like reference numerals with a prefix "1".

[0050] The receptacles 36 and 136 are positioned with the end regions 38, 138 immediately adjacent one another. A joining member 88 comprises two hollow semi-cylindrical parts 80, 81 having two joining edges and two arcuate end edges. Each joining edge is arranged to abut the joining edge of the adjacent part 80, 81 such that the parts 80, 81 are complementary to form an annular band. Each part 80, 81 also has two parallel tracks 83 (shown in Fig. 9b) along an inner surface proximate each arcuate end edge. The tracks 83 are shaped to engage the recessed bands 37, 137 provided in each end region 38, 138 respectively.

[0051] A first and second threaded securing member 82, 84 respectively are also provided to secure the joining member 88 in position. The inner diameter of the securing

members 82, 84 is slightly larger than the outer diameter of the portions 30, 31 to allow the securing members 82, 84 to be positioned thereover. The first threaded securing member 82 has a stepped outer surface 82s and a screw thread 82t. An inner surface of the first securing member 82 has an end portion formed with a depression 82d that corresponds with the length of the joining member 88 as shown in Fig. 9b. The second securing member 84 has a step 84s on its inner surface to allow the end of the first securing member 82 to shoulder out on the step 84s. The second securing member 84 also has a threaded portion 84t on an inner surface thereof to engage with the threads 82t of the first securing member 82.

[0052] Before use within a core barrel assembly, the container is assembled.

The portions 30, 31 are connected by forcing the insert 34 into the recesses 32 along the long edges of the portions 30, 31 to form the receptacle 36. The or each additional receptacle 136 is also assembled in the same way. The first securing member 82 can then be slid over the end region 38 of the receptacle 36. Similarly, the second securing member 84 is slid over the end region 138 of the receptacle 136.

[0053] The joining member 88 engages the receptacles 36, 136 and is arranged such that the joining edges of each part 80, 81 are positioned perpendicular to the long edges along which the receptacle portions 30, 31 are connected. This arrangement avoids an area of the container having a weak link. The tracks 83 of the parts 80, 81 engage with the recessed bands 37, 137 thereby joining the receptacles 36, 136. The first securing member 82 can then be moved such that the depression 82d abuts the joining member 88 that protrudes slightly relative to the outer diameter of the portions 30, 31. The second securing member 84 is screwed along the first securing member 82 such that the threads 84t engage with the threads 82t until the step 84s abuts the opposing side of the joining member 88. This has the effect of securing the joining member 88 in position so that the assembled receptacles 36, 136 are in secured engagement. Additional receptacles can be added using similar joining members 88 and securing members 82, 84 to form a container.

[0054] Prior to insertion in a coring assembly (not shown), the container comprising a plurality of receptacles 36, 136, etc. securely fastened to one another and sealed along its length is assembled in the manner described above. The container is then located within the core barrel 10 and centralised therein using hexagonal centralisers 12. A leading end of the coring assembly (not shown) has a plurality of cutters provided to engage a geological formation and cut a core sample therefrom. The cutters are actuated and a core sample is collected within the container. During collection, if the core sample is entering the container at a slightly offset angle, there may be a tendency for the core sample to catch on an inner surface of the receptacles. However, radial separation of the portions 30, 31 is resisted by the enlarged

end portions 34h of the insert 34 retained within the recesses 32. Once the sample has been collected within the container a spring catcher (not shown) is actuated and the sample is sealed within the receptacle so that it is isolated from downhole drilling muds. The coring assembly can then be pulled out of the hole to retrieve the sample.

[0055] Once the coring assembly is retrieved to surface, the container can be removed therefrom. Typically, the container and the core sample within is divided into lengths corresponding to the length of each receptacle 36, 136 using a cutting tool. If on-site inspection of the core sample is required a tool such as a crow bar has its flattened end inserted into the join between the receptacle portions 30, 31. The crow bar can then be moved such that it acts as a lever to apply a force to separate the receptacle portions 30, 31 by urging the enlarged end 34h through the narrow opening 32o such that the inserts 34 are urged out of engagement of the recesses 32 allowing at least one of the portions 30, 31 to be lifted radially away from the core sample. In order to facilitate the separation of the receptacle portions 30, 31, the leading outer edges of the portions 30, 31 can be chamfered to provide a purchase for the tool in use. The act of separation may have damaged the or each portion 30, 31, which is thus treated as disposable and may be recycled or reconfigured for reuse.

[0056] The outer surface of each of the receptacles 26, 46, 56, 66, 76 shown in Figs 1, 1a and 3 - 6a can similarly be provided with recessed bands 37 and secured to like receptacles using joining members 88 and securing members 82, 84.

[0057] A similar procedure for collection, retrieval and inspection of the core sample can be followed for the receptacle 26 shown in Fig. 1 and the receptacle 56 is shown in Fig. 4.

[0058] The receptacle 46 shown in Fig. 3 is assembled to form part of a container assembly in a similar manner as described with reference to Figs. 8 to 9b. As the receptacle 46 is assembled prior to insertion downhole, the air pocket 48 is at ambient atmospheric pressure. However, since the receptacles 46 making up the container assembly are transported downhole, the pressure of the environment gradually increases towards the subterranean formation. The pressure differential increases since the air pocket 48 is sealed from the ambient environment downhole by the seals 44. This urges the portions 40, 41 into contact with one another. Thus, during collection of the sample separation of the receptacles 46 is resisted by the pressure differential across the air pocket 48 acting to maintain the portions 40, 41 in engagement. Withdrawal of the coring assembly from the downhole environment reduces the pressure differential across the air pocket 48 until the coring assembly and the receptacle 46 is once again subject to atmospheric pressure. In the absence of a pressure differential the two portions 40, 41 are easily parted on the surface and one or more of the portions 40, 41 can simple be lifted away to provide ac-

cess to the core sample on-site.

[0059] The receptacle 66 shown in Fig 5 is integrally formed and has a waisted bridging portion 64. Several such receptacles can be assembled end to end to form a container. Once a core sample has been retrieved to surface following collection from the subterranean formation, a cutting tool (not shown) can be used to cut along the length of the waisted bridging portion 64 of the receptacle 66. Spacing the waisted portion 64 away from the inner surface of the receptacle 66 by the depth of the recess 62 significantly reduces the risk that the core sample will be damaged during the cutting operation. Furthermore, a smaller cutting force is required to divide the waisted section 64 having a smaller wall thickness than the wall thickness of the portions 60, 61.

[0060] The portions 70, 71 of the receptacle 76 shown in Fig. 6 are retained by a spring clip 74 having retaining ends 75 that abut shoulders 73 of the L-shaped recess 72. The clips 74 are deformable and can be removed following retrieval of the coring assembly to surface, thus providing access to the core sample.

[0061] Each embodiment of the connecting means described with reference to Figs. 1 to 6 enables the core sample to be accessed by lifting one or more of the receptacle portions therefrom. Thus, axial withdrawal of the sample from the container is not necessary.

[0062] An alternative joining and securing means is shown in Figs. 10a to 11. Figs. 10a shows a receptacle having receptacle portions 230, 231 and a shaped insert 234 similar to those described with reference to Fig. 7b. The receptacle portions 230, 231 have two end regions 238, 239. The end region 238 has threads 237 provided on an outer surface and the end region 239 has threads 237 provided on an inner surface.

[0063] Fig. 11 shows a similar receptacle with like features labelled with the prefix "3", rather than "2". Before use, the inserts 234, 334 are used to couple the receptacle portions 230, 231, 330, 331 in the manner previously described. A joining and securing member 188 is provided with internal threads adapted to engage with the threads 237, 337 at the end regions of the receptacle portions 230, 231, 330, 331.

[0064] This method of joining receptacle portions end-to-end can be used in preference to that described with reference to Figs. 7a to 9b and can also be used with any of the described connecting means.

[0065] Modifications and improvements can be made without departing from the scope of the invention.

Claims

1. A container (10) for receiving and retaining a sample from a subterranean formation, wherein the container (10) is arranged to be removably accommodated within a coring assembly, the container comprising a receptacle (26), formed from at least two receptacle portions (20, 21) and a connector for connecting

each receptacle portion (20, 21) to the adjacent receptacle portion (20, 21), such that the receptacle portions (20, 21) are separable on disconnection of the connector.

2. A container (10) as claimed in claim 1, wherein the receptacle portions (20, 21) are complementary to form a receptacle (26) in the shape of a substantially hollow cylinder.

3. A container (10) as claimed in claim 2, wherein a cylinder axis is defined by the long axis extending through the cylinder and wherein the receptacle portions (20, 21) are connectable along a line parallel to the cylinder axis of the receptacle (26) such that at least one of the receptacle portions (20, 21) is movable radially away from the sample on disconnection of the connector.

4. A container (10) as claimed in any preceding claim, wherein each receptacle (26) comprises two receptacle portions (20, 21) and the receptacle portions (20, 21) are in the form of two semi-cylindrical half-shells.

5. A container (10) as claimed in any preceding claim, wherein the connector is arranged to maintain each receptacle portion (20, 21) in contact with the adjacent receptacle portion (20, 21) when the container (10) is receiving a sample.

6. A container (10) as claimed in any preceding claim, wherein at least part of the connector is integrally formed with the or each receptacle portion (20, 21).

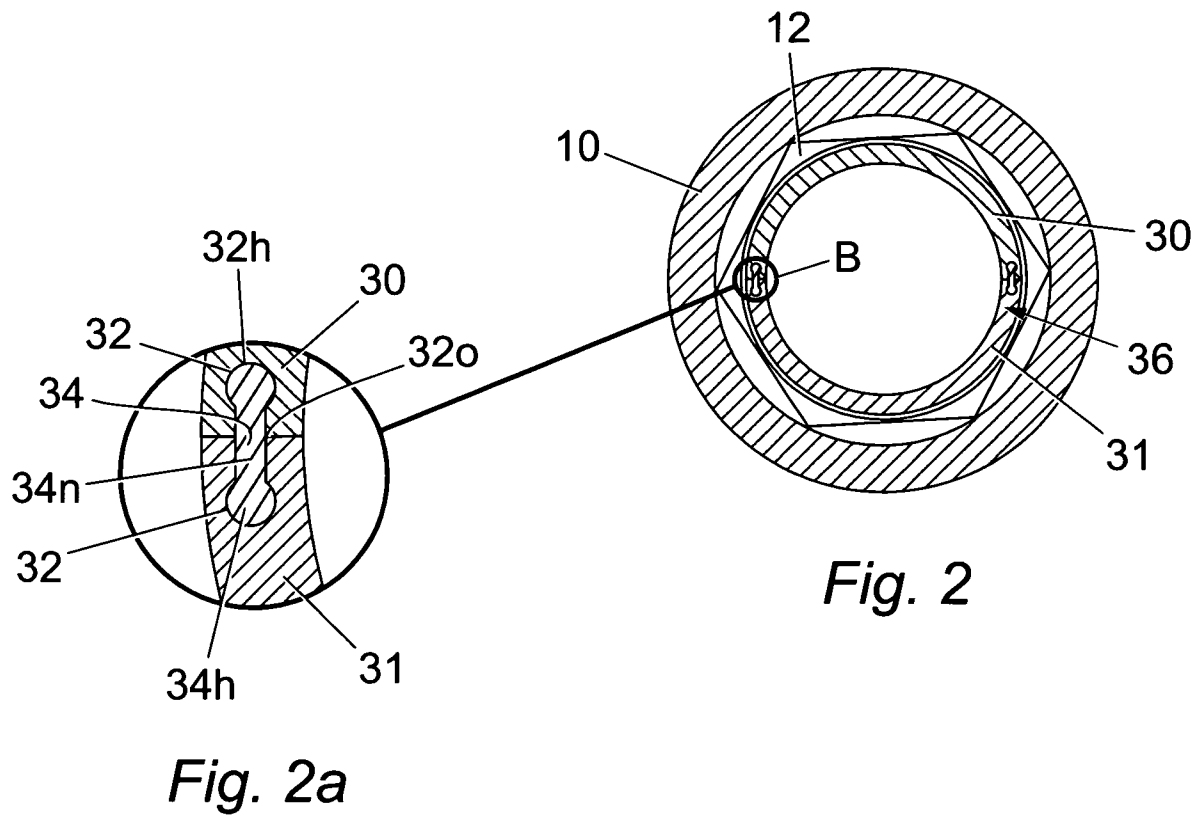
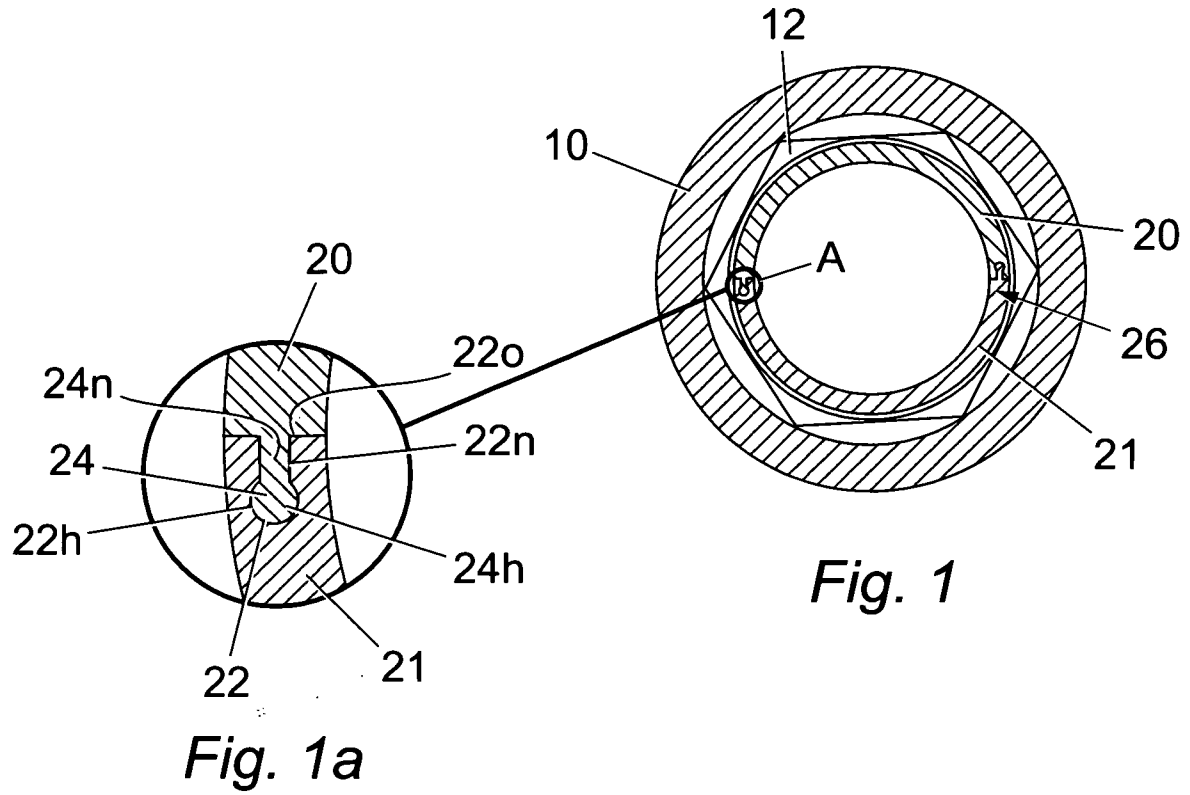
7. A container (10) as claimed in any preceding claim, wherein each receptacle portion (20, 21) has contact edges arranged to contact the contact edges of the adjacent receptacle portion (20, 21) and wherein the connector comprises moulded contact edges of the receptacle portions (20, 21).

8. A container (10) as claimed in claim 7, wherein the connector comprises a shaped recess (22) disposed on at least a part of the contact edge of a receptacle portion (21) and a shaped protrusion (24) disposed along a corresponding part of the contact edge of an adjacent receptacle portion (20), wherein the shaped protrusion (24) is arranged to mate with the shaped recess (22).

9. A container (10) as claimed in claim 8, wherein each receptacle portion (20, 21) has a protrusion (24) disposed along one contact edge and a recess (22) disposed along the other contact edge.

10. A container (10) as claimed in claim 8 or claim 9, wherein the protrusion (24) is formed with a head

- (24h) having a width greater than an opening (22o) of the recess (22) such that the connector connects the receptacle portions (20, 21) with a snap fit.
11. A container (10) as claimed in claim 7, wherein the connector comprises a separate shaped insert (34) and each receptacle portion (30, 31) is provided with at least one recess (32) disposed along the contact edges for securely receiving the shaped insert (34).
 12. A container (10) as claimed in claim 7, wherein the connector comprises at least one centrally disposed recess (42) formed in the contact edges of the receptacle portions (40, 41) such that the recesses (42) of the contact edges of adjacent receptacle portions (40, 41) are aligned to form at least one aperture between adjacent receptacle portions (40, 41) and which at least one aperture is sealed to restrict fluid communication between the aperture and the ambient environment.
 13. A container (10) as claimed in claim 6 or claim 7, wherein the receptacle portions (60, 61) are joined with an integral connector comprising a weakened region (64) including an area of reduced wall thickness between adjacent receptacle portions.
 14. A container (10) as claimed in claim 13, wherein the region of reduced wall thickness is spaced away from an inner surface of the receptacle portions (60, 61).
 15. A container (10) as claimed in any preceding claim, wherein the connector comprises at least one binding member arranged to circumscribe an outer circumference of the receptacle and apply a radial compressive force to the receptacle portions.
 16. A container (10) as claimed in claim 15, wherein each binding member comprises a sleeve formed using a heat-shrinkable polymer thereby to apply a radial compressive force to the receptacle portions.
 17. A container (10) as claimed in any preceding claim, wherein the container (10) is sealed to prevent fluid ingress and egress.
 18. A container (10) as claimed in any preceding claim, wherein the container (10) comprises a plurality of receptacles (36, 136) joined end to end by a joining member (80, 84) that engages the ends of adjacent receptacles (36, 136) to couple the receptacles (36, 136) to one another.
 19. A container apparatus comprising a container (10) according to any preceding claim wherein the apparatus further comprises a tool for disconnecting the connector to separate the receptacle portions.
 20. An apparatus according to claim 19, wherein the tool comprises a bar having a bevelled end for insertion between the receptacle portions.
 21. An apparatus according to claim 19, wherein the tool comprises a cutting device for making a cut through the connector of the at least one receptacle portion.
 22. A method of receiving, retaining and accessing a sample from a subterranean formation, comprising the steps of:
 - a) forming a receptacle (26) by providing at least two receptacle portions (20, 21) and connecting each receptacle portion (20, 21) to the adjacent receptacle portion (20, 21) using a connector;
 - b) accommodating the receptacle (26) within a coring assembly;
 - c) receiving and retaining a sample within the receptacle (26);
 - d) removing the receptacle (26) from the coring assembly; and
 - e) accessing the sample by disconnecting the connector and removing at least one of the receptacle portions (20, 21).
 23. A method according to claim 22, wherein step (e) involves disconnecting the connector and lifting one or more of the portions (20, 21) radially away from the sample to thereby access the sample.
 24. A method according to claim 21 or claim 22, including recycling and reforming the at least one receptacle (26) prior to reuse.
 25. A sampling assembly for receiving, retaining and accessing a sample from a subterranean formation, wherein the sampling assembly comprises a container arranged to be removably accommodated within a coring assembly, the container comprising at least one receptacle, wherein the or each receptacle is arranged to receive and retain a sample and wherein the or each receptacle has at least two receptacle portions and a connecting device for connecting each receptacle portion to the adjacent receptacle portion, and wherein the sampling assembly further comprises a tool for disengaging the connecting device to separate the receptacle portions.



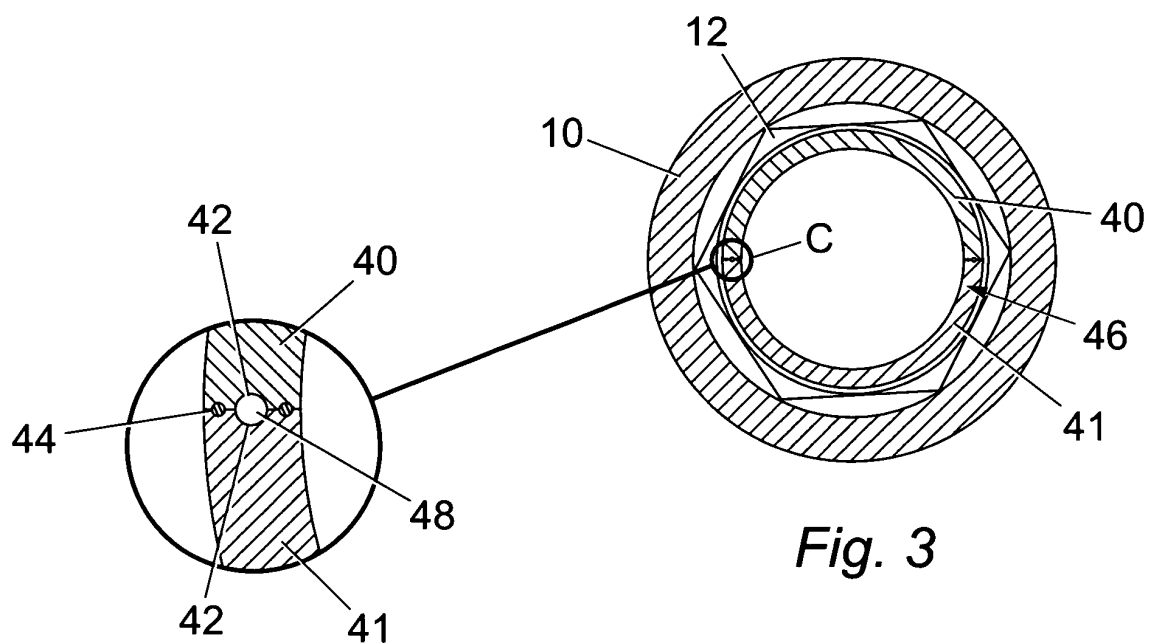


Fig. 3

Fig. 3a

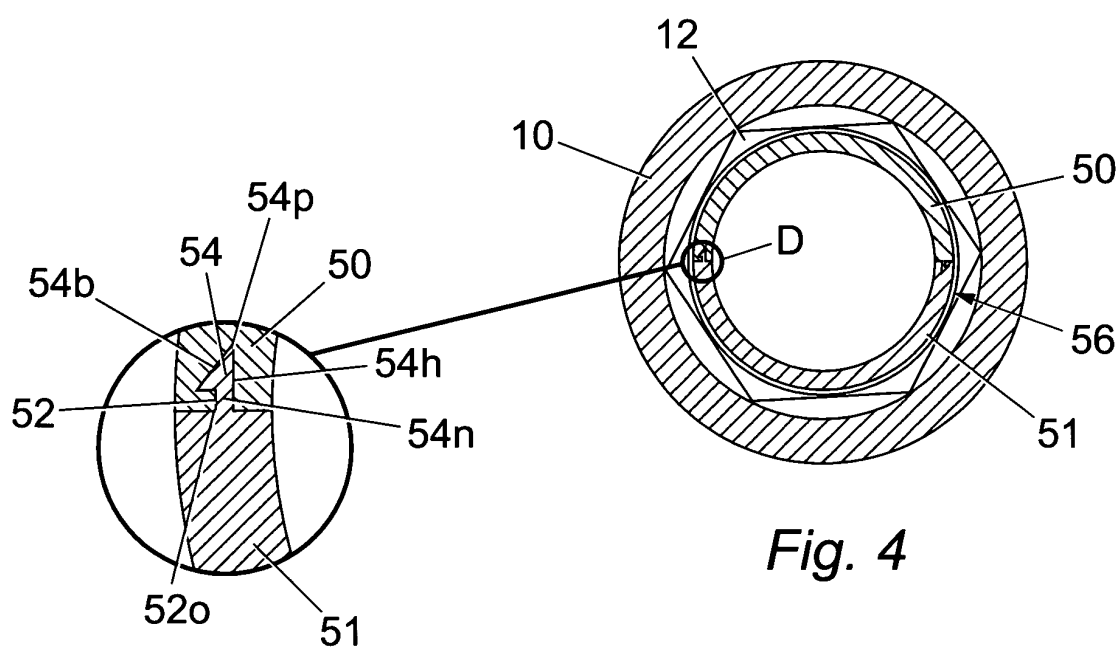


Fig. 4

Fig. 4a

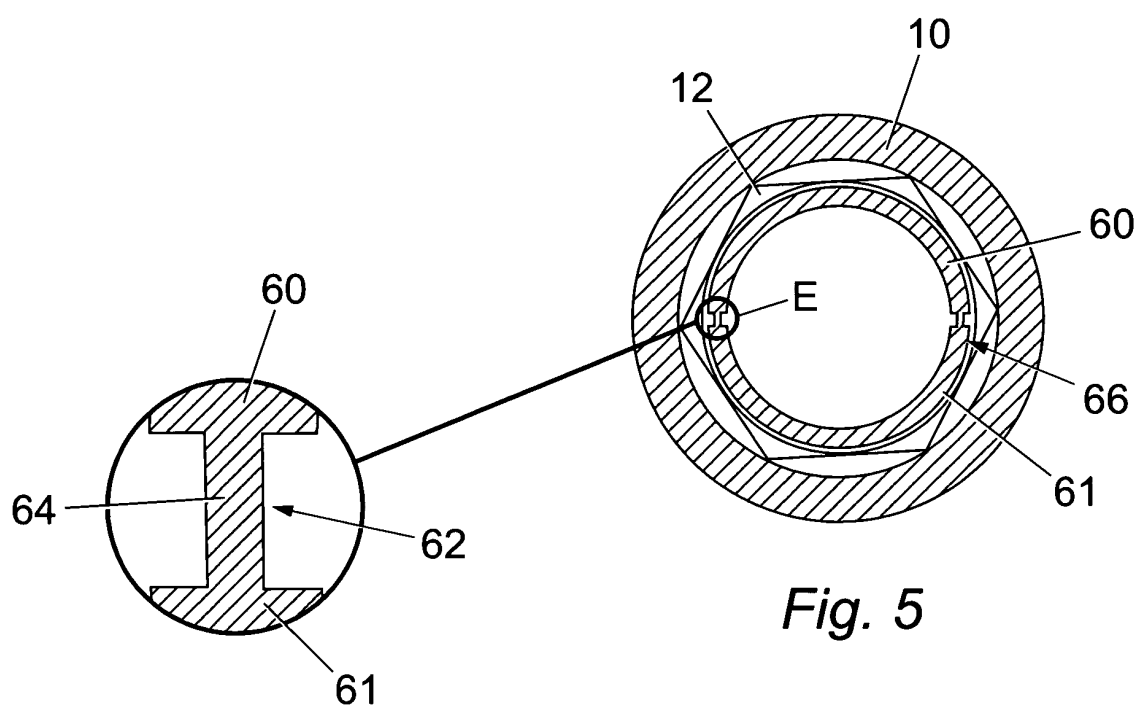


Fig. 5a

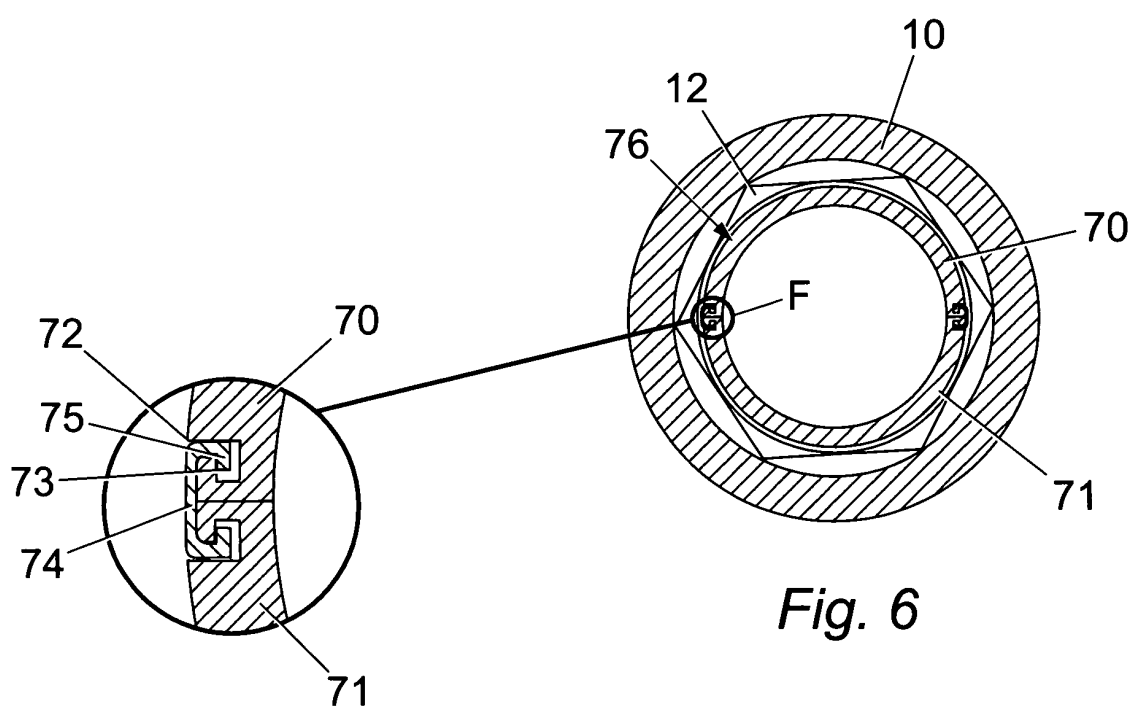


Fig. 6a

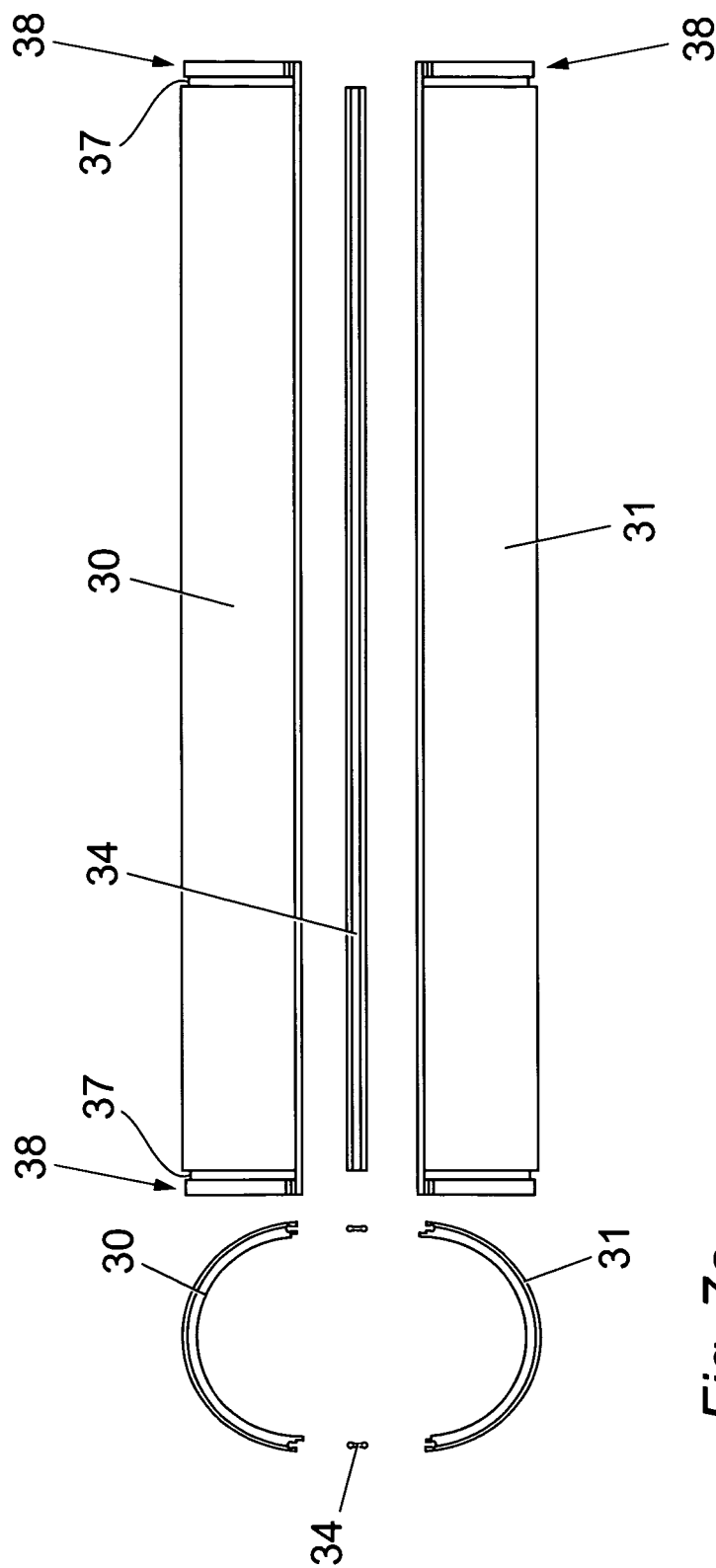


Fig. 7b

Fig. 7a

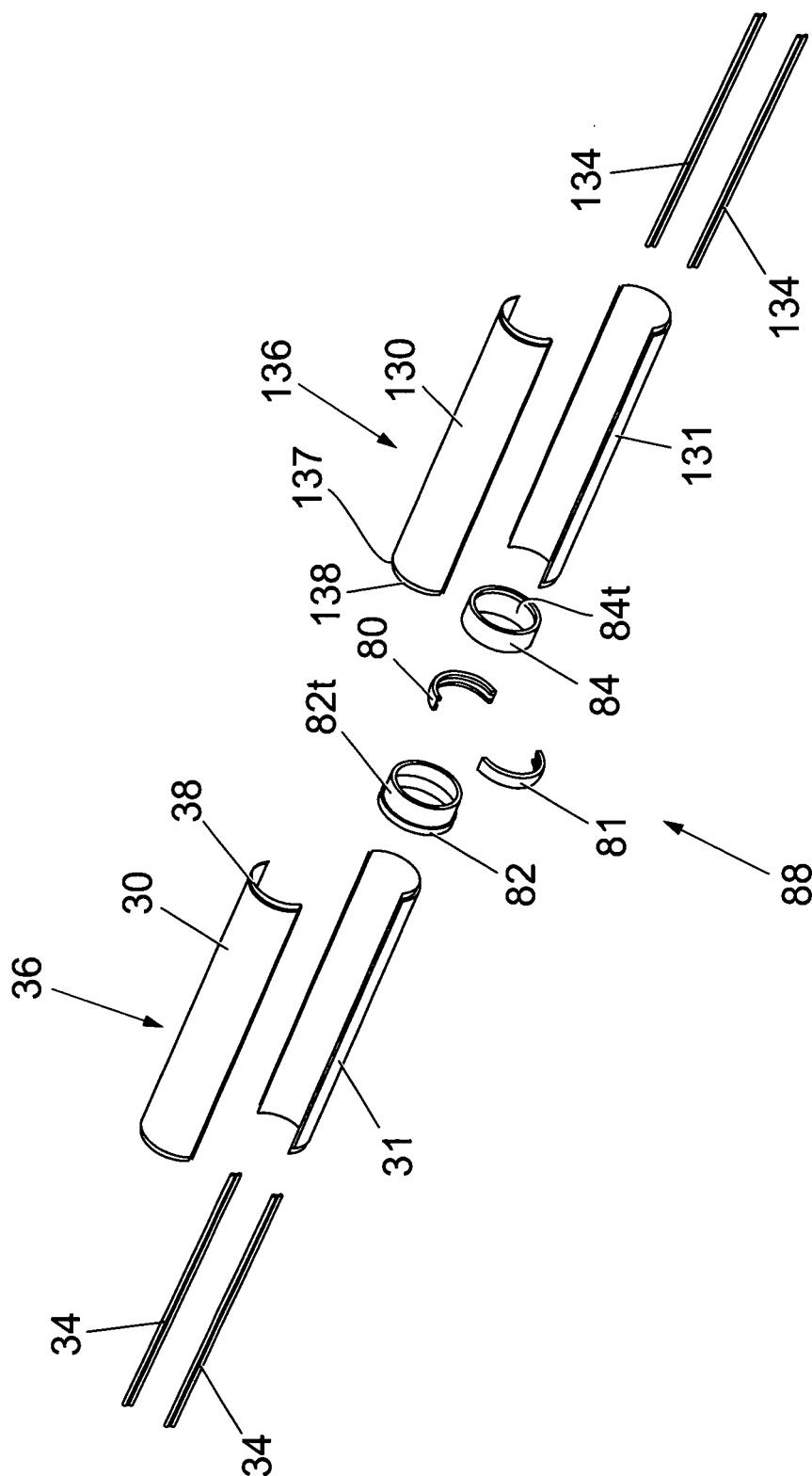
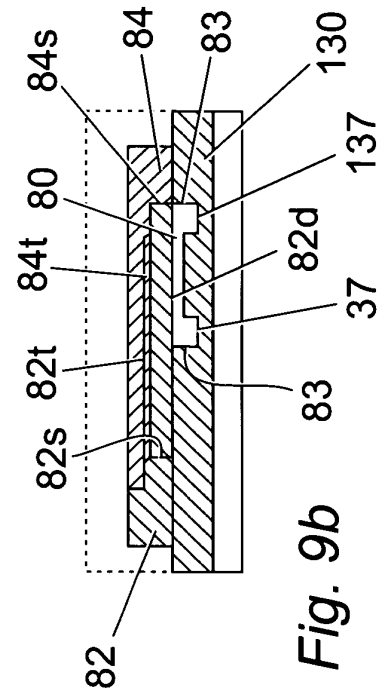
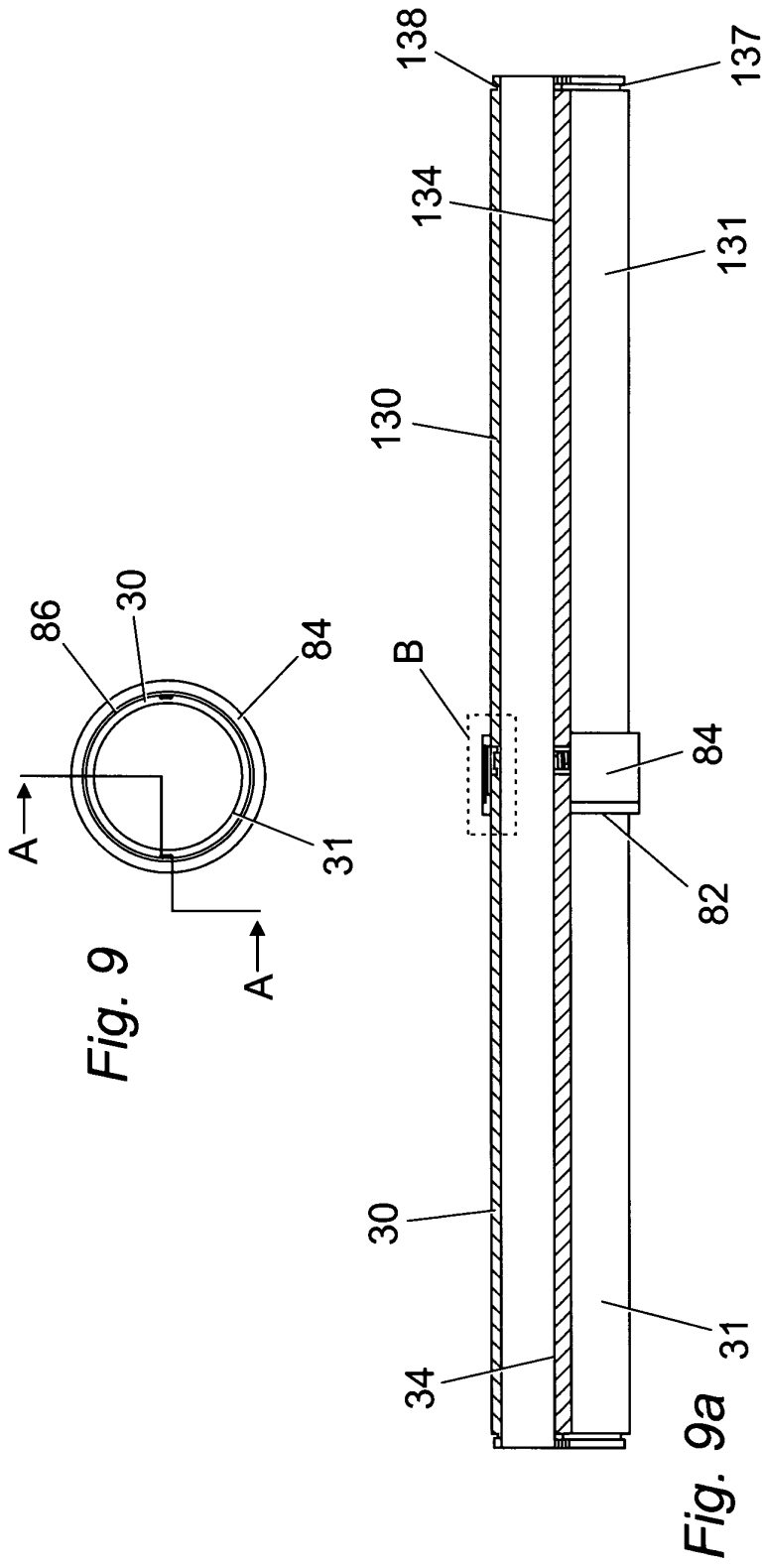


Fig. 8



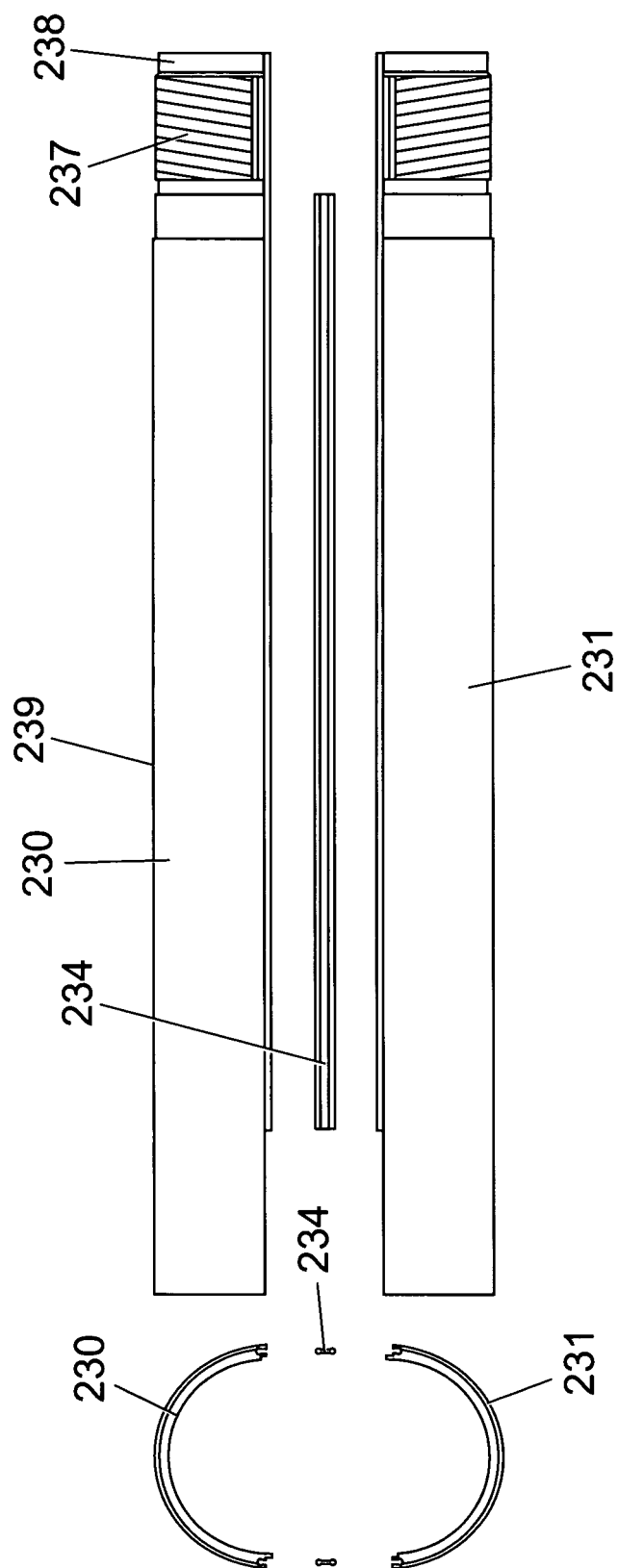


Fig. 10a

Fig. 10b

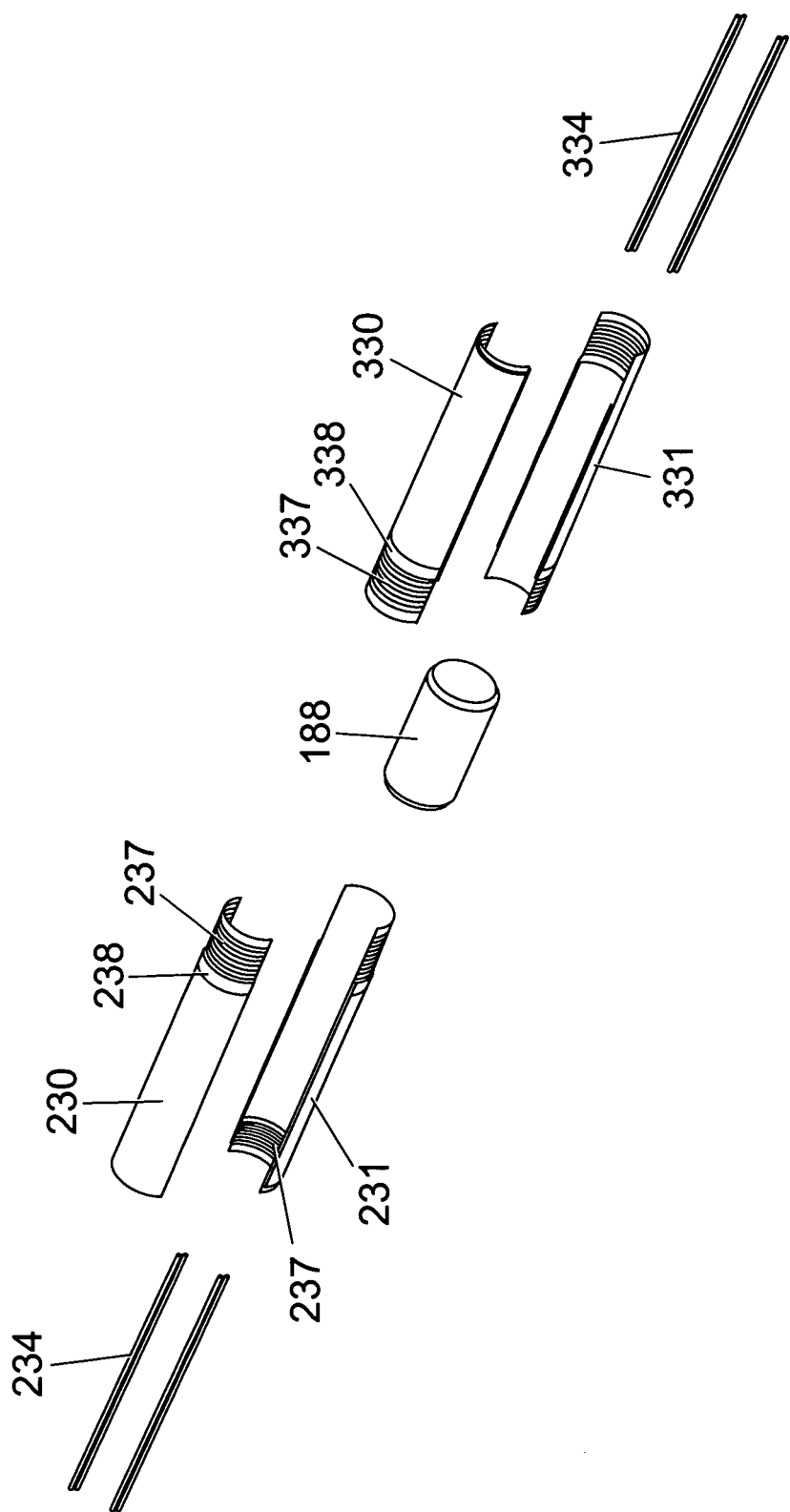


Fig. 11



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 25 3737

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Place of search The Hague		Date of completion of the search 19 December 2007	Examiner van Berlo, André
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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