United States Patent

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[54] **VENTED SAMPLING DEVICE**

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[52] **U.S. Cl.**.....**73/420,** 73/422 R, 128/205 D

[51] **Int. Cl.**.....**G01l 19/00,** A61b 5/00

[58] **Field of Search**.73/420, 422; 128/214.4, 2.05 D, 128/349 BV; 137/197

[56] **References Cited**

UNITED STATES PATENTS

2,601,216	6/1952	White	137/197
3,225,762	12/1965	Guttman	128/214.4
3,242,920	3/1966	Anderson	128/205 D
3,435,819	4/1969	Reynolds	128/2.05 D
3,610,228	10/1971	Temkin	128/2.05 D

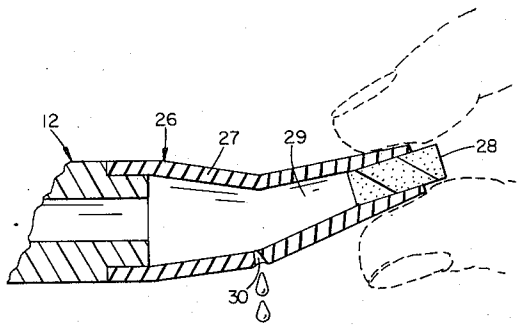
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[57] **ABSTRACT**

In measuring manometrically the pressure of body fluids such as spinal fluid, a connector is provided which comprises an air-pervious liquid-impervious closure plug at one end, together with a sampling slit in the surface of the connector.

9 Claims, 2 Drawing Figures



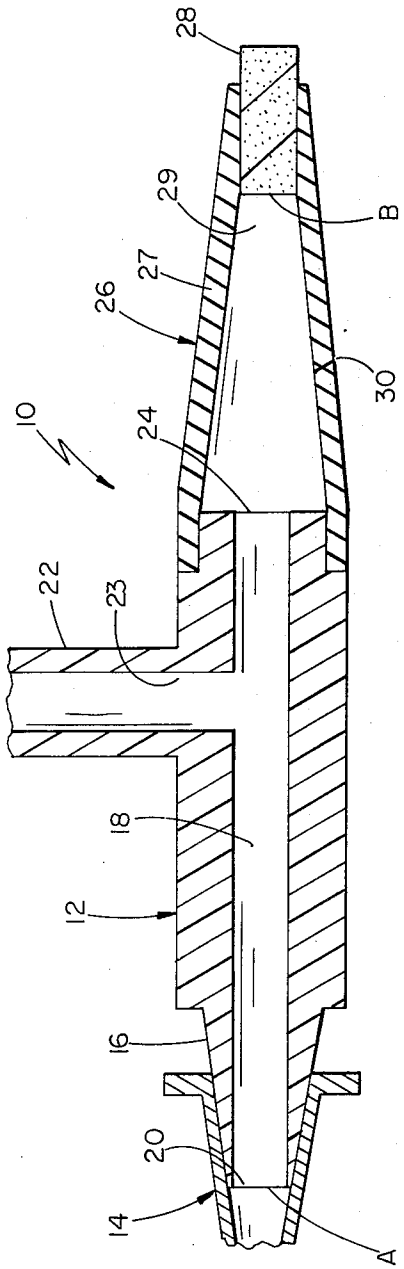


FIG 1

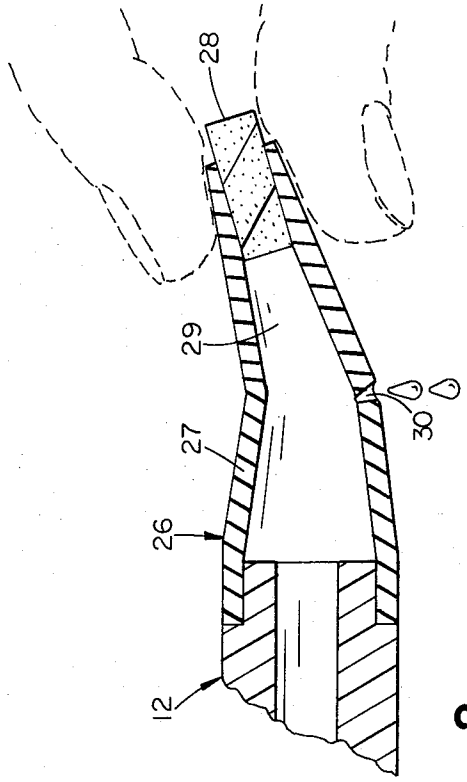


FIG 2

VENTED SAMPLING DEVICE

This invention relates to an air-vented end closure for a conduit intended to be filled with liquid. More particularly it relates to such an end closure which is permeable to air and other gases but impermeable to liquids, and which can be manually manipulated so as to allow sampling of the liquid in the conduit.

Though not limited thereto, the device of this invention has particular advantages in surgical procedures where it is desired simultaneously to measure the pressure of a body fluid and to sample said fluid for inspection or analysis, as in spinal fluid analysis. Devices of this nature commonly comprise a spinal puncture needle in which is inserted a connecting device leading to a manometer and some sort of valve for taking a fluid sample after the spinal fluid pressure has been measured. Such combinations are generally disclosed in U. S. Pat. Application, Ser. No. 71,232, filed Sept. 10, 1970, of common assignee, and may be of unitary construction or composed of separate interconnectable parts.

One disadvantage in using such devices, especially when a closed-end manometer is used, is that when the needle is tapped into the spinal column, residual air exists in the bore of the needle and in the chamber of the connecting device. The emerging spinal fluid therefore meets with a certain volume of air as soon as spinal puncture is performed, and before fluid reaches the base of the manometer. It is therefore necessary either to open the sampling valve until the horizontal leg of the connecting device is filled with fluid, or to calibrate the air capacity of the connecting device and to correct the manometer reading according. Either expedient is cumbersome and time consuming. The deficiencies and uncertainties of prior art devices are especially noticeable when low pressures of spinal fluid are to be read.

It is an object of this invention to provide a means whereby a true manometer reading of liquid under pressure is automatically obtained without the need for manipulative air bleed-off.

It is an additional object of the invention to provide such a device in which a sample of said fluid may be readily withdrawn from said means.

A further object of the invention is to provide a means for automatically venting a gas from a sterile chamber during the filling of the chamber with body fluids.

Other objects of the invention will be more readily understood from the following description and drawings, in which:

FIG. 1 is a cross-sectional representation of an embodiment of this invention.

FIG. 2 is a similar cross-sectional view of the device of FIG. 1 in flexed position for sampling.

Referring to FIG. 1, the vented sampling device **10** of this invention comprises a conduit portion **12**, provided with a central lumen **18**, said conduit portion being preferably tapered at one end, as at **16**, with an open end **20** for insertion into the large end of a lumbar puncture needle or the like, **14**. The needle is conventional and is shown principally broken away. The body of the conduit portion **12** may be formed of a plastic material which is firm enough to resist easy deformation, but resilient and yieldable enough to allow a firm fit of the tapered end **16** into the hollow end of the needle, or a Luer fit of rigid parts may be employed.

The conduit portion is also provided with a projecting stem **22** with a passageway **23** opening into the central lumen **18** of the conduit portion. The stem **22** may comprise the base of an openend or closed-end manometer, or a manometer may be attached thereto. The structure of a closed-end manometer and its mode of attachment to the conduit **12** are shown in the above-mentioned U.S. Pat. Application, Ser. No. 71,232: consequently the stem portion **22** is shown principally broken away. The general attachment of manometers to conduits for measuring fluid pressure is a known art.

The other open end **24** of the conduit is capped with a closure **26**, which may be uniform in bore or may preferably be tapered as shown. This closure consists of a wall portion **27** and inner lumen or chamber **29**, the closure fitting snugly at one end onto the conduit **12** and at the other end being rendered liquid-tight by the microporous plug **28**, which is inserted into the wall **27** the lumen **29**, conveniently but not necessarily in the end thereof.

The closure **26** is formed at least in part from a soft, resilient, readily deformable elastomeric substance such as natural or synthetic rubber. It is provided with a slit **30** through a portion of its circumference, said slit maintaining a position closed to liquid passage so long as the closure **26** remains in its normal horizontal undistorted position, due to the approximation of the abutting edges of the slit.

The microporous plug **28** which closes the end of the closure **26** is selected from that known class of materials which will transmit air and other gases rather readily, but which are impervious to liquids and preferably impervious to bacteria in a gas stream. Such materials may be produced from finely divided plastic particles so compressed as to form an interconnected network of ultra-fine capillaries or passages. Suitable materials for forming the plug **28** are microporous polyethylene, polyfluoro-carbons, polyurethanes, or polyvinyl resins, compressed or sintered into plugs.

In operation, spinal fluid under pressure passing through the needle enters into the open end A of the conduit device, whence it flows horizontally to the inner wall of plug **28** at B, sweeping the air before it in its passage. Impeded from further horizontal passage, the fluid enters the bore **23** of the manometer tube, thus allowing for a correct reading of, for example, spinal fluid pressure without the necessity of a manipulative bleeding-off of air, or correction factors applied to the reading.

If a sample of spinal fluid is desired after the pressure has been measured, this is readily accomplished by the manipulation shown in FIG. 2.

Since the needle and manometer positions are not affected, only the closure **26** and a portion of the conduit are shown. By a simple deflection of the elastomeric closure, as by grasping the plug end **28** between thumb and forefinger and lifting, the slit **30** is opened so that its opposing edges no longer approximate, and fluid from the chamber **29** flows out through the slit.

The devices of this invention are particularly suitable in single-use, closed-end manometer systems or fluid sampling systems which may be purchased, ready for use, in sterile condition. Plugs such as **18** of microporous material are available which serve as filters for air-borne micro-organisms, due to their fine

pore size and the tortuous passageways for gas flow. Accordingly the interior of the sampling device **10**, when said device is preconnected to a needle and a closed-end manometer, may be filled with spinal fluid without contamination of the fluid by exposure to the atmosphere.

Having thus described our invention, we claim:

1. A flexible air-vented closure for a conduit for liquids which comprises

a flexible-walled conduit providing a chamber open at one end,

a passageway through the wall of said conduit, said passageway being pervious to gases but impervious to liquids to permit the escape of gases from said chamber when displaced by the introduction of liquid into said chamber;

and an openable slit in a wall portion of said closure,

the opposing wall edges of said slit normally lying in abuttment so as to prevent leakage of fluid from said chamber,

said slit forming a drainage opening by distortion of the flexible walls to separate the abutting opposite edges of said slit.

2. The closure according to claim **1** in which the openable slit is located at a point lying between the open end of said closure and the gas-pervious passageway.

3. The closure according to claim **1** in which the flexible conduit is readily deflectable by digital manipulation.

4. A conduit having a gas-ventable chamber therein for the containment of liquid therein, at least a portion of the walls of said chamber being flexible, which comprises:

an opening for the introduction of liquids into said chamber;

a passageway from said chamber to the atmosphere outside of said chamber,

said passageway being pervious to gases but impervious to liquids to permit the escape of gases from said chamber when displaced by the introduction of liquids into said chamber;

and an openable slit in the flexible-walled portion of the conduit,

the opposing wall edges of said slit being in abuttment so as to prevent leakage of fluid from said chamber,

said slit forming a drainage opening by distortion of the flexible portion of the wall to separate the abutting opposite edges of said slit.

5. The conduit of claim **4** wherein said slit is located between said opening and said passageway.

6. The conduit of claim **4** wherein said chamber has a passageway in communication therewith to conduct liquids from said chamber to a liquid monitoring device.

7. The conduit of claim **6** wherein said device is a closed-end manometer.

8. The conduit of claim **6** wherein the slit and the passageway communicating with said monitoring device are located intermediate the opening and the gas-pervious passageway.

9. The conduit of claim **8** wherein said gas-previous passageway comprises an opening in the wall of said conduit and a plug of microporous material closing said opening.

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