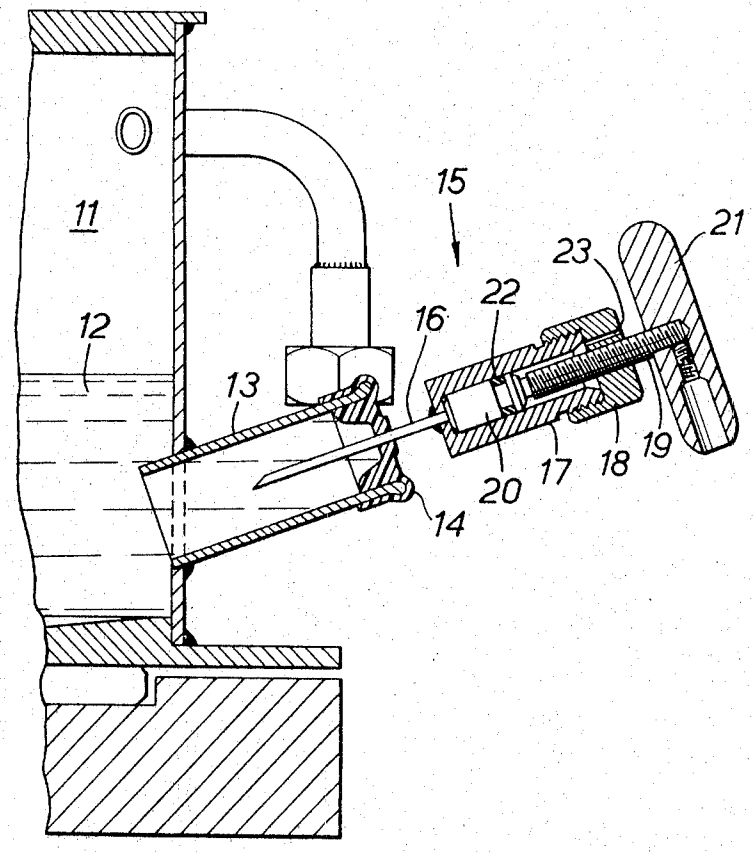
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SAMPLING DEVICE

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SAMPLING DEVICE

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This invention relates to sampling devices for withdrawing samples of fluid from, or introducing samples of fluid into, apparatus operating under a high degree of vacuum or at a high pressure.

At the present time if samples are required to be taken from, or introduced into, apparatus operating under a high degree of vacuum, or at a high pressure, it is necessary to have a complicated by-pass system including a number of valves.

It has been found that such samples can be withdrawn or introduced, even under the above-mentioned conditions, via a rubber septum or serum cap on the apparatus.

According to the present invention we provide a sampling device capable of withdrawing samples of fluid from, or introducing samples of fluid into, apparatus operating under a high degree of vacuum or at a high pressure, comprising a hypodermic syringe including a piston having an O-ring seal located in a groove around the periphery of the piston in a plane normal to the longitudinal axis of the piston.

The term "high degree of vacuum" where used in this specification is intended to mean a vacuum within the range 760 to 10^{-4} milimetres of mercury.

The term "high pressure" where used in this specification is intended to mean a pressure at least as high as 50 p.s.i.g.

In order that the invention can be more clearly understood a specific embodiment thereof will hereinafter be described, by way of example only, with reference to the accompanying drawing which shows a sectional view of a sampling device used in conjunction with an apparatus containing fluid to be sampled.

Referring now to the drawing, there is shown a container **11** in which is contained a fluid **12**. A pipe **13** is welded through an aperture in the wall of the container **11**, the free end of the pipe **13** being sealed with a serum cap **14**.

A sampling device **15** comprising a hypodermic syringe is shown in the sampling position with its needle **16** inserted into the serum cap **14**. The sampling device **15** comprises barrel **17**, into one end of which the needle **16** is located. The other end of barrel **17** is externally threaded to receive a screw cap **18**, the latter having an internally threaded portion which co-operates with a threaded rod **19**. A piston **20** is attached to one end of the threaded rod **19** and a handle **21** is fixed to the other end. The piston **20** has an O-ring seal **22** located in a groove around the periphery of the piston **20** in a plane normal to its longitudinal axis. The O-ring seal **22** ensures a fluid tight seal between the piston **20** and the barrel **17**. The piston **20** is moved in either direction along the inside of barrel **17** by rotation of the handle **21** in the appropriate direction, a small diameter hole **23** being provided in screw cap **18** to allow air to flow into and out of the inside of barrel **17** behind the piston **22**.

The sampling device **15** is used in the following manner. Screw cap **18** is screwed down tight onto the barrel **17** and the piston **20** is then moved down to the end of the barrel **17** to exclude as much air as possible by rotating handle **21** in a clockwise direction. The needle **16** is then inserted through the serum cap attached to the apparatus to be sampled and a sample of liquid is drawn into the barrel **17** by counter-clockwise rotation of handle **21**. When sufficient sample has been collected the needle **16** is removed from the serum cap. The sample is then ejected from the barrel **17** as required by clockwise rotation of handle **21**.

An experimental model of the sampling device as shown in FIGURE 1 has been made and tested. It was found that samples can be withdrawn from vacuum systems operating at pressures at least as low as 10^{-4} milimetres of mercury. Samples can also be withdrawn from systems operating at pressures above atmospheric at least as high as 50 p.s.i.g. It was also found that for withdrawing liquid samples from a molecular still at a pressure of 10^{-4} millimetres of mercury it was advantageous to use a needle having a bore of 0.003 inch diameter or more because of the small driving force which existed. Needles of such large gauge are not necessary for introducing samples into high vacuum systems nor are they necessary for withdrawing or introducing samples into apparatus at atmospheric or higher pressure or for use with gas samples at any pressure.

The sampling device is preferably fabricated from metal, the needle consisting of stainless steel hypodermic tubing. However it is possible to use other materials, for example the barrel may be constructed from glass if required.

In the arrangement shown in FIGURE 1 the piston shaft has been threaded, so that sample removal or sample introduction is effected by rotating the handle. This is not absolutely essential but it does have the advantage that it prevents the piston from being damaged by impact against the end of the barrel by sudden release of the handle under vacuum as might occur if the shaft is not threaded.

I claim:

1. A sampling device capable of withdrawing samples of fluid from, or introducing samples of fluid into, apparatus operating under a high degree of vacuum or at a high pressure, comprising a hypodermic syringe including a barrel, a needle of hypodermic tubing operatively secured to said barrel, a piston positioned within and having a diameter approximately equal to the bore of said barrel, said piston having a groove around its periphery in a plane normal to its longitudinal axis and an O-ring located in said groove sealing with said barrel, and a threaded member fixed to said piston, the arrangement being such that rotation of said threaded member relative to said barrel causes longitudinal movement of said piston within said barrel.

2. A sampling device capable of withdrawing samples of fluid from, or introducing samples of fluid into, apparatus operating under a high degree of vacuum or at a high pressure, comprising a hypodermic syringe including a barrel, a needle of hypodermic tubing having a bore of approximately 0.033 inch diameter operatively secured to said barrel, a piston positioned within and having a diameter approximately equal to the bore of said barrel, said piston having a groove around its periphery in a plane normal to its longitudinal axis and an O-ring located in said groove sealing with said barrel.

3. A sampling device as claimed in claim **1** wherein the threaded member is rotatably mounted through a cap located at the end of the barrel remote from the needle.

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