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SAMPLING VALVE

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ABSTRACT OF THE DISCLOSURE

A valve to obtain samples from a stream of liquid is constructed from a body and slide. The slide has at least four cavities connecting four pairs of ports in the body. By moving the slide from a normal position to a sampling position, a sample is removed from one pair of the ports to the testing stream for analysis.

This invention relates to a sampling device and method, and more particularly to a device and method for taking a sample from a continuous stream of liquid and transferring it to a stream of fluid. Such a device and method is particularly applicable to routine chromatographic analysis, for example gas chromatographic analysis of a chemical plant output.

British Patent 800,212 describes and claims a type of valve designed to deliver constant small volumes of liquid at predetermined regular intervals into a stream of fluid. It has been found that in the valve of the type described in the patent, the liquid tends to adhere to the walls of the chamber, and therefore an appreciable time is required to remove the sample from the chamber.

It is an object of the present invention to reduce this time.

Accordingly, the present invention is a valve comprising a slide and a body provided with passages and cavities which may be placed in communication to give at least three chambers through which fluid may flow, such that when the slide is in a first position there is provided through the valve a first continuous path comprising a first of said chambers, a second continuous path comprising a second of said chambers and a third continuous path comprising a third of said chambers and that when the slide is in a second position there is provided through the valve a fourth continuous path comprising at least the inlet passage to said third chamber, said first and said second chambers, and the outlet passage from said third chamber.

The chambers may comprise cavities in the slide and the passages may be within the body of the valve. The body of the valve may suitably be made from stainless steel. The face which is in contact with the slide should be flat and highly polished.

The slide is suitably made of a material having a low coefficient of friction against the body, such as polytetrafluorethylene, for example that glass-filled P.T.F.E. sold under the trade name Fluorogreen. The slide has a flat face in which the cavities may be cut.

It is preferable that the valve slide and body should cooperate to form five chambers through which fluid may flow, the two additional chambers being arranged so that when the slide is in said second position, they form fifth and sixth continuous paths through the valve, in cooperation with the inlet and outlet passages to and from said first and second chambers.

Another aspect of the invention is a method for obtaining samples from a stream of liquid which comprises filling a first chamber with a solvent, filling a second chamber with a portion of said stream of liquid, and introducing said chambers into a fluid flowpath, whereby liquid

is removed from said second chamber, solvent is transferred from said first chamber to said second chamber thereby forming a solution in said solvent of any liquid remaining in said second chamber, and the liquid removed from the second chamber and the solution are transported along the fluid flowpath.

The solvent used may be a volatile organic solvent, for example acetone. The fluid may be any suitable gas, for example helium. The fifth and sixth continuous paths, referred to above, which may be present when the slide is in the second position, enable the flow of sample liquid and solvent to be maintained while a sample is being taken. Then the sampling operations may be carried out under conditions approximating to continuous flow.

This method is readily adaptable to injecting a sample of a stream of liquid into a chromatographic device. In the event that the chromatographic device is a gas chromatography column the liquid removed from the first chamber and the solution can be vaporised in a flash evaporator.

An embodiment of the invention will now be described with reference to the accompanying diagrammatic drawings in which:

FIG. 1 represents a plan view of the interface between the body and slide of a body and slide valve embodying the invention.

FIG. 2 represents another plan view as in FIG. 1 but with the slide in a second position.

FIG. 3 represents a section through the body and slide along the line III—III of FIG. 2.

In FIGS. 1 and 2 of the drawings the full lines indicate the body and its details, and the broken lines indicate the slide and its details.

Not shown in the drawings are conventional components of the valve which can cooperate with each other, the body and the slider to maintain the block and slide in fluid-tight contact and to move the body and slide relatively from the position indicated in FIG. 1 to that indicated in FIG. 2.

The face of the body **1** is pierced by seven passages **11–17**. Passages **11**, **12** and **14–17** go right through the body and can be connected by means not shown to sources of, or receivers for, fluids. Passage **13** is formed by drilling two holes at 60° so that they meet to give a passage with two openings onto the face of the body, as shown in FIG. 3.

The face of the slide **2** which is shown in contact with the body **1** is flat and has six elongated cavities **21–26** thereon.

When such a valve is to be used for sampling a stream of liquid for gas chromatographic analysis, the volume of each of the cavities **21–26** can be within the range 1–9 microlitres, for example 5 microlitres. Cavities **22** and **25** can be of different volumes, although cavities of the same volume have been found satisfactory when sampling an aqueous mixture of lower fatty acids, comprising formic, acetic, propionic and the butyric acids, using acetone as the solvent and helium as the fluid.

In use, the valve is connected as follows:

Passage **11** to a source of supply of solvent (e.g. acetone),
Passage **12** to a source of supply of fluid (e.g. helium),
Passage **14** to a sample receiver (e.g. a chromatographic device),
Passage **15** to a liquid receiver,
Passage **16** to a source of supply of liquid (e.g. an output line from a chemical plant containing, say, a mixture of fatty acids),
Passage **17** to a solvent receiver.

In the steady state the valve is as shown in FIGURE 1. Solvent enters passage **11**, fills the chamber constituted by cavity **22** and leaves the valve by way of passage **17**. The stream of liquid to be sampled enters the passage **15**,

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FIG.1

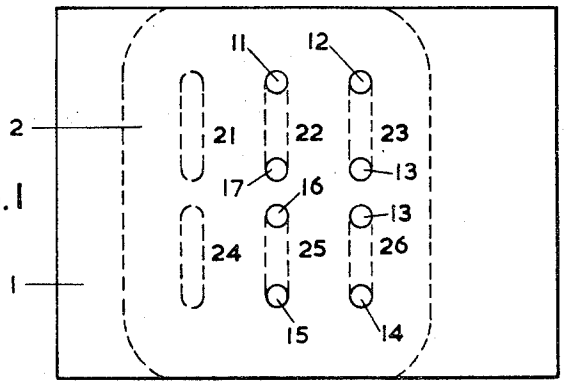


FIG.2

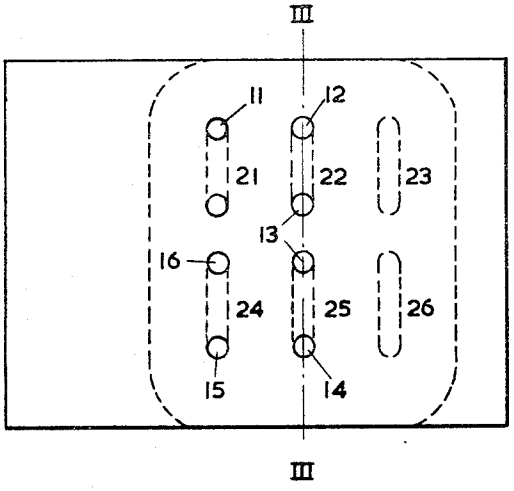
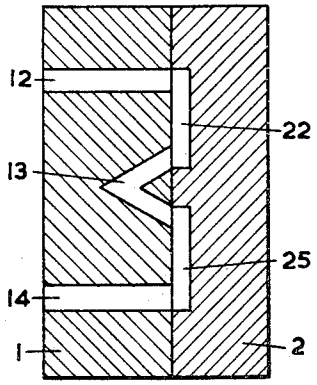


FIG.3



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