

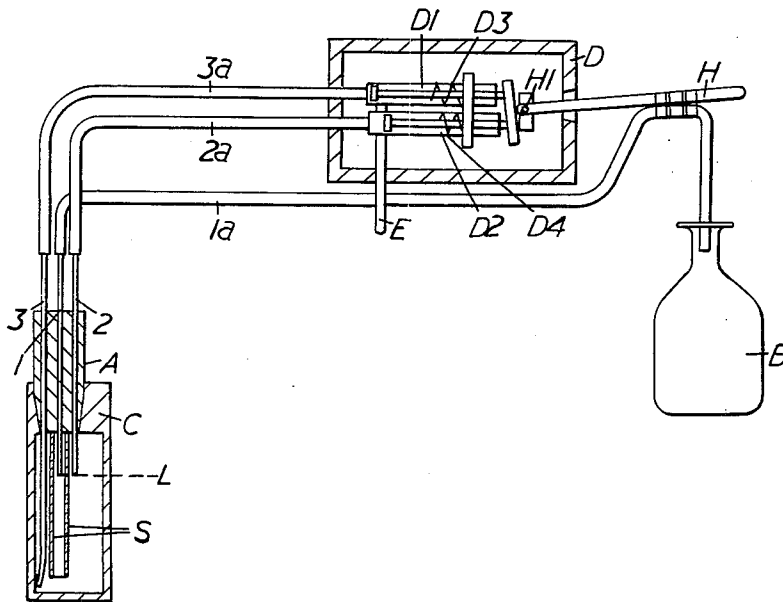
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LIQUID SAMPLE CONTAINERS FOR USE IN A SPECTROPHOTOMETER

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LIQUID SAMPLE CONTAINERS FOR USE IN A SPECTROPHOTOMETER

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3 Claims. (Cl. 73-421)

This invention relates to liquid sampling containers for use in optical apparatus, e.g., absorption spectrophotometers (which may operate in the ultra-violet, visible or infra-red regions of the spectrum) and also to means for feeding a liquid sample to said containers and for withdrawing it therefrom.

In instruments at present in use it is necessary to take a clean empty sample container and fill it with a sample, for example, by either pouring or by employing a pipette, before the container is inserted into the instrument. This operation is time-consuming especially as precautions have to be taken to ensure that the outer light transmitting surfaces of the container be kept perfectly clean.

According to the invention a liquid sample container for use in a spectrophotometer comprises tubes communicating with the interior of the container and adapted for introducing the liquid sample and for removing it, the position of the tubes being such that the container may be readily positioned in the spectrophotometer without obstructing the radiation beam through the container. The tubes are preferably carried by a removable stopper for the container, so arranged that when in position the tubes extend near one side of the container leaving the other side unobscured.

Another feature of the invention is a sample container for use in a spectrophotometer, comprising tubes communicating with the interior of the container and adapted for introducing the liquid and for removing it by the application of suction and wherein a control valve is provided having a lever or handle adapted so that in one position suction is connected to a tube for introducing liquid into the container, whilst in another position of the lever or handle suction is connected to the tube for emptying the container, whilst in a third or mean position of the lever or handle, suction is cut off from the tubes, the tap in this condition effectively sealing the container from liquid or air, entry or egress. In such an arrangement three tubes are preferred, one adapted to communicate with a source of sample liquid and the others being adapted to communicate one at a time with a suction source or alternatively to be both sealed therefrom. Of the last two said tubes, one extends into close proximity with the base of the container and serves for emptying the container, whilst the other tube serves to provide suction to the first said tube and adapt it for replenishment of the container. In such an arrangement another feature of the invention is a means whereby the changeover of the functions of the tubes as above is effected by a single lever or handle.

The above and other features of the invention will be more readily understood by reference to the accompanying drawing which is a diagram of a sample container and also shows means according to the invention for filling and emptying the sample container.

The sample container is indicated at C and has a stopper A housing three tubes 1, 2 and 3. Tubes 1 and 2 extend to a level L in the container, this level representing the quantity of the liquid sample required to be contained in C. The tube 3 extends almost to the base of the container and is used for emptying purposes. The pipes 1, 2 and 3 are connected to fine bore flexible tubing 1a, 2a and 3a respectively. A screen S, fixed to the stopper A,

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is provided to control the movement of the sample liquid during filling and emptying. The tubes 2a and 3a lead to a tap D which has a lever of handle H pivoted at H1 and operating the valves D1 and D2 against the force of springs D3 and D4. The valves control communication between the tubes 3a and 2a with the suction source in pipe E. The pipe 1a extends as shown so that it may be supported on the lever H with one end of the pipe extended downwardly.

The operation of the apparatus is as follows:

Assuming that the container C be empty, a bottle B containing sample liquid is introduced below the lever H, so that the pipe 1a extends within the bottle. Slight raising of the bottle in this position causes it to engage the lever and rock it on its pivot H1, opening 2a to the suction pipe E. This causes liquid to pass from the bottle B through pipe 1a into the container C until the level L is reached. Thereafter excess liquid entering the container is drawn off through the tubes 2 and 2a. The bottle B is then removed, which causes the lever H to assume the mean position, with pipes 2a and 3a both closed in D1 and D2 so that the suction pipe E is cut off from the container. After the measurements have been made in the spectrophotometer the sample liquid may be removed from the container by slightly depressing the lever H to open the pipe 3a to the suction pipe E. To prevent residual droplets in the tube 1 being sprayed out over the inside walls of the container, the screen S is provided inside this container, this guides all droplets to the bottom of the container, from where they may be removed by suction through the tube 3. This screen S also serves to prevent air bubbles being formed within the sample liquid during the filling process. If air bubbles were allowed to form within the sample liquid, they may remain in such a position as partially to obstruct the light beam through the container giving rise to a false result.

An alternative way to prevent the bubbles being formed is to bend the tube 1 within the container so that the entering sample liquid stream cannot at any time impinge upon the surface of the sample liquid already in the container during the filling cycle. For example the end of the tube 1 may be bent so as to approach a side wall of the container.

The container C is made wider than that usually employed for the normal instrument and the stopper A with its tubes 1, 2 and 3 are housed at one side of the container so that when the sample is under test the light beam can pass through the container without obstruction by the tubes.

During normal measurement procedure the instrumental sensitivity has to be adjusted so that the 100% transmission level is defined. This adjustment requires a reference sample to be moved into the radiation beams in place of the test sample. This movement of the test sample is readily facilitated by the arrangement of the drawing, since the tubes 1a, 2a and 3a are of flexible polythene or the like. An alternative procedure would be to fill the container C when required with the reference sample, making the instrumental adjustments in the usual way, but keeping the container fixed in the beam. In using the apparatus described, the residual sample left in the container after the emptying operation, may be made less than 1% of the contents of the container. For the measurement of the absorption of a series of samples which have very similar absorbences, this residual liquid is small enough to be ignored. If accurate measurements are required of materials with widely different absorbences, a single flushing out of the container (by filling and emptying) with the sample to be measured, would reduce any contamination to a minute and negligible proportion.

Various modifications may be made in detail of the ap-

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paratus described above without exceeding the invention.
I claim:

1. A liquid sampling means for use in optical apparatus comprising a sealed container for the sample, opposite wall areas of said container being transparent to light, a sampling tube connected with a supply of the liquid and extending to a predetermined level in the container, a source of suction, a first suction tube extending within said container to the said level, a second suction tube extending within said container to near the base of the container and valve means controlling the access of suction from said source to the respective suction tubes, the tubes being located at one side only of the container leaving an unobstructed path for the passage of an optical radiation beam through the sample and the transparent areas of the container.

2. A liquid sampling means according to claim 1

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wherein the valve means is controlled by a lever operable by engagement and motion of a receptacle for the liquid to be sampled.

3. A liquid sampling means according to claim 2 comprising a screen for the sampling tube to guide any droplets towards the bottom of the container.

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