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Siphon-dispensers

——An Application of Glass Blowing and the Utilization of Waste Wares in the Chemical Laboratory——

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Some simple dispensers of the siphonic type were produced on trial. These siphon-dispensers were made from waste wares by glass blowing in the chemical laboratory, and used for repeated taking of rough amount of liquid. In qualitative analytical practice for students, this apparatus can be used for taking sample solution and as an example of glass blowing too.

Introduction

Dispensers[1),2)] are used in chemical analysis, and several kinds of devices have appeared on the market, but the dispensers reported in this paper were assembled personally by glass blowing. On these dispensers, the utilization of waste glasswares and the application of the principle of siphon were planed.

By the reason of the siphonic type, the dispensers described here consist of three parts. Part A is the part from which a liquid pour into Part C through Part B. It is made up of the glass bottle of an adequate capacity, a rubber stopper fitted with two glass tubes which are bent to the form of a washing bottle as shown in Fig. 1, and a rubber pressure bulb (for spray) to push out the liquid. Part B between Part A and Part C makes connections with each parts, and a hole to pass the air is essential in it. Part C is the part for a rough measure of the liquid, and comprises a glass vessel, in which a certain quantity of the liquid is stored, and a siphonic tube joined to the bottom of this vessel.

Materials and Method

The materials used here were the wastes of glasswares seen in the chemical laboratory, and were mainly provided for Part B and Part C.

A 1*l* reagent bottle fitted with the above rubber stopper was prepared, and an end of the short glass tube was connected to the rubber pressure bulb. This Part A was used in common with other dispenser, except for the special case, and could be separated from other parts easily.

Materials of Part B were the parts which had a mantle with an outside-opening part and an inside glass tube, or which could be finished to this form, that is, a part of Soxhlet extractor, the upper part of automatic burette, the stopper-part of burette, a branched tube of distillation apparatus, funnels etc. Both ends of the mantle and the inside tube had to be connected to the end of the long bent tube of Part A and the upper part of Part C, naturally. For the purpose of these connection, the appropriate diameter and length of each tube were

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selected, and rubber stoppers, rubber tubes, vinyl tubes, vinyl hoses were used. In common cases, an edge of the inside tube was narrowed in order to make moderately flow of the liquid into the store-part of Part C. Part B was able to play its role with a rubber stopper cut off deeply lengthways or a vinyl tube made a hole lengthways, as the simple type.

Materials used for Part C were glass wares which had a wide tube or a globe for reserve of the liquid and a long narrow tube led from the wide tube or the globe, or which could be processed to this form, that is, test tubes, centrifuge tubes, measuring glass, whole pipettes, and glass tubes of different diameters. In order to make the siphonic part, the long glass tube with the upper store part was bent twice to the shape of U. Although this secondary work of bending was difficult, it was facilitated by a way that the second U-tube was made in the vertical plane against the plane of the first U-tube. In figures presented here, however, siphonic tubes have been drawn in the same plane to make the understanding easy. The shortage of length of the siphonic tube was supplied by adding of glass tube or vinyl tube.

In the case of need, a few articles for support of Part C were provided from a waste polyethylene bottle and so on. An example is shown in (c) of Fig. 6. The small ring was the neck of the bottle and the large ring was a part of the body of it. Both the rings were adhered by adhesives such as Araldite, and a spring that was made by spiral winding of copper wire was equipped.

Results and Discussion

In this laboratory, twelve siphon-dispensers (about 8–25 m*l*) were produced and by the structures they were divided into three forms: (1) the basic form served completely all of the Parts (Form 1), (2) the form in which an end of the long glass tube of Part A also served as an inside tube of Part B (Form 2), and (3) the form which had not Part B or had simplified form of it (Form 3). In other words, (1) (four examples) and (2) (three examples) are the standard types and (3) (five examples) is the simple type. Some of them are shown in Fig. 1–7. In these Figures, A, B, and C are simple notations for Part A–C, respectively, and g for glass ware, r for rubber goods, and v for vinyl goods.

After the apparatus was set, a part of the liquid in the glass bottle was pushed into the store-part of Part C through Part B by gripping the rubber pressure bulb. When the height of the liquid surface in the store-part reached just to the highest part of the siphonic tube, the liquid in the store-part began to flow, and the settled amount of the liquid was fractionated. The important point on this operation is the handling of the rubber pressure bulb. Just before the liquid begins to flow, the gripping of rubber pressure bulb must be stopped.

Fig. 1 shows a complete apparatus of the siphonic type, other Figures show Part B and Part C or only Part B. Part B in Fig. 1 is the stopper-part of a burette which lacks the stopcock, Part C is a 10 m*l* measuring glass.

Part B in Fig. 2 is the stopper-part of a two-way stopper that opens downward and lacks the stopcock.

Part B in Fig. 3 is the branched tube of a distillation apparatus, Part B in Fig. 4 is the upper part of an automatic burette, and Part C in Fig. 3 and 4 is a 10 m*l* whole pipette. In Fig. 4, an end of the long tube of Part A is bent upward.

Part B in Fig. 5 is a funnel whose three sides of the upper edge are bent inside, and the upper figure shows the top view of this funnel. And Araldite is used for the connection between the funnel and the test tube of Part C.

Part B shown in Fig. 6 (a) is the lower part of Soxhlet extractor whose side tube is also

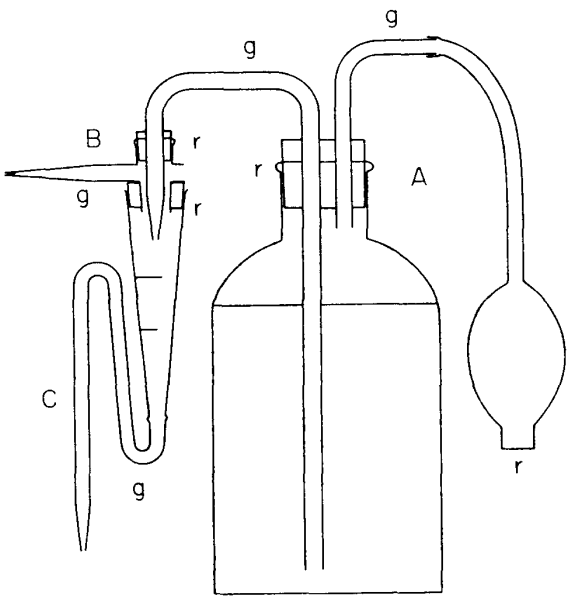

Fig. 1.

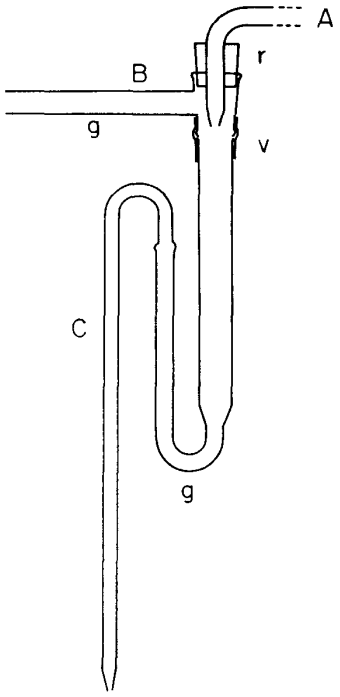

Fig. 2.

employed as the siphonic tube in Fig. 3. Part C is a wide glass tube of the diameter of 1.6 cm. Part B shown in Fig. 6 (b) is the globe-part of a Würtz's fractionating column, the upper part (10 m*l* whole pipette) of Part C is widen, and the connection between Part B and Part C is not sticked but is upholded with a vinyl-covered wire.

The apparatus shown in Fig. 7 is Form 3 lacked Part B, as noted above. Part C of it is a separatory funnel, but this apparatus is not so good owing to the existence of a defect in opening of the lower part. The apparatus shown in Fig. 4, Fig. 5, and Fig. 6 (a) and (b) are Form 1, and those shown in Fig. 1–3 are Form 2.

The significant points on the production are the correlation in the height between the end

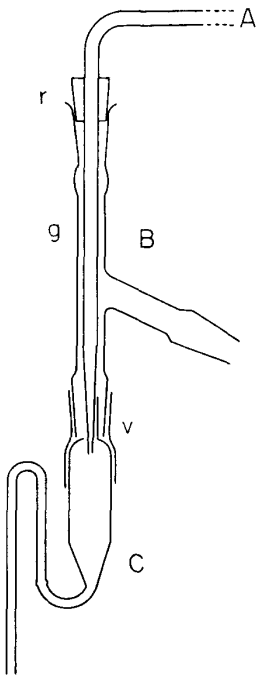

Fig. 3.

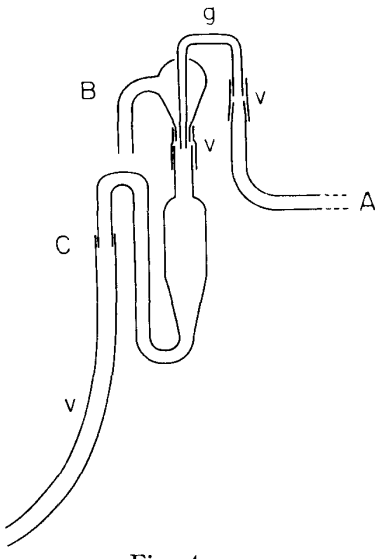

Fig. 4.

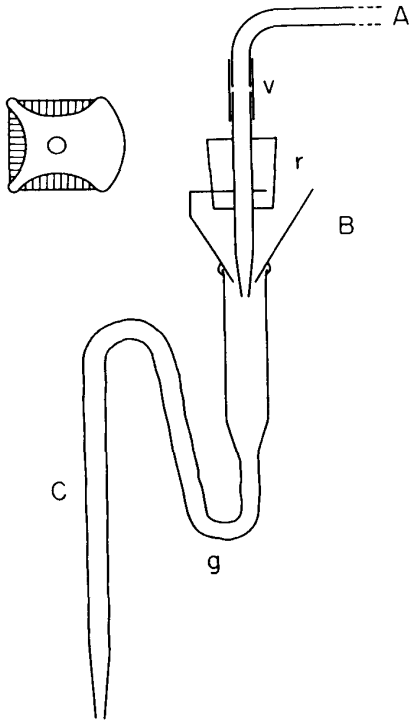

Fig. 5.

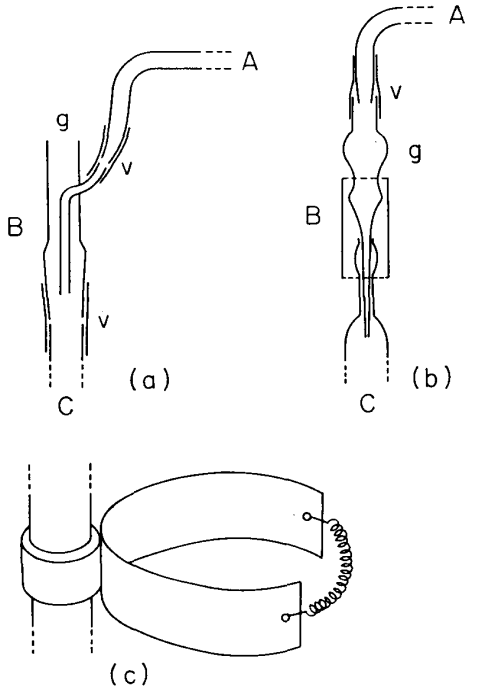

Fig. 6.

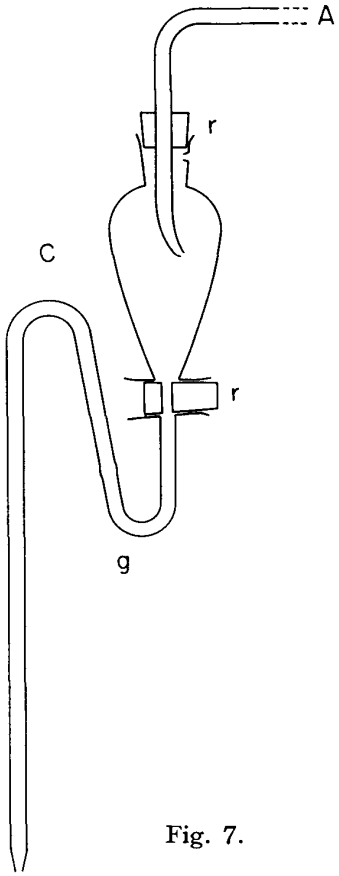

Fig. 7.

of the long tube in Part A and the surface of the liquid in the glass bottle, between the former and the highest point of the siphonic tube, and the setting of a outside-opening hole in Part B or the upper part of Part C. When h is the height from the higher surface of the liquid to the highest point of the siphon, ρ is the density of liquid, and g is the acceleration of gravity, if the product $h\rho g$ is larger than the atmospheric pressure, the siphon is not used.

The dispensers reported here can be made up readily by the use of waste materials, and are able to take about 10–20 m*l* repeatedly from a moderate quantities of liquid. On the best thing (Fig. 5), the amounts of liquid was 13.0 ± 0.2 m*l*. So this method and the siphon-dispenser may be used more practically.

References

1) K. Tada, Gendai Kagaku (Chemistry Today), No. 75, 58 (1977).
2) H. Bennett and W. G. Hawley, Methods of Silicate Analysis, 2nd ed., Academic Press, London, 1965, p. 26.

要　　旨

化学実験室にある各種のガラス器具の廃品からガラス細工で，サイフォン形の簡易分注器を試作した。この装置は，液の貯蔵と注入にあてるA部と、概量の液を測ってサイフォン管で流出させるC部，および前2者の間にあってこれらを接続しかつ外部に向っての開口部を持ったB部より成り，これら3部を材料の選択と適当な加工で連結させて組立てたものである．

製作した分注器は中程度の量の液体から 10～20 ml 程度を繰返し採取するのに用いられ，その分注量は最も良いもので 13.0 ± 0.2 ml であった．これらは化学実験で試料溶液の採取に，またガラス細工の教材としても使用でき，さらに実用的な利用も可能である．