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(12) # EUROPEAN PATENT APPLICATION

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(54) **Pipette.**

(57) The subject of the present invention is a pipette comprising a cylindrical handle portion (1), a frame portion (2) connected to same, in whose cylinder space a piston (3) is fitted for sucking liquid into, and removing liquid from, a tip (4) connected to the lower end of the frame portion (2) and functioning as a liquid container. The piston (3) is provided with two piston rods (8 and 9) fitted inside each other, each of them being at the upper end provided with a knob (16 and 17). Out of the said piston rods (8 and 9), the stroke of the inner, secondary piston rod (9) is longer than the stroke of the second piston rod (8), surrounding the first one. Moreover, the piston rods are prevented from rotating in relation to the handle portion (1). According to the invention, around the piston rod (9), a sleeve-shaped adjustment device (12) has been fitted by means of a threaded joint for the purpose of calibration of the pipette, while the adjustment device is placed in the chamber space of the upper end of the handle portion (1) and is supported by means of shoulders against the support portion (13) of the handle portion (1). The turning of the adjustment device (12) in relation to the piston rod (8) so as to adjust or calibrate the pipette has been arranged as taking place from outside the pipette by using the adjustment and calibration unit.

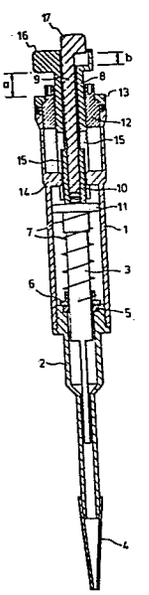

Fig.1.

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Pipette

The subject of the present invention is a pipette comprising a cylindrical handle portion, a frame portion connected to same, in whose cylinder space a piston is fitted for sucking liquid into, and removing liquid from, a tip connected to the lower end of the frame portion and functioning as a liquid container, and that the piston is provided with two piston rods fitted inside each other, each of them being at the upper end provided with a knob, and that out of the said piston rods, the stroke of the inner, secondary piston rod is longer than the stroke of the second piston rod, surrounding the first one, and that the piston rods are prevented from rotating in relation to the handle portion.

The invention is in particular concerned with a liquid dosage pipette, more specifically with its adjustment for different volumes and with its calibration.

In the pipette in accordance with the invention the adjustment of the pipette for different volumes and the calibration can be performed by using the same adjustment and calibration unit. It is particularly characteristic of the invention that the calibration of the pipette can be performed from outside the pipette without opening it and that the calibration unit moves along in such a unit as transfers the movement to the pipette piston or as is a part of the piston.

The pipette in accordance with the invention is mainly characterized in that around the piston rod surrounding the secondary piston rod, a sleeve-shaped adjustment device has been fitted by means of a threaded joint for the purpose of calibration of the pipette, while the adjustment device is placed in the chamber space of the upper end of the handle portion and is supported by means of shoulders against the support portion of the handle portion and that the turning of the adjustement device in relation to the piston rod so as to adjust or calibrate

the pipette has been arranged as taking place from outside the pipette by using the adjustment and calibration unit.

By applying the invention described herein to pipettes of different types, e.g. to adjustable or fixed-volume single-channel or multi-channel pipettes, remarkable advantages are achieved as compared with such pipettes in which the calibration nut of the pipette is fixed in the handle portion of the pipette or the calibration screw is placed inside the pipette, in which case, every time that it is desired to calibrate the pipette, the pipette must be opened.

The invention comes out more closely from the following description and from the attached drawing, which shows an exemplifying embodiment of a pipette in accordance with the invention as a side view in section.

In the pipette shown in Figure 1, a frame portion 2 is connected to a preferably cylindrically shaped handle portion 1, inside which frame portion 2 a piston portion 3 moves and to which it is possible to connect a pipette tip 4 functioning as a liquid container. The sealing between the frame portion 2 and the piston 3 takes place by means of an O-ring 5, against which a spiral spring 7 presses by means of an O-ring support 6. A secondary piston rod 9 runs inside the piston rod 8, said secondary piston rod 9 being connected to the adjustment unit 10 by means of a threaded joint. A flange 11, constituting a support for the spiral spring 7, presses the piston 3 against the adjustment unit 10. The piston rod 8 is by means of a threaded joint connected with the adjustment device 12, which is by means of shoulders supported against a support and scale portion 13 connected to the handle portion 1.

Inside the handle portion 1 there are guides 14, which glide in the shaft 8 in guide grooves 15 parallel to the longitudinal axis.

When pipetting is performed by means of the pipette shown in Fig. 1, the knob 16 in the upper part of the piston rod 8 is pressed, which knob transfers the movement via the piston rod 8 and the adjustment unit 10 located therein to the piston 3 by the intermedaiate of the flange 11. During the step of filling of the pipette tip 4, the knob 16 is pressed the distance a to its lower position, and thereupon, while the pipette tip 4 is in the liquid, the piston 3 is allowed to rise the distance a to its upper position. When the pipette tip 4 is emptied, the knob 17 of the secondary piston rod 9 is depressed, whereby the secondary piston rod 9 goes down a total of the distances a and b. Here the total movement (a+b) is transferred by means of the adjustment unit 10 to the piston by the intermediate of the flange 11, whereby the emptying movement of the piston 3 is longer than its filling movement, which again guarantees good emptying of the pipette tip 4 out of the liquid to be pipetted.

Below, some of the characteristics and advantages of the present invention will be presented.

The pipette may be calibrated to a certain volume at the manufacturing stage by means of an adjustment device 12 to be operated from the outside of the pipette and connected to the mobile piston rod 8. Moreover, the distance passed by the secondary piston rod 9 inside the piston rod 8 can be adjusted by means of the adjustment unit 10.

When adjustment is performed by means of the adjustment device 12 by turning it either clockwise or anticlockwise, turning of the piston rod 8 along with the unit is prevented by means of the guides 14 and guide grooves 15. These means also prevent rotation of the piston rod 8 during pipetting.

The adjustment device 12 and the scale portion 13 can be provided with scales in order to faciliate the calibration and/or to indicate a certain volume. Such

scales may, if necessary, be provided with markings so as to indicate a certain volume and/or a certain mass for liquids of different specific gravities. The scales concerned may also be used so that by their means a desired volume is adjusted for the pipette within a certain volume range.

The invention described here is also suitable for so-called reverse pipetting method, wherein more liquid is taken into the pipette tip than is removed from it (Medical Laboratory Technology, 31, 213, 1974). Then the filling of the pipette tip 4 takes place so that the secondary knob 17 is depressed first into its lower position, whereby the piston 3 goes down the total distance of a and b, and then liquid is sucked into the tip 4 by allowing the piston 3 to pass to its upper position the distance a+b. At the stage of emptying of the pipette tip 4 the knob 16 is depressed into its lower position, whereby the piston 3 goes down the distance a. The volume of liquid corresponding the distance a of the piston 3 is removed from the pipette tip 4. In many cases the reverse pipetting method improves the precision and reproducibility of pipetting.

WHAT IS CLAIMED IS:

1. A pipette comprising a cylindrical handle portion (1), a frame portion (2) connected to same, in whose cylinder space a piston (3) is fitted for sucking liquid into, and removing liquid from, a tip (4) connected to the lower end of the frame portion (2) and functioning as a liquid container, and that the piston (3) is provided with two piston rods (8 and 9) fitted inside each other, each of them being at the upper end provided with a knob (16 and 17), and that out of the said piston rods (8 and 9), the stroke of the inner, secondary piston rod (9) is longer than the stroke of the second piston rod (8), surrounding the first one, and that the piston rods are prevented from rotating in relation to the handle portion (1), c h a r a c t e r i z e d in that around the piston rod (8) surrounding the secondary piston rod (9), a sleeve-shaped adjustment device (12) has been fitted by means of a threaded joint for the purpose of calibration of the pipette, while the adjustment device is placed in the chamber space of the upper end of the handle portion (1) and is supported by means of shoulders against the support portion (13) of the handle portion (1) and that the turning of the adjustment device (12) in relation to the piston rod (8) so as to adjust or calibrate the pipette has been arranged as taking place from outside the pipette by using the adjustment and calibration unit.

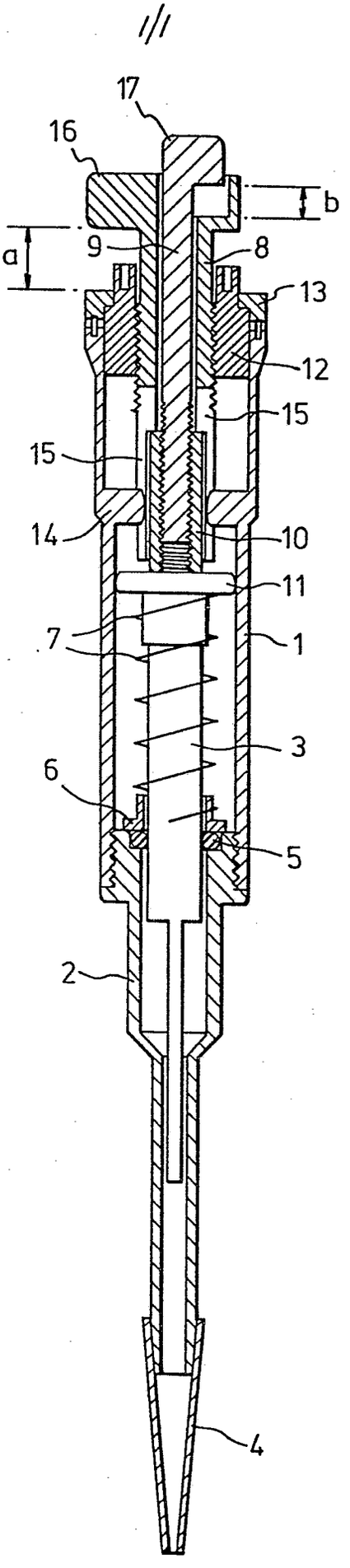

Fig. 1.

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EUROPEAN SEARCH REPORT

Application number EP 81 30 1936

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	GB - A - 2 029 262 (METSALA) * claims 1,2,4,5 * --	1
	US - A - 4 096 751 (WITHERS et al.) * column 5, lines 22 to 55 * --	1
	US - A - 4 141 250 (D'AUTRY) * column 3, lines 48 to 64 * --	1
	US - A - 4 128 009 (D'AUTRY) * claims 1 to 5 * ------	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

B 01 L 3/02

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

B 01 L

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	07-09-1981	LAMMINEUR