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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **DOSAGE PIPETTE.**

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DE-A-3 008 346
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DE-C-2 926 691
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(73) Proprietor: **LABSYSTEMS OY**
Pulttitie 9
SF-00810 Helsinki 81 (FI)

(72) Inventor: **FAGERSTEDT, Mikael**
Madvägen 18 as. 2
SF-00800 Helsinki 80 (FI)
Inventor: **KASKI, Erkki**
Prinsessantie 4 H 75
SF-00820 Helsinki 82 (FI)
Inventor: **TERVAMÄKI, Jukka**
Aidasmäentie 16 - 20 E
SF-00650 Helsinki 65 (FI)

(74) Representative: **Freed, Arthur Woolf et al**
Reginald W. Barker & Co.
13 Charterhouse Square
London EC1M 6BA (GB)

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Description

The invention described herein is concerned with a pipette which is provided with a piston and a cylinder and with two operating knobs, whereat, by means of one of the said knobs, the cylinder can be filled with liquid by depressing the knob once, and by means of the other one of the knobs, the cylinder can be emptied stepwise by means of successive depressions of the piston, of desired magnitude. There may be one or several piston-cylinder assemblies.

Several types of such so-called step pipettes are known in prior art, e.g., a pipette in accordance with the published Finnish Patent Application FI 802,403 or the pipette as per the German published Patent Application DE 2,926,691 (= GB 2,057,581). The said prior-art pipettes, however, often involve the drawback that the filling lever must be operated by lifting, whereby two hands are usually required. Moreover, when the prior-art apparatuses are used, an error is often produced when, by mistake, the last dose is also dosed, in which case the piston can no longer be displaced over a sufficiently long distance. The pipette of DE—A—2926691 has a special device to prevent actuation of the piston when insufficient liquid remains.

DE—A—3008346 discloses a dosage pipette has been piston mounted inside a cylinder. A toothed dosage rack is attached to the piston and a striking pin is engageable with the dosage toothing of the toothed dosage rack. The striking pin has coupled to it a dosage button so that when the dosage button is depressed the striking pin engages and displaces the toothed rack longitudinally. The toothed dosage rack is also provided with a second toothing engaged by a cog wheel. That cog wheel engages a second toothed rack which is provided with a filling pressing knob.

According to the present invention there is provided a dosage pipette, provided with a handle, a cylinder attached to the handle, a piston inside the cylinder, a toothed dosage rack attached to the piston, a striking pin engageable with the dosage toothing of the said rack, the said striking pin being mounted on a dosage lever so that, when the dosage lever is depressed, the striking pin engages and displaces the toothed rack longitudinally, characterised in that, at the side of the dosage toothing, there is pivoted lifting lever, whose pivot position in relation to the toothed rack can be adjusted longitudinally as desired by means of an adjusting device and which lever is provided at the end opposite its pivot with a cam disposed to lie laterally alongside the rack teeth, and which engages the striking pin to displace it from the dosage toothing during upward movement of the striking pin and disengages thereafter, and that the toothed dosage rack is additionally provided with a second toothing, with a cogwheel resting against the said toothing and, at the opposite side, resting against a second toothed rack, which is provided with a filling press knob.

The pipette is easy to operate, because it can be filled by one hand, while the other hand remains free, e.g., for the handling of test tubes. Moreover, the lifting-lever system described here is of simple construction and reliable in operation. By means of the cam provided at the top end of the toothed rack, it is, moreover, possible to avoid the pipetting of the last, too little dose.

The invention will be illustrated in more detail by means of the attached drawings. Figure 1 is a sectional side view of an embodiment, and Figure 2 is a certain sectional view of same as viewed from the top. Figure 3 shows a detail of the tip portion of a multi-tip pipette.

The pipette comprises an oblong handle (1), at whose lower end there is a cylinder (2), and in the cylinder a piston (3). The cylinder may be attached to the handle, e.g., by means of a bayonet socket. To the top end of the piston, a toothed rack (4) parallel to the handle is attached, which rack is provided with two toothings (5) and (6). A striking pin (8) is pressed against the toothing (6) by the force of a spring (16), and the striking pin is mounted on a lever (9). The lever (9) is mounted on a shaft (15) located in the handle. Moreover, the lever is connected with a spring (19), which attempts to keep the lever in its upper position. The movement of the striking pin (8) is stopped at the lower position by a limiter (18)

A cogwheel 7 operates in contact with the toothing 5 on the toothed rack 4, which cogwheel is mounted on a shaft 10. At the other side, the cogwheel 7 operates in contact with a toothed rack 11, whose top end is provided with a press knob 12.

At the side of the toothing 6 on the toothed rack 4, there is a resilient lifting lever 20 and, on the lever, a cam 21, which raises the striking pin 8 apart from the toothing 6 during the stage of upward movement of the lever 9. The top end of the lifting lever is provided with a guide pin 23, which is fitted into a guide groove 25 provided in the adjusting wheel 24. The adjusting wheel is mounted on a shaft 26.

The top end of the toothed rack 4 is additionally provided with a cam 22, which, as the toothed rack approaches its lower position, shifts the lifting lever 20 towards the striking pin 8.

The pipette operates so that, when the lever 9 is in its upper position and when the striking pin 8 is, consequently, apart from the toothing 6 and when the piston 3 is in the cylinder 2 in its lower position, the press knob 12 is depressed, whereat the cogwheel 7 starts revolving and lifts the toothed rack 4 and, along with the rack, the piston 3 in the cylinder 2 upwards. In this way, suction is generated in the cylinder 2, whereby the cylinder is filled with liquid 13.

After the cylinder 2 has been filled completely and the press knob 12 is in its lower position 14, the dosage can be started by means of the lever 9. When the dosage lever 9 is depressed, the spring 16 presses the striking pin 8 into the toothing 6,

whereat the striking pin 8 starts pushing the toothed rack 4 and the piston 3 downwards until the striking pin 8 meets the limiter 18, against which the movement stops. The spring 19 restores the dosage lever 9 back to its upper position upon completion of the depressing. Thereat, the striking pin 8 must jump over the toothing 6 until; near the upper position of the striking pin 8, the cam 21 of the resilient lifting lever 20 raises the striking pin 8 apart from the toothing 6.

The dosage can be repeated until the toothed rack 4 and the piston 3 approach their lower position. Thereat, the cam 22 at the top end of the toothed rack 4 meets the lifting lever 20 and raises it by the height of the toothing 6. Thereat, on the other hand, the cam 21 of the lifting lever 20 raises the striking pin 8 to such an extent that the striking pin no longer reaches the toothing 6 when the lever 9 is depressed again for dosage. Thereby, striking of the piston 3 against the bottom of the cylinder 2 is prevented, which striking might make the last dose inaccurate.

When the adjusting wheel 24 is turned, the guide groove 25 shifts the lifting lever 20 upwards or downwards by the intermediate of the pin 23, whereat, correspondingly, at the botton end of the lifting lever, the cam 21 is shifted and permits the striking pin 8 to move over the desired distance on the toothing 6, e.g. over 1, 2, 3, 4 or more teeth, per each depression of the dosage lever 9. In this way, a 1-, 2-, 3- or 4-fold dose is obtained.

In Figures 1 and 2, the toothings 5 and 6 are shown as located one after the other, but, if desired, they may also be very well placed side by side on the toothed rack 4.

Claims

1. A dosage pipette, provided with a handle (1), a cylinder (2) attached to the handle, a piston (3) inside the cylinder, a toothed dosage rack (4) attached to the piston, a striking pin (8) engageable with the dosage toothing (6) of the said rack, the said striking pin being mounted on a dosage lever (9) so that, when the dosage lever is depressed, the striking pin engages and displaces the toothed rack longitudinally, characterised in that, at the side of the dosage toothing, there is pivoted lifting lever (20), whose pivot position relates to the toothed rack can be adjusted longitudinally as desired by means of an adjusting device (24) and which lever is provided at the end opposite its pivot with a cam (21) disposed to lie laterally alongside the rack teeth, and which engages the striking pin to displace it from the dosage toothing during upward movement of the striking pin (8) and disengages thereafter, and that the toothed dosage rack is additionally provided with a second toothing (5), with a cogwheel (7) resting against the said toothing and, at the opposite side, resting against a second toothed rack (11), which is provided with a filling press knob (12).

2. Pipette as claimed in Claim 1, characterised in that the top end of the toothed dosage rack is provided with a cam (22), which, when the toothed dosage rack approaches its lower position, pushes the lifting lever towards the striking pin so that the lifting lever prevents the striking pin from reaching contact with the toothing.

3. Pipette as claimed in Claim 1 or 2, characterised in that the toothings on the toothed dosage rack are placed side by side.

4. Pipette as claimed in Claim 1 or 2, characterised in that the toothings on the toothed dosage rack are placed one after the other.

5. Pipette as claimed in any of Claims 1 to 4, characterised in that the filling press knob is placed at the side of the handle.

Patentansprüche

1. Dosierpipette mit einem Griff (1), einem am Griff befestigten Zylinder (2), einem Kolben (3) innerhalb des Zylinders, einer mit dem Kolben verbundenen Dosierzahnstange (4), einem mit der Dosierzahnung (6) der Zahnstange in Eingriff bringbaren Anschlagzapfen (8), wobei der Anschlagzapfen so auf einem Dosierhebel (9) angeordnet ist, daß, wenn der Dosierhebel gedrückt wird, der Anschlagzapfen mit der Zahnstange in Eingriff tritt und sie in Längsrichtung verschiebt, dadurch gekennzeichnet, daß auf der Seite der Dosierverzahnung ein Hubhebel (20) angelenkt ist, dessen Schwenklage mit Bezug zur Verzahnungsstange je nach Wunsch in Längsrichtung eingestellt werden kann, und zwar mittels einer Einstelleinrichtung (24), wobei der Hebel an seinem der Anlenkung gegenüberliegenden Ende mit einem Nocken (21) versehen ist, der seitlich entlang der Zähne der Zahnstange liegt und der mit dem Anschlagzapfen in Eingriff tritt, um diesen von der Dosierverzahnung während der Aufwärtsbewegung des Anschlagzapfens (8) zu verschieben und dann zu lösen, und daß die Dosierzahnstange zusätzlich mit einer zweiten Verzahnung (5) versehen ist, wobei ein Sperrad (7) auf der Verzahnung aufruht und auf der gegenüberliegenden Seite an einer zweiten Zahnstange (11) anliegt, die mit einem Fülldruckknopf (12) versehen ist.

2. Pipette nach Anspruch 1, dadurch gekennzeichnet, daß die Dosierzahnstange am oberen Ende mit einem Nocken (22) versehen ist, der, wenn die Dosierzahnstange sich ihrer unteren Lage nähert, den Hubhebel gegen den Anschlagzapfen drückt, so daß der Hubhebel den Anschlagzapfen daran hindert, mit der Verzahnung in Kontakt zu treten.

3. Pipette nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Verzahnungen auf der Dosierzahnstange nebeneinander angeordnet sind.

4. Pipette nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Verzahnungen der Dosierzahnstange hintereinander angeordnet sind.

5. Pipette nach einem der Ansprüche 1 bis 4,

dadurch gekennzeichnet, daß der Fülldruckknopf seitlich an Griff angeordnet ist.

Revendications

1. Pipette de dosage munie d'une poignée (1), d'un cylindre (2) fixé à la poigneé, d'un piston (3) à l'intérieur du cylindre, d'une crémaillère de dosage (4) fixée au piston, d'un cliquet (8) pouvant s'encliqueter dans la denture de dosage (6) de ladite crémaillère, ledit cliquet étant monté sur un levier de dosage (9) de telle sorte que lorsque ledit levier de dosage est abaissé le cliquet s'engage dans la crémaillère dentée et la déplace longitudinalement, caractérisée par le fait que sur le côté de la denture de dosage pivote un levier de levage (20) dont la position de pivotement par rapport à la crèmaillère dentee peut être ajustée longitudinalement à volonté, au moyen d'un dispositif d'ajustage (24) et dont le levier est muni, à l'extrémité opposée à son pivot, d'une came (21) disposée de manière à se situer latéralement le long des dents de la crémaillère et qui s'engage dans le cliquet afin de l'éloigner de la denture de dosage pendant le mouvement ascendant du cliquet (8) et qui le dégage ensuite et par le fait que la crémaillère de dosage est en outre munie d'une deuxième denture (5), d'un pignon (7) s'appuyant contre ladite denture et, sur le côté opposé, s'appuyant sur une deuxième crémaillère dentée (11) qui est munie d'un bouton pression (12) de remplissage.

2. Pipette selon la revendication 1, caractérisée par le fait que l'extrémité supérieure de la crémaillère de dosage est munie d'une came (22) laquelle, lorsque la crémaillère de dosage approche de sa position inférieure, pousse le levier de levage vers le cliquet de telle sorte que le levier de levage empêche ledit cliquet d'entrer en contact avec la denture.

3. Pipette selon les revendications 1 ou 2, caractérisée par le fait que les dentures sur la crémaillère sont placées côte à côte.

4. Pipette selon les revendications 1 ou 2, caractérisée per le fait que les dentures sur la crémaillère de dosage sont placées l'une après l'autre.

5. Pipette selon l'une quelconque des revendications 1 à 4, caractérisée par le fait que le bouton pression de remplissage est placé sur le côté de la poignée.

Fig.1.

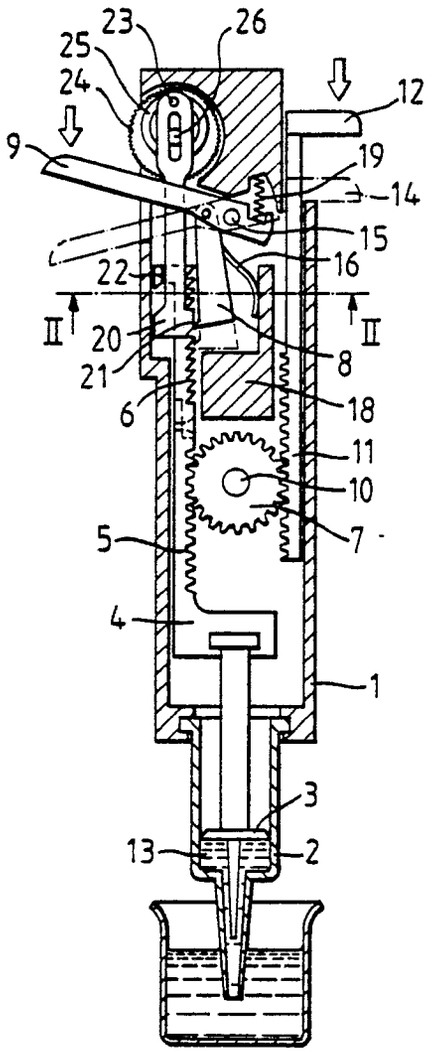

Fig.2.

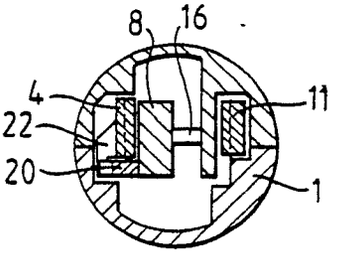

Fig.3.