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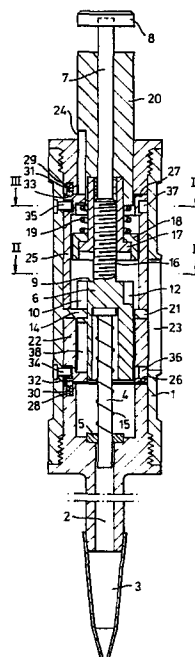
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(54) Pipette with adjustable volume.

(57) Piston pipette in which, on the outer face of the piston rod (7), there are grooves (10, 11, 12, 13) of different lengths, parallel to the piston rod and open at their upper end and, on the body, there is an inwardly projecting limiter pin (14) fitted as gliding in one of the grooves at a time, the said limiter pin, together with the closed bottom end of the groove, determining the upper extreme position of the piston. Moreover, onto the piston rod, a limiter sleeve (18) is fitted by means of a thread, and on the inside face of the body there is a stationary limiter flange (21), which, together with the limiter sleeve, determines the other extreme position of the piston.



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# Pipette with adjustable volume

The present invention is concerned with a pipette provided with a piston, whose dosage volume is  
5 adjusted to the desired level by changing the stroke length of the piston.

In prior art, many sorts of adjustable piston pipettes are known, for example out of the patent publications FI 57,542 (corresponds to GB  
10 2021972), FI 57,543 (corresponds to GB 2,022,453), and FI 62,470 (corresponds to EP 67,605). These pipettes, however, involve the drawback that the adjustment of the volume is based exclusively on a screw of slow pitch, which is accurate but quite slow in operation.

15 The object of the present invention is to provide a continuously or almost continuously adjustable piston pipette whose volume adjustment is accurate but rapid.

The mechanism of adjustment of the pipette  
20 of the present invention has two parts: a rapid coarse adjustment and a precise fine adjustment. The coarse adjustment acts upon the limiter of one extreme position of the piston and lengthens or shortens the stroke length of the piston stepwise. On the other hand, by  
25 means of the fine adjustment, the other limiter of the piston is shifted upwards or downwards. The fine adjustment lengthens or shortens the stroke length by no more than the distance corresponding to the steps of the coarse adjustment. The coarse adjustment is  
30 accomplished either so that the outer face of the piston rod is provided with grooves of different lengths and parallel to the rod, of which grooves any one can be positioned on a limiter pin provided on the pipette body and projecting inwards, whereby one  
35 end of the groove is closed and determines one of the extreme positions of the piston, or so that the corresponding grooves are provided on the body and the

limiter pin on the piston rod. The fine adjustment is accomplished so that the pipette body is provided with a second limiter which, together with a stop member provided at the piston rod, determines the other extreme position of the piston, the distance of the said limiter from the said stop member being adjustable. A recommended fine adjustment mechanism is a limiter flange provided inside the body and determining the lower extreme position of the piston and, as its stop member, a sleeve fitted around the piston rod as moving by means of a threading.

When pipetting is performed, the desired volume is first selected by placing the corresponding groove onto the limiter pin. Thereupon, the accurate volume is set by means of the fine adjustment member. The coarse adjustment takes place rapidly, by means of one movement, and in this way the entire setting time becomes shorter than if the whole setting procedure were carried out by means of a fine adjustment member, whose operation is relatively slow.

A preferred embodiment of the invention will be illustrated in more detail by means of the attached drawings, wherein

Figure I is a sectional side view of the pipette,

Figure II shows a section at the level II in Fig. I,

Figure III shows a section at the level III in Fig. I, and

Figure IV shows the display of the volume of the pipette seen from outside.

The pipette comprises a body 1 and a cylinder part 2, which is threaded into the bottom portion of the body and to which a disposable container 3 is attached by means of a friction joint. Into the cylinder part 2, a piston 4 and its seal ring 5 are fitted. The piston 4 relates to a sleeve 6 and to an

extension 7 of the sleeve, the top end of the said extension 7 being provided with a press knob 8. The outer face of the sleeve 6 is provided with grooves 10, 11, 12 and 13 parallel to the piston, having different lengths and extending to the top end 9 of the sleeve. Inside the body 1, there is a limiter pin 14. Around the piston 4, there is a spiral spring 15, which presses the piston to its upper position. In the upper position the limiter pin 14 rests against the bottom end of one of the grooves 10, 11, 12 or 13.

The extension 7 of the sleeve is provided with a fine adjustment threading 16 and with a threaded sleeve 17, which is fitted onto the said thread and whose bottom end widens as flange-shaped. A ring 18 rests against the bottom flange of the threaded sleeve 17, which said ring 18 is pressed by a spiral spring 19, which is placed around the threaded sleeve and which is stronger than the spring 15, and the top end of the spring 19 is locked in its position by a sleeve 20. Moreover, inside the body 1, there is a limiter flange 21, which determines the lower extreme position of the ring 18.

The coarse adjustment of the volume of the pipette is performed by, by means of the knob 8, pressing the piston 4 to its lower position and by, by means of the knob 8, turning the groove 10, 11, 12 or 13 corresponding to the desired volume onto the limiter pin 14. The fine adjustment of the volume is carried out by turning by the sleeve 20, whereby the threaded sleeve 17 is also turned and the distance of the ring 18 from the limiter flange 21 becomes larger or smaller.

The sleeve 6 is preferably provided with ten grooves of different lengths, the lengths having equal steps from length to length, whereby an illustrative volume display can be easily constructed for the pipette.

At the lower end of the sleeve 6, there is a keyway 38, which rotates the ring 22 when the knob 8

is rotated. On the outer circumference of the ring 22, there are numbers, which can be read through the lower portion of the opening 23 provided in the body 1. This reading indicates the volume corresponding to the groove 10, 11, 12 or 13 that has been set. The sleeve 20 is provided with a keyway 24, which rotates a number ring 25, whereby the numbers marked on the outer circumference of the said ring 25 can be read through the upper portion of the display opening 23. This reading indicates how much the volume indicated by the number ring 22 has been increased by means of fine adjustment.

For the purpose of locking the number rings 22 or 25, notches 26 or 27 have been made into their end faces. The notches 26 or 27 are jointly operative with springs 30 and 31 and balls 32 or 33 placed in recesses 28 or 29.

The movement of rotation of the number rings 22 or 25 is limited by means of pins 34 or 35 and grooves 36 or 37. The grooves 36 or 37 do not extend around the entire circumference of the rings 22 or 25, and, consequently, the number rings can never revolve an entire full circle.

When the knob 8 is being depressed, the piston 4 is first pressed downwards when the spring 15 yields, until the ring 18 meets the limiter flange 21. This stroke length corresponds to the volume to be pipetted. In order to empty the pipette completely, the knob 8 is depressed further with a higher force, whereby the spring 19 yields until the threaded sleeve 17 meets the limiter pin 14.

## WHAT IS CLAIMED IS:

1. Pipette, which is provided with a body and with a piston fitted into a cylinder provided in the body and opening downwards, c h a r a c t e r -  
i z e d in that either on the outer face of the piston rod (7) there are grooves (10, 11, 12, 13) of different lengths, parallel to the piston rod and open at their upper or lower end, and on the body there is  
an inwardly projecting limiter pin (14), which is fitted as gliding in one of the grooves at a time and which, together with the closed end of the groove, determines one of the extreme positions of the piston, or there are corresponding grooves on the inside face of the  
body and there is a corresponding limiter pin on the outside face of the piston rod; and, moreover, in that either the piston rod is provided with a limiter (18) displaceable in the longitudinal direction of the rod and the inside face of the body is provided with a  
stationary limiter (21) which, together with the displaceable limiter, determines the other extreme position of the piston, or a corresponding displaceable limiter is fitted on the body and a corresponding stationary limiter on the piston rod.

2. Pipette as claimed in claim 1, c h a r -  
a c t e r i z e d in that the grooves are provided on the piston rod and the limiter pin on the body.

3. Pipette as claimed in claim 2, c h a r -  
a c t e r i z e d in that the grooves are open at their top end.

4. Pipette as claimed in claim 3, c h a r -  
a c t e r i z e d in that the displaceable limiter is provided on the piston rod above the grooves and that the stationary limiter is provided on the body.

5. Pipette as claimed in claim 4, c h a r -  
a c t e r i z e d in that the displaceable limiter is a threaded sleeve (17) fitted around the piston rod or

a ring (18) related to the said sleeve.

6. Pipette as claimed in claim 5, c h a r -  
a c t e r i z e d in that inside the body, around the  
piston rod, there is a number ring (22) revolving  
5 together with the piston rod, the reading on the said  
number ring being seen through the lower portion of the  
display opening (23) in the body and the said reading  
indicating the suction volume corresponding to the  
stroke length of the groove at each particular time  
10 set on the limiter pin, and that around the threaded  
sleeve, there is a second number ring (25) revolving  
together with the said sleeve, the reading of the said  
number ring being seen through the upper portion of the  
display opening (23) and the said reading indicating  
15 the suction volume corresponding to the stroke length  
determined by the displaceable limiter and by the  
stationary limiter.

7. Pipette as claimed in any of claims 1  
to 6, c h a r a c t e r i z e d in that the number  
20 of the grooves is ten and the grooves have different  
lengths, the lengths having equal steps from length  
to length.

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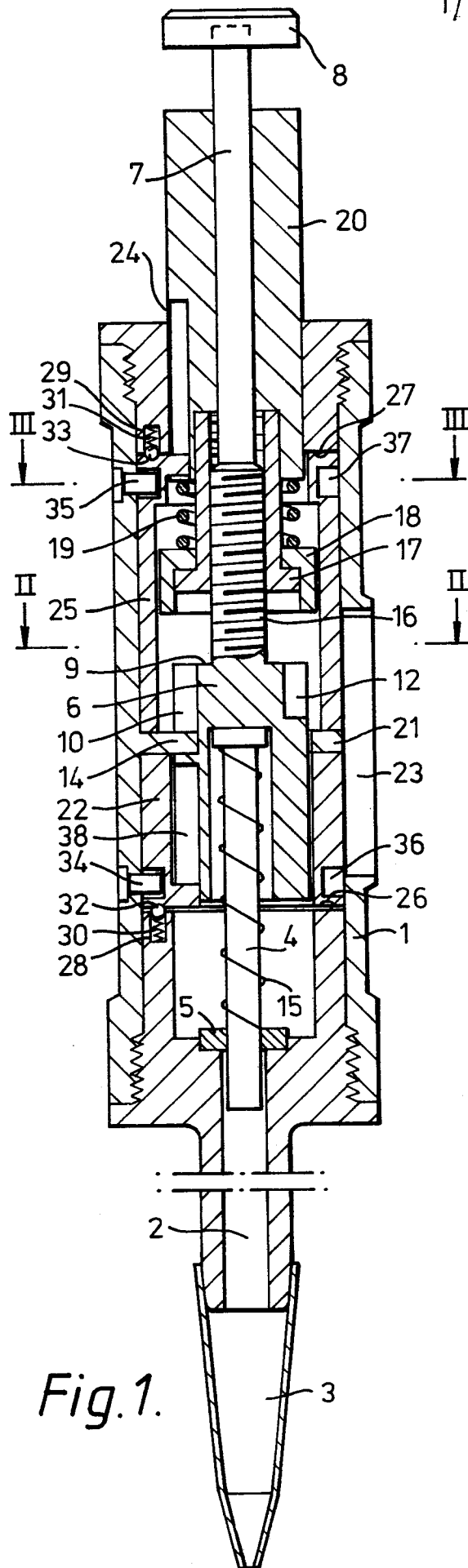


Fig. 1.

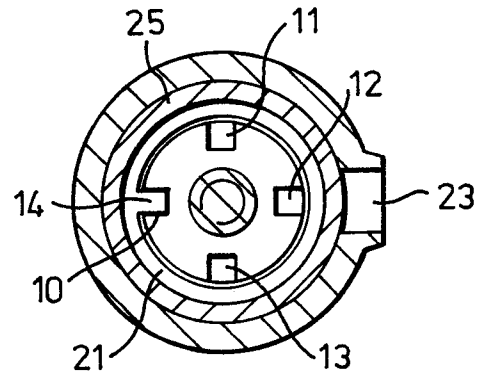


Fig. 2.

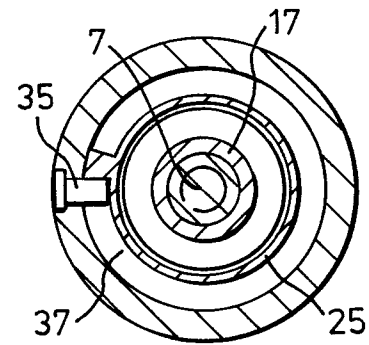


Fig. 3.

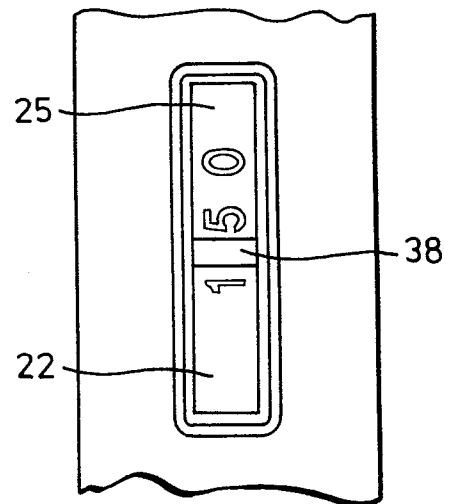


Fig. 4.