

[54] **EXCHANGEABLE PISTON PUMP UNIT**

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[56]

References Cited

FOREIGN PATENTS OR APPLICATIONS

1,195,135 6/1970 Great Britain..... 222/309

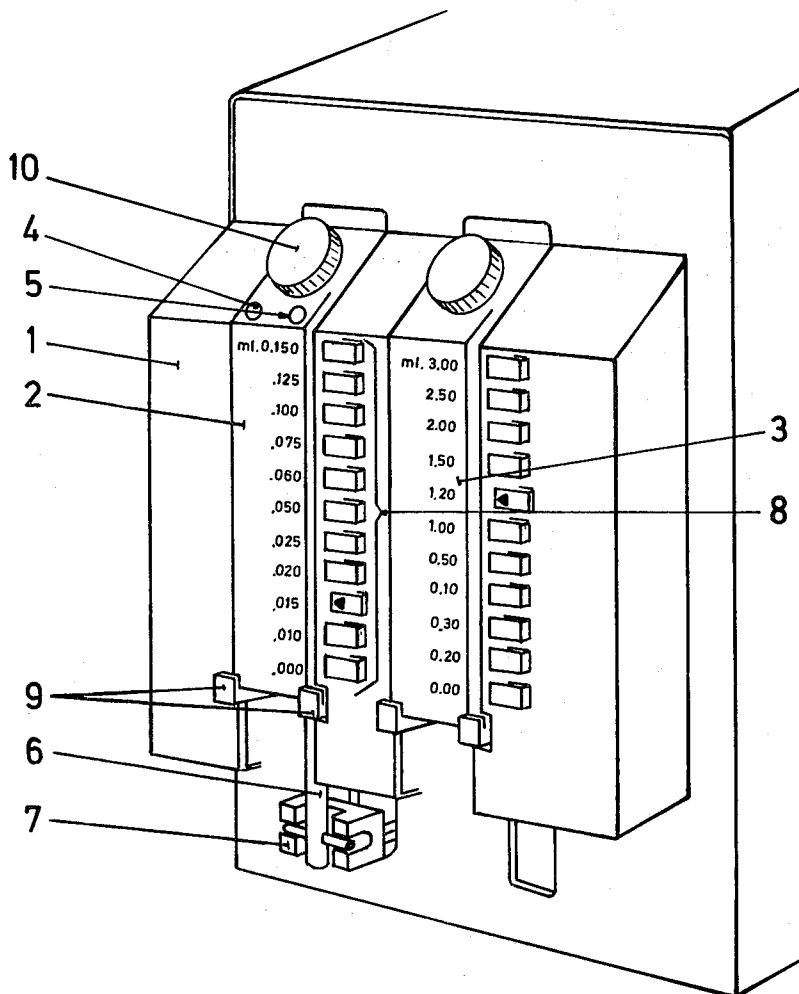
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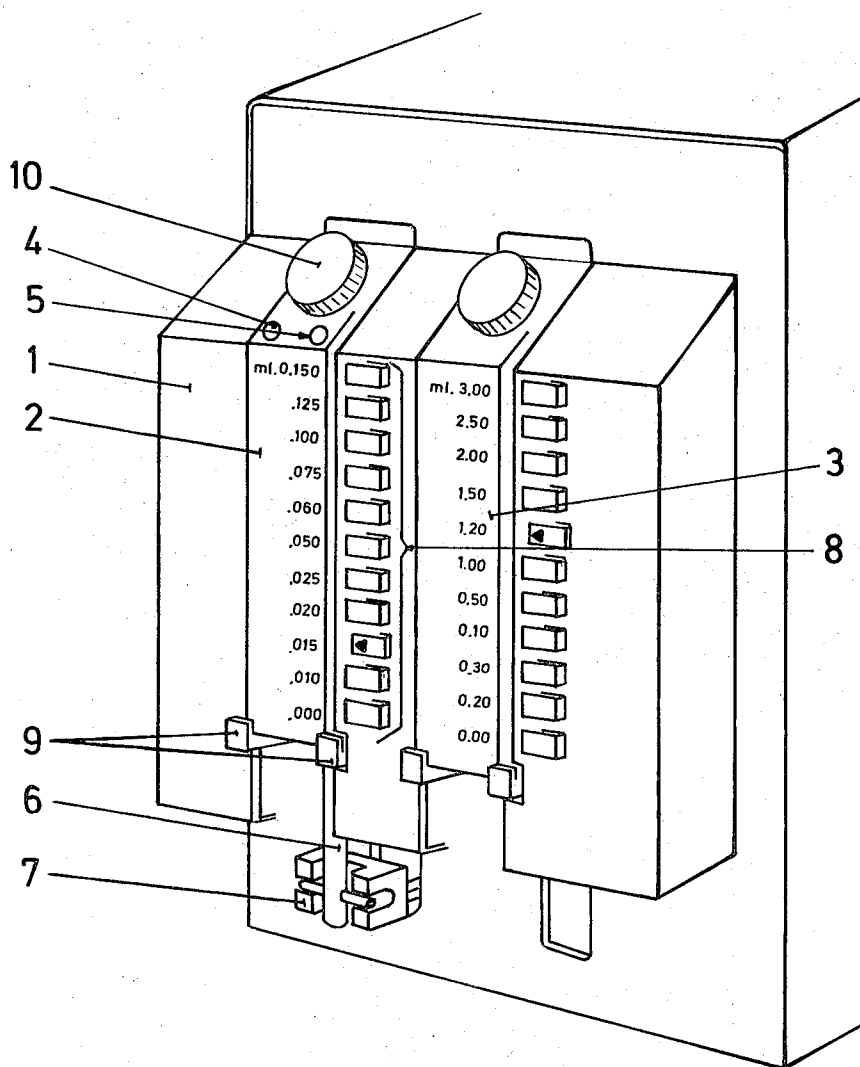
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ABSTRACT

A dispenser for liquids includes a mounting unit to interchangeably hold a series of exchangeable piston type pumps, each of which is marked with scales to indicate the volume displaced by corresponding movement of the pump piston, the mounting unit including a piston actuator and a series of push buttons controlling the stroke of the actuator and located adjacent the respective portions of a pump scale corresponding to the volume to be dispensed under the control of each respective push button.

6 Claims, 1 Drawing Figure





EXCHANGEABLE PISTON PUMP UNIT

The present invention refers to exchangeable piston pump comprising a pump piston and a pump cylinder for use in a pump socket comprising driving means for the pump piston and a number of digital volume setting means for setting different piston strokes.

An essential step in the treatment of specimen e.g. in clinical laboratories consists in portioning a certain amount of specimen fluid obtained from a blood sample or a urine sample for carrying out investigations of said sample and in adding a likewise accurately determined amount of a reagent. An essential part of a fully or partly automated system for specimen treatment in a clinical laboratory thus consists of fluid portioning means which carries out these operations. The portioning means usually consists of pumps or syringes which if a reagent is to be added are connected with a reagent vessel from which a predetermined and accurately adjusted amount of fluid is sucked into the pump and thereafter is sprayed into the specimen vessel.

In adjusting different pump volumes it is extremely important that a desired volume can be adjusted fast and accurately and that the risks for errors in the adjustment are reduced to a minimum since they can have very severe consequences. When using a piston pump for the adjustment of volumes, the pump volume is changed by changing the piston stroke. This adjustment could be carried out either through an analogous adjustment, usually consisting of the stops between which the piston is moveable which are adjusted by means of a micrometer screw, which is provided with a scale in volume units. The drawback of this process is firstly that it is difficult to make correct readings from the micrometer and secondly that in order to cover big volume ranges, one usually uses exchangeable pump units having different cylinder diameters, which means that the value read from the micrometer has to be converted with respect to the pump unit used. The risks for fatal errors are thereby increased considerably. In order to decrease these risks one could, when the exchangeable pump units have cylinders made from glass, make a graduation directly on the glass cylinder and by means of the micrometers displace the piston within the cylinder until it is in a position corresponding to a desired volume given on the pump cylinder. However, this method will also involve big risks for erroneous readings and furthermore, the accuracy of the volumes will not be very high.

In order to permit a fast setting of accurate volumes it is therefore more advantageous to use a digital setting of the stops instead of an analogous one, i.e. the stops for the piston are set by activating different push buttons for different piston strokes. An example of such a device where the volumes are set by activating push buttons is e.g. described in the Swedish patent application No. 3380/72, where the push buttons activate a friction clutch so as to disconnect the driving means from the piston at different positions of the piston in accordance with the push button activated. The set of push buttons is preferably arranged close to the exchangeable pump unit which is releaseably attached to an instrument panel. However, even when the setting of volumes is made digitally, the risk for erroneous adjustments remains when the unit is changed. It is of course possible to provide each push button with a number of different volume indications, the one to be used being determined by the cylinder diameter of the

actual pump unit, but such an arrangement will always include a risk for an erroneous setting. It is an object of the present invention to eliminate the above described drawbacks in an exchangeable pump unit where the pump volume is determined by digital adjusting means and to secure that a correct volume is always set, independent of the pump unit used. The characteristics of the invention will appear from the attached claims.

The invention will now be described in detail, reference being made to the enclosed drawing which shows a fluid portioning unit comprising two exchangeable pump units having means for digital setting of the volumes.

In the drawing reference 1 denotes the panel of a portioning unit in which two pump units 2 and 3 are releaseably attached. In this Swedish application, the control of the driving means 7 by the push buttons 8 is carried out by making the push buttons activate stops at different levels for the up and down movement of the driving means in order to obtain different pump strokes. The pump units are identical with exception for their cylinder volumes, but for the sake of simplicity only one unit will be described in detail. The unit 2, the cover of which constitutes the pump cylinder is attached to the panel by means of two brackets 9 towards which the unit is pressed by means of a screw 10. Within the cylinder the unit is provided with a piston, not shown in the figure, said piston being driven by a piston rod 6 from a driving means 7. From the driving means 7 the piston rod is moved upwards and downwards, the piston stroke being determined by activating one of the push buttons in a set of push buttons 8. The control of the driving means 7 from the push buttons 8 could be carried out in various ways, e.g. according to what is described in the Swedish patent application No. 3380/72. One type of pump unit suitable for this purpose is disclosed and claimed in the application of Kjell Fagerström, Hans Krook and Bertil Mattson, entitled "Piston Pump Unit," Ser. No. 367,490, filed concurrently with this application. When the piston is moved upwards and downwards the pump cylinder is connected to an inlet and an outlet channel 4 and 5, respectively, by means of a valve not shown. By activating a specific push button the piston stroke is thus determined. The amount fluid sucked in and sprayed out at each cycle of operation will thereby for a certain piston stroke be determined by the diameter of the pump cylinder in the pump unit used. In order to make it possible to read the pump volume directly, the pump unit according to the invention is provided with volume indications applied directly on the pump unit and each indication is applied close to that push button in the panel which for the respective pump unit gives the accurate volume. Thus, it is possible to determine the pump volume directly and with high accuracy, the risk for erroneous settings being almost completely eliminated. In order to further decrease the risk for mistakes, one could instead of a complete row of push buttons use only one button which is inserted into a bore in the panel close to the volume indication that denotes the desired volume.

We claim:

1. Liquid dispensing system comprising a plurality of exchangeable liquid pump units and mounting means for removably supporting any one of said pump units in a position for dispensing liquid in measured quantities,

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each of said pump units including a housing containing movable piston means having an exteriorly projecting means for moving the piston means, said mounting means including a plurality of setting means arranged in spaced relationship to each other and in proximity to a support pump unit, said mounting means also being provided with driving means for engagement with the means for moving the piston means of a pump unit in predetermined increments in response to actuation of a setting means, the amount of said increment of movement being dependent upon the respective setting means actuated, each of the housings of the pump units being provided with volumetric indicia means arranged in spaced relationship to each other and to be disposed respectively in proximity to respective ones of said setting means, the predetermined increment of movement of a piston means initiated by actuation of each setting means being the respective amount necessary to dispense the volume of liquid denoted by the indicia means disposed in proximity to that setting means.

2. The invention described in claim 1, wherein an increment of movement of the piston means of one of said pump units dispenses a volume of liquid which differs from the volume of liquid dispensed by the piston means of another pump unit during the same increment

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of movement, the indicia means of both said pump units being similarly arranged and denoting respectively different appropriate volumetric values.

3. The invention described in claim 2, wherein the exterior configuration of said pump units is substantially identical.

4. The invention described in claim 1, wherein said mounting means includes a panel provided with a recess within which a pump unit is received, the setting means being disposed in a row adjacent one margin of said recess.

5. The invention described in claim 4, wherein any one of said pump units may be received within said recess, each of said pump units being provided with a surface to be disposed generally in alignment with the surface of said panel, said indicia means being disposed on said pump unit surface in a row parallel to said row of setting means.

6. The invention defined in claim 5, wherein the surface of said panel is flat and said recess is defined by a pair of parallel vertical margins, said pump units being elongated and said surfaces upon which the indicia are disposed being generally flush with the surface of the panel when supported by the mounting means.

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