

ANALYZING APPARATUS FOR MEASURING LIQUID OR GASEOUS SAMPLES

BACKGROUND OF THE INVENTION

This invention relates to an analyzing apparatus for measuring liquid or gaseous samples, comprising a sample input device with an input opening for introducing a sample into the path of analysis, which opening may be actuated to move relative to the analyzer from an initial position to a feed position, and further comprising one or more measuring chambers, a feed pump and a waste vessel, all of which are connected via hose pipes, and further comprising additional hose pipes for the delivery of standard media that may be introduced into the path of analysis by means of valves.

DESCRIPTION OF THE PRIOR ART

Such analyzers have been described before, for instance in German laid-open print 25 21 061, and for example are used for analyzing blood and other biological liquids. The sample enters the path of analysis by an input opening which may be actuated to move relative to the analyzer from an initial position to a feed position by means of a positioning mechanism, in which feed position the samples delivered for analysis in sample vessels, etc., may be taken in via the input opening. In the initial position for this known type of device the input opening is coupled to a cleaning device dispensing liquid and gaseous media for cleaning and drying the input opening and the path of analysis behind it.

The main disadvantage of this known type of analyzer, the great complexity of design necessitated by the feed of standard and calibrating media, cleansing liquids, reagents and other such substances required for measurement purposes, since the individual media are introduced into the sample or analysis path at different points, which will require a considerable number of additional branch-off and shut-off devices, together with the necessary actuating and control elements.

SUMMARY OF THE INVENTION

It is an object of the present invention to modify an analyzing apparatus of the above type such that the necessary standard and cleansing solutions, etc., may be introduced in a simpler manner, resulting in an uncomplicated overall design of the apparatus and offering greater ease of operation and maintenance in addition to being less costly.

According to the present invention this is achieved by configuring the apparatus such that in its initial position the input opening of the sample input device will come into sealing contact with the outlet opening of a flow channel through a funnel element, the flow channel having an inlet opening which is connected to further hose pipes for delivering standard media and air thereto. This set-up will ensure that in its initial position the input opening of the sample input device, together with the outlet opening of the flow channel through the funnel element, will form part of a closed path for the additional media required for measuring and cleaning, this closed path being interrupted only during the actual sample intake by actuating the input opening to move relative to the analyzer from its initial position to its feed position. Passage of the individual media through the sample path is identical, i.e., at least between the input opening and the waste vessel, which will considerably simplify control of the flow of liquids to be intro-

duced into the path of analysis, shut-off valves, etc., for instance, are necessary in front of the fittings of the funnel element only, and will greatly facilitate repair and maintenance. The greater simplicity of the overall design will reduce both outer dimensions and weight as well as manufacturing costs.

In an analyzer whose sample input device is configured as a hollow needle that may be tilted into feed position, the input opening being placed at its point, and which is provided with a tilting mechanism producing a relative movement in the direction of the needle axis at the beginning of the tilting phase in order to remove the point of the needle from the initial position, as has been described in the above German laid-open print 25 21 061, for example, a further embodiment of the present invention provides that in the initial position the point of the hollow needle establishes a direct sealing contact with the outlet opening of flow channel through the funnel element.

The above publication essentially describes a cleaning device for an analyzing apparatus in which the hollow needle used for sample input will dip in its untilted, i.e., initial, position relative to the analyzer, into a vessel containing a cleansing fluid whose fluid level relative to the dipped needle is kept approximately constant. As mentioned before, in this known kind of apparatus any other media required for measuring and calibrating are entered via additional facilities adding to the complexity of design.

According to the above proposal a perfect seal is achieved in a simple manner between the input opening located at the point of the hollow needle and the outlet opening of the funnel element, regardless of any inaccuracies in the positioning of the two openings relative to each other due to maintenance and manufacturing tolerances.

In another preferred embodiment of the present invention a spring-loaded actuator flap is provided as part of a housing which will act as a cover of the sample input device whenever the hollow needle is in its initial position, and which is connected via a lever mechanism to the funnel element guided in the direction of the hollow needle axis, and which flap will therefore push the funnel element away from the point of the hollow needle whenever it is lifted from its initial position, and which is further connected to a tilting lever provided with a cross-element which in the initial position is at a certain distance from the hollow needle, such that this cross-element will be in contact with the hollow needle approaching it from inside the analyzing apparatus once a given lifting angle of the actuator flap has been reached. If the actuator flap is lifted any further, this cross-element will carry along with it the hollow needle which may be rotated around a shaft fixed in the housing, until the feed position has been reached. The actuator flap ensures protection of the sensitive components of the sample input device during operation of the apparatus. Lifting of the actuator flap will permit access to the sample input device from outside for the purpose of sample intake, in addition to effecting a tilting of the hollow needle with the input opening at its end. For this purpose the funnel element guided in the direction of the axis of the hollow needle is moved away from the point of the hollow needle, thus releasing the hollow needle and allowing it to tilt. Since both actions are caused by the same lifting of the actuator flap, it may be ensured in a simple manner that the hollow needle will