APPARATUS FOR DISTRIBUTION AND PREPARATION OF SAMPLES FROM PRIMARY VESSELS

This application is a continuation of U.S. patent application Ser. No. 518,075, filed July 28, 1985, now abandoned which in turn is a divisional of U.S. patent application Ser. No. 300,929, filed Sept. 10, 1981, now U.S. Pat. No. 4,413,060.

This invention relates to a process and apparatus for the distribution and preparation of sample from primary vessels, more particularly samples of patients' sera, liquid reagents or the like, which are transferred into fixedly mounted secondary vessels of any desired construction, preferably in accordance with the data from a distribution sheet recorded by a control programing apparatus, where the secondary vessels can be moved into position one after the other by means of a transporting carriage for the primary vessel, having an associated diluter, this transporting carriage being movable in the x-y plane by means of two stepping motors, and the primary vessel is brought back into its starting position after each delivery or after delivery of the samples intended for the entire series of samples.

THE PRIOR ART

A process and apparatus for this kind are described in German Offenlegungsschrift No. 2,841,086. The essential feature of this process and apparatus is that the transporting carriage is fitted with a pipette capable of being raised and lowered, and when the carriage is moved into position above the primary vessel it lowers the pipette and the sample is sucked up through a diluter connected to the pipette by movable flexible tubes and fixedly associated with the magazine, and then the pipette is raised again and moved into a delivery position determined by the control programing above a dish provided as secondary vessel, and the sample is ejected into the secondary vessel.

As a further feature of this construction, the primary vessel is formed with an electronic sensor contact and is provided with a label capable of being read by a computer, and subsequently, after laboratory preparation of the sample, the information on the label is read by means of a manually guided reading stylus and fed into the computer. The vessel labeled in this way can be brought into any desired removal position in the sample distributor, and the selected position is also fed into the computer via the sensor contact. Parallel to the identification of the sample, the requirement marking card, which is again capable of being read by a computer, is written out and given the same label marking as the primary vessel and this card is fed into the card reader connected to the computer. The sample in the primary vessel is then taken out of the primary vessel in batches, in accordance with the labeling of the vessel and the information on the requirement card, and transferred to secondary vessels arranged in accordance with the information on the card, for individual investigation (cf. DE-OS No. 2,841,086).

We refer also to the publication "Labtronik, Klinische Labortechnik", of Labtronik GmbH, which gives similar information to that mentioned above.

The publication refers particularly to the "Serum distributor with sample identification SV 500" having a processing capacity of more than 1000 samples per hour. The advantages of this system with regard to its

safety and reliability in the preparation and identification of samples and in its throughput are widely known today. A disadvantage is the risk of contamination caused particularly by the pipetting operation, in which traces of the samples may be left behind not only in the pipettes themselves but also, to some extent, in the connecting tube leading to the diluter, chiefly in the area going down from the pipette. Even the provision of intermediate rinsing and cleaning stages which involve taking suitable agents from a primary vessel are releasing them into a secondary vessel (which is then emptied) cannot guarantee the maximum degree of safety which is often necessary.

Moreover, the systems operating exclusively by these processes necessitate the use of primary vessels which, though of different construction, are uniform in at least one main dimension, with respect to the sensor contacts marking the position of the vessel in the sample distributor in the computer. Admittedly, this is fundamentally unavoidable with some of the high throughputs required of the sample distributor. Conversely, in many cases, it would also appear to be convenient to be able to use primary sample vessels of different dimensions and thus achieve substantial neutrality of the sample vessels, although, it should be pointed out, no rigid link with existing processes and systems is then possible.

OBJECT OF THE INVENTION

It is an object of this invention, therefore, to provide a process of the kind described hereinbefore which operates totally without contamination and which makes it possible to use vessels of different dimensions as the primary vessels (without the need for any uniform arrangement of the primary vessels in the sample distributor), but on the other hand, when vessels of identical dimensions are used, makes it possible to arrange the vessels in the sample distributors of the systems described hereinbefore.

A further object is to provide suitable apparatus for performing the process.

Other objects and advantages of the invention will become apparent as the description thereof proceeds.

DESCRIPTION OF THE INVENTION

The above objects are achieved according to the invention in that primary vessels of different dimensions filled with the sample material are arranged with their opening pointing upwards and frictionally or positively connected to a closure member adapted to fit the opening of the primary vessel but of otherwise uniform construction, the closure member comprising a pourer nozzle and an air flow aperture opening into a feed pipe,

that subsequently the closure member is inserted into an intermediate carrier portion fitted with a sealable air inlet, via the air flow aperture, in the sealed position of the air inlet,

that subsequently the primary vessel fitted with the intermediate carrier portion is rotated so that its opening points vertically downwards and is fixed in the clamping means of the transporting carriage (with resultant automatic opening of the air inlet, via the air flow aperture, by the intermediate carrier),

that in order to release the sample material, through the diluter, air is fed into the primary vessel in a suitable amount and with a suitable tension, through a line, an intermediate carrier and the feed pipe connected to the closure member, so that a correspondingly predeter-