SUMMARY OF THE INVENTION

[0005] Embodiments of t~~T~~he present invention overcomes the foregoing problems and other shortcomings, drawbacks, and challenges of conventional sample preparation and sample analysis systems. While the invention will be described in connection with certain embodiments, it will be understood that the invention is not limited to these embodiments. To the contrary, embodiments of this invention includes all alternatives, modifications, and equivalents as may be included within the spirit and scope of the present invention.

[0005a] According to an aspect, there is provided an automated biological specimen preparation and mass spectrometry analysis system for analyzing a plurality of biological specimens, comprising: a sample preparation station configured to prepare samples taken from the plurality of biological specimens; and a sample analysis station including a mass spectrometer configured to quantify one or more analytes in one or more of the prepared samples; wherein the sample preparation station and the sample analysis station are contained within a housing and such that the sample preparation station is positioned substantially on one side of the housing, at a height that is greater than a height of a base of the mass spectrometer; the mass spectrometer is positioned substantially on the other side of the housing, at a height that is less than a height of a base of the sample preparation station; and the sample analysis station further includes one or more liquid chromatography pumps and at least one liquid chromatography mobile phase container, the at least one liquid chromatography mobile phase container being positioned at a height that is greater than a height of the one or more liquid chromatography pumps.

[0006] In accordance with one embodiment of the present invention, a sample preparation and analysis system includes a housing. A sample preparation station and a sample analysis station are positioned within the housing and with the sample analysis station is spaced away from the sample preparation station. A transport assembly is configured to move at least one sample within the housing and between the sample preparation station and the sample analysis station.

[0007] According to another embodiment of the present invention, an automated biological specimen preparation and mass spectrometry analysis system includes a sample preparation station and a sample analysis station. The sample preparation station is configured to prepare samples that are taken from a plurality of biological specimens. The sample analysis station includes a mass spectrometer that is configured to quantify one or more analytes in the prepared samples. The sample preparation and the sample analysis stations are contained within a housing such that the mass spectrometer is lower than the sample analysis station.

[0008] According to yet another embodiment of the present invention, an automated biological specimen preparation and analysis system includes a sample preparation station and a sample analysis station. The sample preparation station is configured to prepare samples that are taken from a plurality of biological specimens and includes a first serviceable component, which may include a specimen rack and/or a reagent rack. The sample analysis station configured to quantify one or more analytes in the prepared samples and including a second serviceable component, which may include a liquid chromatography column and/or a liquid chromatography mobile phase container. A third serviceable component includes a fluid container and/or a waste container. The sample preparation station, the sample analysis station, and the third serviceable component are contained within a housing

such that the first, second, and third serviceable components are positioned closer to a front face of the housing than to a back face of the housing.

[0009] Still another embodiment of the present invention is directed to an automated biological specimen preparation and analysis system and includes a sample preparation station and a sample analysis station. The sample preparation station is configured to prepare samples that are taken from a plurality of biological specimens. The sample analysis station is configured to quantify one or more analytes in the prepared samples. A user interface is configured to receive and/or convey information to a user. A housing contains the sample preparation and sample analysis stations. The user interface s mounted to an exterior portion of the housing and positioned between a left-hand sidewall and a right-hand sidewall of the housing.

[0010] According to another embodiment of the present invention, an automated biological specimen preparation and analysis system includes sample preparation and sample analysis stations positioned within a housing. The sample preparation station is configured to prepare samples taken from patient specimen. The samples are prepared in accordance with an assay selected from a database containing a plurality of unique assays. The sample analysis station includes an analyzer that is dynamically reconfigurable according to the selected assay. Once dynamically reconfigured, the analyzer analyzes the prepared sample. A transport mechanism is configured to transport the prepared sample within the housing and from the sample preparation station to the sample analysis station.

[0011] The above and other embodiment~~objects~~s and advantages of the present invention shall be made apparent from the accompanying drawings and the descriptions thereof.

BRIEF DESCRIPTION OF THE FIGURES

[0012] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the general description given above and the detailed description of the embodiments given below, serve to explain the principles of the present invention. In the figures, corresponding or like numbers or characters indicate corresponding or like structures.

[0013] FIG. 1A is a perspective view of an automated sample preparation and analysis system in accordance with one embodiment of the present invention.

system 10, as depicted in FIG. 3A-3B. Placing the LC pumps 124 relatively close to the mass spectrometer 120 is important to minimize, as much as possible, the distance of the fluidic connections between the LC pumps 124 and the mass spectrometer 120, which thereby reduces the liquid dead volume in the LC system lines and also reduces the risk of degradation of the chromatography caused by the separated liquid traveling over a distance.

[0076] While most of the system components are located within the housing 16, one or more components may optionally be located remotely from the system 10, either adjacent to the system 10 or at some distance from the system 10, but integrated into the system 10 using tubing or the like. For example, mechanical pumps, including roughing pumps, a nitrogen generator or other inert gas sources for operation of the mass spectrometer 120 may be located in a separate frame or frames. Due to their thermal output, as well as their noise and vibration, placement of these components within the housing 16 is not advantageous. While these components could be integrated within the housing 16, they also can be located remotely without denigrating system performance. Having the option to locate these components remotely, for example, in another location within the same laboratory environment, or even in an adjacent room within the overall laboratory, provides significant installation flexibility for the laboratory operator.

[0077] While the present invention has been illustrated by a description of various embodiments, and while these embodiments have been described in some detail, they are not intended to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. The various features of the invention may be used alone or in any combination depending on the needs and preferences of the user. This has been a description of the present invention, along with methods of practicing the present invention as currently known. However, the invention itself should only be defined by the appended claims.

~~**[0078]** What is claimed is:~~