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Pipettor system

Abstract

Various embodiments include a system having a pipetting chamber, a set of pipettor cartridges docked in the pipetting chamber, a gantry system mounted on a ceiling within the pipetting chamber, the gantry system including at least one stationary track aligned in a first direction, and a movable track aligned in a second direction distinct from the first direction, the movable track coupled to the at least one stationary track, and a carrier configured to transport each of the set of pipettor cartridges to a pipetting location within the pipetting chamber, the carrier configured to move each pipettor cartridge in a third direction perpendicular to both the first and second directions.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION (1) This application is a continuation of U.S. Non-Provisional patent application Ser. No. 18/165,150, filed Feb. 6, 2023, (now U.S. Pat. No. 11,933,805), which is a continuation of Non-Provisional patent application Ser. No. 16/838,435, filed Apr. 2, 2020 (now U.S. Pat. No. 11,573,244), which is a continuation of Non-Provisional patent application Ser. No. 16/653,537, filed Oct. 15, 2019 (now U.S. Pat. No. 10,613,110), which is a continuation of U.S. Non-Provisional patent application Ser. No. 15/883,738, filed Jan. 30, 2018 (now U.S. Pat. No. 10,444,251), which is a continuation of U.S. Non-Provisional patent application Ser. No. 15/454,122, filed Mar. 9, 2017 (now U.S. Pat. No. 9,880,184), which is a continuation of U.S. Non-Provisional patent application Ser. No. 14/636,962, filed Mar. 3, 2015 (now U.S. Pat. No. 9,623,405), the disclosures of which are incorporated herein by reference in their entireties.

FIELD
(1) The subject matter disclosed herein relates to life sciences equipment. More particularly, the subject matter disclosed herein relates to pipetting equipment for use in the life sciences industry.
BACKGROUND
(2) Pipettors, also referred to as chemical droppers, are laboratory tools commonly used in the life sciences industry to dispense a volume of liquid. As life sciences equipment has advanced, many

pipettors have been integrated into automated systems. While these automated systems have improved the accuracy and control of pipetting procedures, these conventional automated systems can be less than dynamic in their ability to handle distinct pipetting procedures.

BRIEF DESCRIPTION

(3) Various embodiments include a system having: a pipetting chamber; a set of pipettor cartridges docked in the pipetting chamber; a gantry system mounted on a ceiling within the pipetting chamber, the gantry system including: at least one stationary track aligned in a first direction; and a movable track aligned in a second direction distinct from the first direction, the movable track coupled to the at least one stationary track; and a carrier configured to transport each of the set of pipettor cartridges to a pipetting location within the pipetting chamber, the carrier configured to move each pipettor cartridge in a third direction perpendicular to both the first and second directions.

(4) A first aspect includes a system having: a pipetting chamber; a set of pipettor cartridges docked in the pipetting chamber; a gantry system mounted on a ceiling within the pipetting chamber, the gantry system including: at least one stationary track aligned in a first direction; and a movable track aligned in a second direction distinct from the first direction, the movable track coupled to the at least one stationary track; and a earner configured to transport each of the set of pipettor cartridges to a pipetting location within the pipetting chamber, the carrier configured to move each pipettor cartridge in a third direction perpendicular to both the first and second directions.

(5) A second aspect includes a system having: a pipetting chamber having a ceiling within the pipetting chamber; a set of pipettor cartridges docked on the ceiling within the pipetting chamber; a gantry system mounted on the ceiling within the pipetting chamber, the gantry system including: at least one stationary track aligned in a first direction; and a movable track aligned in a second direction distinct from the first direction, the movable track coupled to the at least one stationary track; and a carrier configured to transport each of the set of pipettor cartridges to a pipetting location within the pipetting chamber, the carrier configured to move each pipettor cartridge in a third direction perpendicular to both the first and second directions; and a control system coupled with the pipetting chamber, the control system for controlling movement of the carrier along the first direction, the second direction and the third direction.

(6) A third aspect includes a pipetting chamber having a ceiling within the pipetting chamber; a set of pipettor cartridges docked on the ceiling within the pipetting chamber; a gantry system mounted on the ceiling within the pipetting chamber, the gantry system including: at least one stationary track aligned in a first direction; and a movable track aligned in a second direction distinct from the first direction, the movable track coupled to the at least one stationary track; and a carrier configured to transport each of the set of pipettor cartridges to a pipetting location within the pipetting chamber, the carrier configured to move each pipettor cartridge in a third direction perpendicular to both the first and second directions, wherein the carrier is further configured to move completely circumferentially about the set of pipettor cartridges docked on the ceiling; and a control system coupled with the pipetting chamber, the control system for controlling movement of the carrier along the first direction, the second direction and the third direction.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) These and other features of this invention will be more readily understood from the following detailed description of the various aspects of the invention taken in conjunction with the accompanying drawings that depict various embodiments of the invention, in which:

(2) FIGS. **1**-**5** shows respective side perspective views of a system according to various embodiments.

(3) FIG. **6** shows a cut-away plan view of one configuration of an interior of pipetting chamber from FIGS. **1-5** according to various embodiments.
(4) FIG. **7** shows an underneath perspective view of a portion of the system of FIGS. **1-5**, including in particular the pipetting chamber, according to various embodiments.
(5) FIG. **8** shows a cut-away perspective view of a system according to various embodiments.
(6) FIGS. **9-11** show respective cut-away perspective views of a storage chamber according to various embodiments.
(7) FIGS. **12-14** show perspective views of systems according to various embodiments.
(8) FIG. **15** shows a side perspective view of a pipetting chamber, including overhead mounted pipetting cartridges, according to various embodiments.
(9) FIG. **16** shows a close-up perspective view of a pipettor cartridge according to various embodiments.
(10) FIG. **17** shows a back perspective view of a system according to various embodiments.
(11) FIG. **18** shows a perspective view of a system according to various embodiments, integrated with an incubator system.
(12) FIG. **19** shows a perspective view of a configuration including a system according to various embodiments.
(13) It is noted that the drawings of the invention are not necessarily to scale. The drawings are intended to depict only typical aspects of the invention, and therefore should not be considered as limiting the scope of the invention. In the drawings, like numbering represents like elements between the drawings.

DETAILED DESCRIPTION

(14) As indicated above, the subject matter disclosed herein relates to life sciences equipment. More particularly, the subject matter disclosed herein relates to pipetting equipment for use in the life sciences industry.
(15) In contrast to conventional pipettor systems, various embodiments include a pipettor system having a gantry configured to move in the X direction, Y direction and Z direction. In some cases, the gantry can include a first sliding rail coupled to a carrier, and at least one (e.g., two) fixed rail, which with the sliding rail is configured to traverse. The carrier may also be configured to move along the sliding rail. A set of docked, movable pipettor cartridges can be located within range of the carrier, which can selectively remove a cartridge from its dock, and transport the cartridge to a pipetting location. The pipetting location can be below (in Z direction) the docking location in some embodiments. In various embodiments, the pipetting location can be located on a pipetting platform, which may also be movable in the X-Y-Z direction. In various embodiments, the docking location of the pipettor cartridges is an overhead docking location. In some particular embodiments, the carrier can rotate around its own central axis to pick up, dock, or facilitate pipetting. The systems disclosed according to various embodiments are configured to effectively execute a variety of pipetting operations within the pipetting chamber without manual intervention.
(16) In the following description, reference is made to the accompanying drawings that form a part thereof, and in which is shown by way of illustration specific example embodiments in which the present teachings may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the present teachings and it is to be understood that other embodiments may be utilized and that changes may be made without departing from the scope of the present teachings. The following description is, therefore, merely exemplary.
(17) FIGS. **1-5** show respective side perspective views of a system **2** according to various embodiments. As shown, the system **2** can include a pipetting chamber **4**, and in some embodiments, the system **2** can further include a storage chamber **6** coupled with the pipetting chamber **4**. According to various embodiments, the system **2** can further include a control system **8**, e.g., a computerized control system, as described further herein. As further described with respect to the additional FIGURES, in some embodiments, the pipetting chamber **4** is separated from the

storage chamber **6**, such that the pipetting chamber **4** can act as an independent pipetting chamber. However, in other embodiments, the pipetting chamber **4** and storage chamber **6** are coupled and may be connected with (integrally or separately) a cart system **10** (e.g., a set of wheels, rollers, track, etc.). FIG. **4** illustrates a set of doors **12**, which can provide access to the pipetting chamber **4**, which is otherwise sealed from the ambient environment when the doors **12** are closed. It is understood that the storage chamber **6** may be similarly sealed from the ambient environment. Various components are labeled in FIGS. **1-5** which are shown and described in greater detail according to additional FIGURES. It is understood that multiple figures are referenced for clarity of illustration and explanation.

(18) FIG. **6** shows a cut-away plan view of one configuration of an interior of pipetting chamber **4** according to various embodiments. As shown, the pipetting chamber **4** can contain a set of pipettor cartridges **14** docked in the pipetting chamber **4** (e.g., at dock location **16**). The pipetting chamber **4** can further include at least one tray dock **16** holding a set (at least one) of pipetting trays **18**. In various embodiments, as shown in FIG. **6**, the tray dock **16** includes distinct tray docks **16***a*, **16***b*, **16***c*, which include at least one static nest position **18** (tray dock **16***a* at the time of this depiction), and at least one dynamic nest position **20** (tray docks **16***b*, **16***c*, at the time of this depiction). In some cases, the dynamic nest positions are at distinct heights (Z-direction) within the pipetting chamber **4**, and are adjustable horizontally (X-direction) within the pipetting chamber **4**. In various embodiments, one tray dock **16** can be loaded/unloaded onto/off-of the static nest position **18** from one of the dynamic nest positions **20** by an arm **22**, which is movable in the X-direction, Y-direction and Z-direction.

(19) FIG. **7** shows an underneath perspective view of a portion of the system **2**, including in particular the pipetting chamber **4**. As shown in this embodiment, the pipetting chamber **4** can further include a carrier **24** which in various embodiments, is movably coupled to the ceiling **28** within the pipetting chamber **4**, and in various embodiments, is coupled to the ceiling **28** via a gantry system **30**. The gantry system **30** can be mounted on the ceiling **28**, and include at least two distinct tracks, e.g., at least one stationary track **32** (two shown) aligned in a first direction (X-direction), and a movable track **34** aligned in a second direction (Y-direction) distinct from the first direction. The movable track **34** can be coupled to the stationary track(s) **32**, e.g., by complementary track integration, meaning that the movable track **34** can move within the stationary track(s) **32**, such that the movable track **34** remains parallel with the stationary track(s) **32**. In various embodiments, the at least one stationary track **32** includes two distinct stationary tracks **32** aligned in parallel, where the two distinct stationary tracks **32** are aligned perpendicular to the movable track **34**.

(20) As shown in FIG. **7** (as well as FIGS. **13-15** and **18**), the carrier **24** is configured to transport each of the set of pipettor cartridges **14** to a pipetting location, e.g., a location of at least one of the pipetting trays **18** within a tray dock **16** in the pipetting chamber **4**. In various embodiments, as described herein, the carrier **24** can be configured to move each pipettor cartridge **14** in a third direction (Z-direction) perpendicular to both the first (X) and second (Y) directions. According to various embodiments, the carrier **24** can be configured to rotate about its primary axis (Acp) such that the carrier **24** can circumferentially navigate about one or more of the pipettor cartridges **14**. Further, the carrier **24**, when engaged with a pipettor cartridge **14**, can rotate that pipettor cartridge **14** about the primary axis of the carrier **24** (Acp), which can facilitate in pipetting operations, as well as in loading and/or unloading of pipettor cartridges.

(21) In some embodiments, for example, as shown in FIGS. **7** and **8**, the set of pipettor cartridges **14** are docked in a docking station **38** coupled to a sidewall **40** of the interior of the pipetting chamber **4**. The docking station **38** can be located in such a manner that the carrier **24** can engage the pipetting cartridges **14** from a top surface **42** of the pipettor cartridges **14**. However, in other embodiments (e.g., as shown in the perspective views of FIGS. **14-17**), the set of pipetting cartridges **14** are docked in a docking station **38** coupled to the ceiling **28** of the pipetting chamber

4, such that the pipettor cartridges **14** hang from overhead mounts **44** (FIG. **15**) in the pipetting chamber **4**. In these embodiments, the carrier **24** can be configured to engage a side of the pipettor cartridges **14** (FIG. **14**, FIG. **15**) and transport the cartridges **14** to/from the pipetting trays **18** and docking station **38**.

(22) According to various embodiments, as illustrated in the cut-away perspective view of the system **2** in FIG. **8**, the storage chamber **6** and the pipetting chamber **4** may be fluidly connected (such that a fluid, e.g., air, water, etc. may pass between) such that the pipetting trays **18** can be passed between the pipetting chamber **4** and the storage chamber **6** (and vice versa) via a lift system traversing the floor **50** of the pipetting chamber **4**. The storage chamber **6** can store pipetting trays **18** when not in use in the pipetting chamber **4**. The cut-away perspective views in FIGS. **9**, **10** and **11** show additional features of the storage chamber **6**, including a storage carousel **49** and robotic arm **22** configured to move pipetting trays **18** along the Z direction between the pipetting chamber **4** and the storage chamber **6**, and further configured to move pipetting trays **18** in the X and Y directions within each of the pipetting chamber and the storage chamber **6**.

(23) The perspective views in FIGS. **11**, **13**, **14** and **17**, for example, illustrate additional features of the system **2**. For example, the system **2** can further include a set of fluid reservoirs **52** coupled with an exterior of at least one of the storage chamber **6** or the pipetting chamber **4**. In some embodiments, as shown in FIG. **17**, the fluid reservoirs **52** may be coupled to both the exterior of the pipetting chamber **4** and the storage chamber **6**. In other embodiments, as shown in FIG. **14**, where the pipetting chamber **4** is a standalone system, the fluid reservoirs can be coupled to the exterior of only the pipetting chamber **4**. In any case, the system **2** can further include a set of fluid conduits **54**, each connected with one of the set of fluid reservoirs **52** and the set of pipettor cartridge(s) **14** within the pipetting chamber **4**. The fluid conduits **54** can be further connected with a pump **56** within the pipetting chamber **4**, where the pump **56** pumps the fluid from the reservoir **52**, through the conduits **54** to the set of pipettor cartridges **14**.

(24) The perspective views in FIGS. **12-14** show additional features of the system **2** according to various embodiments, including, for example, a first set of doors (doors **12**) on a side **60** of the pipetting chamber **4** for accessing the pipetting chamber **4**. Also shown, in some embodiments, the system can include a second set of doors **62** on a side **64** of the storage chamber **6** (side **64** may be shared with side **60**), where the second set of doors can be used to access the stored pipetting trays **18** within the storage chamber **6**.

(25) FIG. **16** shows a close-up perspective view of a pipettor cartridge **14** according to various embodiments. As shown, the pipettor cartridge **14** can include a casing **66**, a mount **68** on a top side **70** of the casing **66** (for top-mounting embodiments), and a set of pipettes **72** extending from a bottom side **74** of the casing **66**. The pipettor cartridge **14** can also include an access door **74** on a side of the casing **66** between the top side **70** and the bottom side **74**. In various embodiments, the pipettor cartridge(s) **14** can include at least one handle **76** on the casing **66** for gripping the casing **66**, and a display (e.g., a light-emitting diode (LED) or other light-based display) **78** indicating at least one of a power to the pipettor cartridge or a status of a pipetting procedure.

(26) FIG. **17** shows a back perspective view of the system **2**, illustrating various aspects described herein. FIG. **18** shows the system **2** integrated with a supply system **80**, e.g., operably connected with an incubator system **80** for incubating specimens and/or transporting specimens to/from the system **2**. FIG. **19** shows a perspective view of the system **2** in a configuration **82** including a movable cart **84** with a robotic arm **86** mounted thereon. The configuration **82** can further include at least one additional system **88**, which can include an incubator system **80** and/or an additional storage system **92**. The configuration **82** can be designed to allow the robotic arm **86** to transport specimens, e.g., pipetting trays **18** or other liquid trays between the system **2**, incubator system **80** (mounted on cart **94**) and/or the additional storage system **92**.

(27) As described herein, the control system (CS) **8** can include any conventional control system components used in controlling laboratory equipment (including, e.g., pipetting chamber **4** and/or

storage chamber **6**). For example, the control system **8** can include electrical and/or electro-mechanical components for actuating one or more components in the pipetting chamber **4** and/or storage chamber **6**. The control system **8** can include conventional computerized sub-components such as a processor, memory, input/output, bus, etc. The control system **8** can be configured (e.g., programmed) to perform functions based upon operating conditions from an external source (e.g., at least one computing device), and/or may include pre-programmed (encoded) instructions based upon parameters of the pipetting chamber **4** and/or storage chamber **6**.

(28) In various embodiments, the control system **8** is embodied, e.g., stored and/or operated in at least one computing device, which is connected with the pipetting chamber **4** and/or storage chamber **6**. One or more of the processes described herein can be performed, e.g., by at least one computing device, such as control system **8**, as described herein. In other cases, one or more of these processes can be performed according to a computer-implemented method. In still other embodiments, one or more of these processes can be performed by executing computer program code (e.g., control system **8**) on at least one computing device, causing the at least one computing device to perform a process, e.g., controlling operation of pipetting chamber **4** and/or storage chamber **6**.

(29) In any event, control system **8** (e.g., at least one computing device) can comprise one or more general purpose computing articles of manufacture (e.g., computing devices) capable of executing program code installed thereon. As used herein, it is understood that "program code" means any collection of instructions, in any language, code or notation, that cause a computing device having an information processing capability to perform a particular function either directly or after any combination of the following: (a) conversion to another language, code or notation; (b) reproduction in a different material form; and/or (c) decompression. To this extent, control system **8** can be embodied as any combination of system software and/or application software. In any event, the technical effect of control system **8** is to control operation of pipetting chamber **4** and/or storage chamber **6**.

(30) Further, control system **8** can be implemented using a set of modules. In this case, a module can enable control system **8** to perform a set of tasks used by control system **8**, and can be separately developed and/or implemented apart from other portions of control system **8**. Control system **8** may include modules which comprise a specific use machine/hardware and/or software. Regardless, it is understood that two or more modules, and/or systems may share some/all of their respective hardware and/or software. Further, it is understood that some of the functionality discussed herein may not be implemented or additional functionality may be included as part of control system **8**.

(31) When control system **8** comprises multiple computing devices, each computing device may have only a portion of control system **8** embodied thereon (e.g., one or more modules). However, it is understood that control system **8** (and its computing device(s)) are only representative of various possible equivalent computer systems that may perform a process described herein. To this extent, in other embodiments, the functionality provided by computing device and control system **8** can be at least partially implemented by one or more computing devices that include any combination of general and/or specific purpose hardware with or without program code. In each embodiment, the hardware and program code, if included, can be created using standard engineering and programming techniques, respectively.

(32) Regardless, when control system **8** includes multiple computing devices, the computing devices can communicate over any type of communications link. Further, while performing a process described herein, control system **8** can communicate with one or more other computer systems using any type of communications link. In either case, the communications link can comprise any combination of various types of wired and/or wireless links; comprise any combination of one or more types of networks; and/or utilize any combination of various types of transmission techniques and protocols.

(33) As discussed herein, control system **8** enables control of pipetting chamber **4** and/or storage chamber **6**. Control system **8** may include logic for performing one or more actions described herein. In one embodiment, control system **8** may include logic to perform the above-stated functions. Structurally, the logic may take any of a variety of forms such as a field programmable gate array (FPGA), a microprocessor, a digital signal processor, an application specific integrated circuit (ASIC) or any other specific use machine structure capable of carrying out the functions described herein. Logic may take any of a variety of forms, such as software and/or hardware. However, for illustrative purposes, control system **8** and logic included therein will be described herein as a specific use machine. As will be understood from the description, while logic is illustrated as including each of the above-stated functions, not all of the functions are necessary according to the teachings of the invention as recited in the appended claims.
(34) In various embodiments, components described as being "coupled" to one another can be joined along one or more interfaces. In some embodiments, these interfaces can include junctions between distinct components, and in other cases, these interfaces can include a solidly and/or integrally formed interconnection. That is, in some cases, components that are "coupled" to one another can be simultaneously formed to define a single continuous member. However, in other embodiments, these coupled components can be formed as separate members and be subsequently joined through known processes (e.g., fastening, ultrasonic welding, bonding).
(35) When an element or layer is referred to as being "on", "engaged to", "connected to" or "coupled to" another element or layer, it may be directly on, engaged, connected or coupled to the other element or layer, or intervening elements or layers may be present. In contrast, when an element is referred to as being "directly on," "directly engaged to", "directly connected to" or "directly coupled to" another element or layer, there may be no intervening elements or layers present. Other words used to describe the relationship between elements should be interpreted in a like fashion (e.g., "between" versus "directly between," "adjacent" versus "directly adjacent," etc.). As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.
(36) The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the disclosure. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.
(37) This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

Claims

1. A system comprising: a pipetting chamber; a set of pipettor cartridges docked in the pipetting chamber; a carrier configured to transport in X, Y and Z directions each pipettor cartridge of the set of pipettor cartridges to a pipetting location within the pipetting chamber; a tray dock movably mounted within the pipetting chamber, the tray dock including more than one tray dock sections each being separate and distinct from each other so as to provide different pipetting trays or other

liquid trays at the pipetting location; and a robotic arm connected to the pipetting chamber and the robotic arm is configured to move the different pipetting trays, and the other liquid trays, to and from the pipetting chamber, wherein the robotic arm is configured to operably communicate with a first at least one supply system to transfer the different pipetting trays and other liquid trays between the first at least one supply system and pipetting chamber.
2. The system according to claim 1, wherein each of the more than one tray dock sections is configured for docking with a different corresponding one of the different pipetting trays or other liquid trays.
3. The system according to claim 1, further comprising a tray storage integral with the pipetting chamber.
4. The system according to claim 3, wherein the robotic arm is configured to transfer the different pipetting trays, and other liquid trays, between the first at least one supply system, and at least one of the pipetting chamber and the tray storage.
5. The system according to claim 3, wherein the robotic arm is configured to transfer the different pipetting trays, and other liquid trays, between at least one of the pipetting chamber and the tray storage and the first at least one supply system.
6. The system according to claim 1, wherein the robotic arm is configured to operably communicate with a second at least one supply system.
7. The system according to claim 6, wherein the robotic arm is configured to transfer the different pipetting trays, and other liquid trays, between the first at least one supply system, and at least one of the pipetting chamber, the tray storage and the second at least one supply system.
8. A method comprising: providing a pipetting chamber; providing a set of pipettor cartridges docked in the pipetting chamber; providing a carrier for transporting, in the X, Y and Z directions, each pipettor cartridge of the set of pipettor cartridges to a pipetting location within the pipetting chamber; providing a tray dock movably mounted within the pipetting chamber, the tray dock including more than one tray dock sections each being separate and distinct from each other so as to provide different pipetting trays or other liquid trays at the pipetting location; and effecting, with a robotic arm connected to the pipetting chamber, moving of the different pipetting trays, and the other liquid trays, to and from the pipetting chamber, wherein the robotic arm operably communicates with a first at least one supply system to transfer the different pipetting trays and other liquid trays between the first at least one supply system and pipetting chamber.
9. The method of claim 8, wherein each of the more than one tray dock sections is configured for docking with a different corresponding one of the different pipetting trays or other liquid trays.
10. The method of claim 8, further comprising a tray storage integral with the pipetting chamber.
11. The method of claim 10, wherein the robotic arm is configured to transfer the different pipetting trays, and other liquid trays, between the first at least one supply system, and at least one of the pipetting chamber and the tray storage.
12. The method of claim 10, wherein the robotic arm is configured to transfer the different pipetting trays, and other liquid trays, between at least one of the pipetting chamber and the tray storage and the first at least one supply system.
13. The method of claim 8, further comprising a second at least one supply system.
14. The method of claim 13, wherein the robotic arm is configured to transfer the different pipetting trays, and other liquid trays, between the first at least one supply system, and at least one of the pipetting chamber, the tray storage and the second at least one supply system.
15. A system comprising: a pipetting chamber; a set of pipettor cartridges docked in the pipetting chamber; a gantry system mounted on a ceiling within the pipetting chamber, the gantry system including: at least one stationary track aligned in a first direction, and a movable track aligned in a second direction distinct from the first direction, the movable track coupled to the at least one stationary track; and a carrier configured to transport each pipettor cartridge of the set of pipettor cartridges to a pipetting location within the pipetting chamber, the carrier configured to move each

pipettor cartridge in a third direction perpendicular to both the first and second directions; a tray dock movably mounted within the pipetting chamber, the tray dock including more than one tray dock sections each being separate and distinct from each other so as to provide different corresponding pipetting trays or at least one set of pipettes at the pipetting location; and a robotic arm connected to the pipetting chamber, configured to move the different corresponding pipetting trays, and the other liquid trays, to and from the pipetting chamber, wherein the robotic arm is configured to operably communicate with at least one supply system to transfer the different corresponding pipetting trays and other liquid trays between the at least one supply system and pipetting chamber.

16. The system of claim 15, wherein the at least one set of pipettes is disposed on one of the tray dock sections at the pipetting location in place of one of the different corresponding pipetting trays.

17. The system of claim 15, further comprising a tray storage integral with the pipetting chamber.

18. The system of claim 17, wherein the robotic arm is configured to transfer the different corresponding pipetting trays, and other liquid trays, between the at least one supply system, and at least one of the pipetting chamber and the tray storage.

19. The system of claim 15, further comprising a storage chamber coupled to the pipetting chamber, the storage chamber for storing the different corresponding pipetting trays.

20. The system of claim 19, wherein the storage chamber includes a storage carousel for storing the different corresponding pipetting trays.
