United States Patent Application Publication	20250258190
Kind Code	A1
Publication Date	August 14, 2025
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MULTIPLE LANE EXTRACTION DRAWER AND PLATE SEALER

Abstract

An automated analyzer can include a plate sealer and a drawer assembly. The plate sealer can include a heated press plate configured to apply heat and pressure to a seal material, wherein the seal material is configured to seal against a top surface of an amplification plate. The plate sealer can include a knife assembly configured to cut the seal material, wherein the heated press plate and the knife assembly are configured to be lowered simultaneously to cut and seal the seal material. The drawer assembly can include a two lane drawer comprising a pipette tip station configured to house two pipette tip holders, an extraction container station configured to house two extraction container holders, and an amplification plate station configured to house two amplification plates. The drawer assembly can include an extractor module positioned relative to the extraction container station, wherein the extractor module comprises magnets configured to apply a magnetic field to extraction container holders of the two extraction container holders.

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Family ID: **1000008577670**

Appl. No.: **19/196151**

Filed: **May 01, 2025**

Related U.S. Application Data

parent US continuation PCT/US2023/078313 20231101 PENDING child US 19196151
us-provisional-application US 63422742 20221104
us-provisional-application US 63585895 20230927

Publication Classification

Int. Cl.: **G01N35/04** (20060101); **G01N35/00** (20060101)

U.S. Cl.:

CPC **G01N35/04** (20130101); **G01N35/0099** (20130101); G01N2035/0403 (20130101)

Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS [0001] This application is a continuation of International Application No. PCT/US2023/078313, filed Nov. 1, 2023, which claims the benefit of U.S. Provisional Application No. 63/422,742, filed Nov. 4, 2022, and U.S. Provisional Application No. 63/585,895, filed Sep. 27, 2023, all of which are hereby incorporated by reference in their entirety.

BACKGROUND
Field
[0002] The technology described herein generally relates to an automated diagnostic analyzer including components thereof. In some aspects, the technology more particularly relates to a multiple lane extraction drawer. In some aspects, the technology relates to a plate sealer.
Description of the Related Art
[0003] Diagnostic testing of biological samples is instrumental in the health care industry's efforts to quickly and effectively diagnose and treat disease. Clinical laboratories that perform such diagnostic testing already receive hundreds or thousands of samples on a daily basis with an ever increasing demand. The challenge of managing such large quantities of samples has been assisted by the automation of sample analysis. Automated sample analysis is typically performed by automated analyzers that are commonly self-contained systems which perform multistep processes on the biological samples to obtain diagnostic results.
[0004] Several current automated clinical analyzers offer a user an array of automated tests or assays that can be performed on a provided sample. Additionally, when samples arrive at the laboratory, they are often not ready for analysis. In order to prepare a sample for testing with an automated analyzer, a lab technician typically transfers an aliquot of the sample from a primary container, as received by the laboratory, to a secondary container which is amenable to the analyzer. In addition, the technician typically must know what tests are to be performed on the sample so that the technician can select a test specific reagent or diluent to be paired with the sample. This can be time consuming and can lead to operator error and exposure to communicable diseases.
[0005] Pre-analytical systems meant to help prepare a sample for analysis and further remove the operator from the workflow between the laboratory's receipt of a sample and the analyzer's test results also exist. However, many of these systems still require significant technician involvement, such as: prior to loading samples in the pre-analytical system; after the samples have been prepared by the pre-analytical system; and after the analyzers have completed analysis.
[0006] For example, some pre-analytical systems may automatically transfer an aliquot of sample from a first container to a second container. However, such systems often require a technician to manually match identification codes of the first and second containers prior to loading them into the system, which can be time consuming and is prone to error.
[0007] In addition, many of these systems are not capable of being integrated with one or more analyzers, and, conversely, the analyzers are not capable of being integrated with such systems. In this regard, a technician must be present to manually transfer the samples from the pre-analytical

system to an analyzer and from the analyzer to a storage location once analysis is complete. This requires skilled labor to perform menial tasks and can create distractions in that the technician must be ever mindful of the progress of the samples within the pre-analytical system and analyzer so that the technician is prepared to transfer samples when ready in order to minimize downtime.

[0008] Moreover, current pre-analytical systems generally prepare samples at different rates than the analyzers evaluate such samples. This further complicates the integration between pre-analytical systems and analyzers. In this regard, a technician may be required to continuously keep track of samples prepared by the pre-analytical system until a full batch of samples is accumulated for manual transfer to an analyzer. Alternatively, technicians may transfer partial batches to an analyzer, which can reduce the analyzer's productivity.

[0009] Thus, while current automated pre-analytical systems and analyzers are beneficial to the clinical laboratory, there is room for better integration and automation of various systems.

SUMMARY

[0010] The present disclosure describes devices, systems, and methods for sample processing and analysis.

[0011] In some embodiments, a plate sealer is provided. The plate sealer can include a heated press plate configured to apply heat and pressure to a seal material. In some embodiments, the seal material is configured to seal against a top surface of an amplification plate. The plate sealer can include a knife assembly configured to cut the seal material. In some embodiments, the heated press plate and the knife assembly are configured to be lowered simultaneously to cut and seal the seal material.

[0012] In some embodiments, the plate sealer can include a roll of the seal material. In some embodiments, the plate sealer can include a rear clamp assembly and a front clamp assembly, wherein the rear clamp assembly and the front clamp assembly are configured to clamp the material when the heated press plate and the knife assembly are lowered. In some embodiments, the plate sealer can include a feed plate configured to advance the seal material. In some embodiments, the plate sealer can include a motor assembly configured to raise and lower the heated press plate and the knife assembly. In some embodiments, the plate sealer can include the amplification plate. In some embodiments, the plate sealer can include a multifunctional robot configured to position the amplification plate. In some embodiments, the plate sealer can include a movable platform configured to receive the amplification plate. In some embodiments, the plate sealer can include a hinged door.

[0013] In some embodiments, a two lane drawer assembly is provided. The two lane drawer assembly can include a two lane drawer. The two lane drawer can include a pipette tip station configured to house two pipette tip holders. The two lane drawer can include an extraction container station configured to house two extraction container holders. The two lane drawer can include an amplification plate station configured to house two amplification plates. The two lane drawer assembly can include an extractor module positioned relative to the extraction container station. In some embodiments, the extractor module comprises magnets configured to apply a magnetic field to extraction container holders of the two extraction container holders.

[0014] In some embodiments, the extractor module is configured to process samples from the two extraction container holders simultaneously. In some embodiments, the extractor module is configured to move up and down relative to the two extraction container holders. In some embodiments, the extractor module is configured to move up and down along one or more rails. In some embodiments, the two lane drawer comprises a retention feature configured to extend over a portion of the pipette tip station and the extraction container station. In some embodiments, the two lane drawer comprises a latching mechanism comprising a push-to-close latch. In some embodiments, the two lane drawer comprises a kick-out mechanism configured to facilitate the sliding extension of the two lane drawer. In some embodiments, the two lane drawer comprises telescoping slides. In some embodiments, the two lane drawer assembly comprises the two pipette

tip holders, the two extraction container holders, and the two amplification plates. In some embodiments, the two lane drawer assembly comprises three of the two lane drawers. In some embodiments, the two lane drawer assembly comprises a tip drawer configured to house five pipette tip holders.

[0015] In some embodiments, a plate sealer for use in a diagnostic testing apparatus is provided. The plate sealer can include a heated press plate configured to apply heat and pressure to a seal material. In some embodiments, the seal material is configured to seal against a top surface of an amplification plate. In some embodiments, the amplification plate comprises a plurality of wells that define amplification compartments for amplification. The plate sealer can include a knife assembly configured to cut the seal material. In some embodiments, the heated press plate and the knife assembly are configured to be lowered simultaneously relative to the amplification plate to cut the seal material and seal the seal material to the amplification plate.

[0016] In some embodiments, the plate sealer can include a roll of the seal material. In some embodiments, the plate sealer can include a rear clamp assembly and a front clamp assembly, wherein the rear clamp assembly and the front clamp assembly are configured to clamp the seal material when the heated press plate and the knife assembly are lowered. In some embodiments, the plate sealer can include a feed plate configured to advance the seal material. In some embodiments, the plate sealer can include a motor assembly configured to raise and lower the heated press plate and the knife assembly. In some embodiments, the plate sealer can include the amplification plate. In some embodiments, the plate sealer can include a multifunctional robot configured to position the amplification plate. In some embodiments, the plate sealer can include a movable platform configured to receive the amplification plate. In some embodiments, the plate sealer can include a hinged door.

[0017] In some embodiments, a two lane drawer assembly is provided. The two lane drawer assembly can include a two lane drawer. The two lane drawer can include a pipette tip station configured to house two pipette tip holders. The two lane drawer can include an extraction container station configured to house two extraction container holders. The two lane drawer can include an amplification plate station configured to house two amplification plates. The two lane drawer assembly can include an extractor module positioned relative to the extraction container station. In some embodiments, the extractor module comprises magnets configured to apply a magnetic field to extraction container holders of the two extraction container holders.

[0018] In some embodiments, the extractor module is configured to process samples from the one extraction container holder. In some embodiments, the extractor module is configured to move up and down relative to the two extraction container holders. In some embodiments, the extractor module is configured to move up and down along one or more rails. In some embodiments, the two lane drawer comprises a retention feature configured to extend over a portion of the pipette tip station and the extraction container station. In some embodiments, the two lane drawer comprises a latching mechanism comprising a push-to-close latch. In some embodiments, the two lane drawer comprises a kick-out mechanism configured to facilitate the sliding extension of the two lane drawer. In some embodiments, the two lane drawer comprises telescoping slides. In some embodiments, the two lane drawer assembly can include the two pipette tip holders, the two extraction container holders, and the two amplification plates. In some embodiments, the two lane drawer assembly can include three of the two lane drawers. In some embodiments, the two lane drawer assembly can include a tip drawer configured to house five pipette tip holders.

Description

BRIEF DESCRIPTION

[0019] FIG. **1** is a front perspective view of a high-throughput diagnostic system according to an

embodiment of the present disclosure.
[0020] FIG. **2** is a front perspective view of an analyzer of the high-throughput diagnostic system of FIG. **1** absent an external housing.
[0021] FIG. **3** is another front perspective view of the analyzer of FIG. **2**.
[0022] FIG. **4**A-**4**F are views of a processing deck of the analyzer of the high-throughput diagnostic system of FIG. **1**, and components thereof.
[0023] FIGS. **5**A-**5**C are views of an embodiment of a two lane drawer and extractor according to the present disclosure.
[0024] FIGS. **6**A-**6**C are view of the two lane drawer of FIG. **5**A in relation to the analyzer according to the present disclosure.
[0025] FIG. **7** is a view of an embodiment of a two lane drawer according to the present disclosure.
[0026] FIG. **8** is a view of an embodiment of a three lane drawer according to the present disclosure.
[0027] FIGS. **9**A-**9**B are views of an embodiment of a six lane drawer and a stationary retention housing according to the present disclosure.
[0028] FIGS. **10**A-**10**C are views of an extractor scissor lift according to the present disclosure.
[0029] FIG. **11** is a view of an extractor pusher according to the present disclosure.
[0030] FIGS. **12**A-**12**E are views of a plate sealer according to the present disclosure.

DETAILED DESCRIPTION

[0031] Embodiments of the present disclosure provide devices, systems, and methods capable of processing a sample. In some embodiments, a multi-lane drawer is provided which hold consumables used during processing, such as two or more pipette tip holders, two or more extraction container holders, and two or more amplification plates. An embodiment includes one or more extractor modules configured to apply a magnetic field to extraction containers within the multi-lane drawer. In some embodiments, a plate sealer is provided which seals an amplification plate for processing. As described herein, the multi-lane drawer and the plate sealer can be components of a high-throughput system configured to process a plurality of a samples while reducing technician involvement. The systems described herein can prepare samples for analysis, while automating one or more steps between the receipt of the sample to producing test results.
[0032] FIG. **1** depicts a high-throughput system **00** according to an embodiment of the present disclosure. The high-throughput system **00** can include a first analyzer **2000**. The high-throughput system **00** can include a second analyzer **4000**. The high-throughput system **00** can include any number of analyzers. The high-throughput system **00** can include pre-analytical system **10**. The analyzers **2000**, **4000** and pre-analytical system **10** are modular such that they can be physically connected and disconnected from one another. The analyzers **2000**, **4000** and pre-analytical system **10** are modular such that they can be electronically connected and disconnected from one another. In some embodiments, the analyzers **2000**, **4000** can have the same configuration. The analyzers **2000**, **4000** can have the same function. The analyzers **2000**, **4000** can be duplicates of each other. The pre-analytical system **10** can couple to at least two of the same analyzers. In some embodiments, the analyzers **2000**, **4000** can have a different configuration. The analyzers **2000**, **4000** can have a different function. The analyzers **2000**, **4000** can perform different operations. The analyzers **2000**, **4000** can analyze different assays. The pre-analytical system **10** can couple to at least two different analyzers. The modularity of pre-analytical system **10** allows it to couple to any analyzer so configured. As shown, the first and second analyzers **2000**, **4000** are disposed at opposite sides of pre-analytical system **10** in a linear arrangement. In other embodiments, the pre-analytical system **10** can be disposed at one end of the high-throughput system **00**. The pre-analytical system **10** and analyzers **2000**, **4000** can be arranged in any physical arrangement. The analyzer **4000** can be coupled to either side of pre-analytical system **10**.
[0033] The pre-analytical system **10** can include a sample container shuttle transport assembly **4250**, shown in FIG. **4**A. The sample container shuttle transport assembly **4250** can transfer a

sample container to one or more analyzers **2000**, **4000**. The sample container shuttle transport assembly **4250** of pre-analytical system **10** can extend toward analyzer **4000** when analyzer **4000** is located to the left of system **10** (exemplified in FIG. **1**). In other embodiments, the sample container shuttle transport assembly **4250** of pre-analytical system **10** can extend toward analyzer **4000** where analyzer **4000** is located to the right of system **10**. In some embodiments, the sample container shuttle transport assembly **4250** ends at the threshold of the analyzers **2000**, **4000**. In other embodiments, the sample container shuttle transport assembly **4250** extends into the analyzers **2000**, **4000**. The analyzer **2000**, **4000** can have a conveyor that can continue the path of a respective shuttle transport assembly **4250** into analyzer **2000**, **4000**. The sample container shuttle transport assembly **4250** can be a rack or carrier structure with a plurality of receptacles, each receptacle sized and configured to receive a sample container. The sample container shuttle transport assembly **4250** can include an actuator which causes movement of the rack or carrier structure. The high-throughput system **00** can include an opening **120** to receive the rack or carrier structure with the plurality of sample containers. The analyzers **2000**, **4000** can include one or more submodules **2110**, **2120**, **2130**. These submodules can be the same or different from each other.

[0034] The high-throughput system **00** can include an overall system display interface **1332**. Data can be entered and viewed through a graphical user interface ("GUI") which may be displayed on the display interface **1332**. Data can be entered and viewed through a graphical user interface which is specifically associated with analyzer **2000**, **4000**. Data can also be entered from a vision system of a multipurpose robot. Data can also be entered from scanners within pre-analytical system **10**. Data can also be obtained by sensors, such as door sensors, to obtain information regarding certain conditions and activities occurring within analyzer **2000**, **4000**. Data can also be obtained by sensors, such as temperature sensors, to obtain information regarding certain conditions and activities occurring within analyzer **2000**, **4000**. Data can also be obtained about the location of one or more consumables. Data can also be obtained about the location of the sample container.

[0035] The pre-analytical system **10** can be an automated system for pre-analytical processing of sample to be assayed. The analyzer **2000**, **4000** can be a modular system that is configured to operate in cooperation with the pre-analytical system **10**. The analyzer **2000**, **4000** can be configured for modular connectivity to the pre-analytical system **10**. The analyzer **2000**, **4000** can be configured for high-throughput processing and analysis of samples. The analyzer **4000** is described in greater detail below. The analyzer **2000** can include any of the features described herein.

[0036] FIGS. **2** and **3** show the analyzer **4000**. The analyzer **4000** can include a structural frame **4011** comprised of several support components. The support components can be segments of metal tubing, as an example. The frame **4011** is configured to support and define various decks or levels for sample processing and analysis. The decks can include a supplementary deck **4012**. The decks can include a processing deck **4014**. The decks can include a multipurpose robot deck **4016**. The analyzer **4000** can include a housing or shell that surrounds the frame **4011**. The housing is shown in FIG. **1**. The analyzer **4000** can include two detectors **4260***a*, **4260***b*. The detectors **4260***a*, **4260***b* can be located at opposite ends of analyzer **4000**. The detectors **4260***a*, **4260***b* can have cavities that face the center of analyzer **4000**. The detectors **4260***a*, **4260***b* can have a housing that receives a sealed amplification plate **4040**, shown in FIG. **4**F. The detectors **4260***a*, **4260***b* can have a thermocycler that is used to amplify a target analyte within the sealed amplification plate **4040**. The detectors **4260***a*, **4260***b* can detect the target analyte using a set of illuminators, for example LED lights. The analyzer **4000** can include a plate sealer **4220**. The plate sealer **4220** can seal the amplification plate **4040**. The analyzer **4000** can include waste **4004** to dispose of the amplification plate **404**. The analyzer **4000** can include a liquid waste repository that receives all liquid waste of the analyzer **4000**. The analyzer can include a multipurpose robot **4300**.

[0037] FIGS. **4**A and **4**B depict the processing deck **4014**. The detectors **4260***a*, **4260***b* are shown

in relation to the processing deck **4014**. The sample container shuttle transport assembly **4250** is also shown, which can transport sample containers into the analyzer **4000**. The processing deck **4014** can include one or more consumable drawers **4120**. In the illustrated embodiments, six consumable drawers **4120** are shown. The processing deck **4014** can include any number of drawers including one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, or any range of two of the foregoing values. Each drawer **4120** includes a single lane of consumables. Each drawer **4120** can hold a pipette tip holder **4060**. Each drawer **4120** can hold an extraction container **4020**. Each drawer **4120** can hold an amplification plate **4040**. In the embodiment depicted, the processing deck **4014** includes six consumable drawer assemblies **4120**. Each drawer **4120** can house the majority of the consumables utilized in an assay workflow.

[0038] The processing deck **4014** can include the plate sealer **4220**. The plate sealer **4220** can have a moveable platform **4224** that receives an amplification plate **4040** and moves the amplification plate **4040** into the plate sealer **4220**. The processing deck **4014** can include one or more orbital shakers **4230**. The orbital shakers **4230** can oscillate one or more sealed amplification plates **4040** in a circular motion to fully rehydrate a dried reagent with an eluted sample within the compartments of the sealed amplification plate **4040**. The processing deck **4014** can include reagent trough assemblies **4050**. The reagent trough assembly **4050** can include troughs that house bulk reagents. The processing deck **4014** can include one or more piercing tools **4240**. The piercing tool **4240** can be shaped to puncture the heavy duty seal of the reagent trough assembly **4050**. The piercing tool **4240** sits within respective nests or carriers **4270**, **4280** toward the center rear of processing deck **4014** until they are used to puncture a reagent trough assembly **4050**. The processing deck **4014** can include one or more waste chutes **4210**. The waste chutes **4210** can extend through processing deck **4014**. The waste chutes **4210** can receive used amplification plates **4040**. The processing deck **4014** can include a tip drawer **4110**. The tip drawer **4110** can house one or more pipette tip holders **4060**. In the illustrated embodiments, the tip drawer **4110** can hold five pipette tip holders **4060**.

[0039] FIG. **4**C depicts a side perspective view of the drawer **4120**. The drawer **4120** can include a housing **4122**. The drawer **4120** can include a pipette tip station **4124**. The drawer **4120** can include an extraction container station **4126**. The drawer **4120** can include an amplification plate station **4128**. The stations **4124**, **4126**, **4128** can be linearly arranged. The pipette tip station **4124** can be near the front of the drawer **4120**. The extraction container station **4126** can be between the pipette tip station **4124** and the amplification plate station **4128**. The amplification plate station **4128** can be near the rear of the drawer **4120**. The drawer **4120** can include other arrangements of the pipette tip station **4124**, the extraction container station **4126**, and the amplification plate station **4128**. The pipette tip station **4124** can be configured to hold the pipette tip holder **4060**. The extraction container station **4126** can be configured to hold the extraction container holder **4020**. The amplification plate station **4128** can be configured to hold the amplification plate **4040**. The drawer **4120** can be considered a one lane drawer. The drawer **4120** can hold a single pipette tip holder **4060**. The drawer **4120** can hold a single extraction container holder **4020**. The drawer **4120** can hold a single amplification plate **4040**.

[0040] The drawer **4120** can be configured to include an extractor module **4125**. The extractor module **4125** can be disposed within the housing **4122** of the drawer **4120**. The extractor module **4125** can include one or more magnets. The magnets can be mounted to a plate or platform of the extractor module **4125**. The magnets can be mounted in horizontal rows. The magnets can be disposed on either side of the extraction containers within the extraction container holder **4020**. The extractor module **4125** can provide a movable magnetic field that is utilized to extract polynucleotides, such as DNA, from the samples. The extractor module **4125** can be housed in the consumable drawer **4120** beneath extractor container station **4126**. The extractor module **4125** can be selectively moveable in an up-down direction along one or more rails **4127**. The rails **4127** can be disposed on one or more sidewalls separating compartments beneath each of stations **4124**, **4126**

and **4128**. The extractor module **4125** is in an up or extraction position in FIG. **4**C. The extractor module **4125** can be lowered by movement along the rails **4127**.

[0041] The drawer **4120** can include a hinged retention feature **4121**. The retention feature **4121** can rotate about a hinge **4123**. The retention feature **4121** can be a spring-loaded arm. The retention feature **4121** can be hingedly connected to housing **4122**. The retention feature **4121** can be connected immediately behind the extraction container station **4126**. The retention feature **4121** can have a retention position and consumable replacement position. In the retention position, as shown in FIG. **4**C, the retention feature **4121** extends over the pipette tip station **4124** and the extraction container station **4126**. The retention feature **4121** can include an opening allowing access to the pipettes within the pipette tip holder **4060**. The retention feature **4121** can include an opening allowing access to the extraction containers within the extraction container holder **4020**. In this position, the retention feature **4121** is configured to encompass the perimeter of the pipette tip holder **4060** located in the pipette tip station **4124**. In this position, the retention feature **4121** is configured to encompass the perimeter of the extraction container holder **4020** located in the extraction container station **4126**. The retention feature **4121** encompasses the perimeters while allowing access thereto via openings in retention feature **4121**. The retention feature **4121** secures the edges of the pipette tip holder **4060**. The retention feature **4121** secures the edges of the extraction container holder **4020**. The retention feature **4121** limits or prevents the extraction container holder **4020** and the pipette tip holder **4060** from being inadvertently moved during operation. The retention feature **4121** limits or prevents liftoff during pipetting operations. When the consumables in the drawer **4120** need to be replaced, the drawer **4120** can be extended from the front of the analyzer **4000**. In some embodiments, a feature configured to lock the retention feature **4121** in the retention position is released when the drawer **4120** is extended. Under the bias of a torsion spring located within hinge **4123**, the retention feature **4121** rotates about hinge **4123** to the consumable replacement position which provides clearance for a user to replenish consumables within the drawer **4120**.

[0042] Referring back to FIG. **4**A, the drawers **4120** sit at the front of analyzer **4000**. The drawers **4120** can be disposed between the detectors **4260***a*, **4260***b*. The drawers **4120** can include a visual indicator, such as a colored LED, on a front end thereof that indicates status of the drawer **4120** to a user. The visual indicator can let a user know that the drawer **4120** is currently being used. The visual indicator can let a user know that the drawer **4120** is ready to be used. The visual indicator can let a user know that the drawer **4120** needs replenishing with consumables.

[0043] FIGS. **4**D-**4**E show the extraction container holder **4020**. The extraction container holder **4020** can be a multi-layer structure. The extraction container holder **4020** can include a lower portion **4025** with a plurality of openings **4029**. The lower portion **4025** can include one or more features **4028**. The features **4028** on sidewalls **4027** of the lower portion **4025** can provide an interference fit with features on the drawer **4120** of analyzer **4000**. The extraction container holder **4020** can include a plurality of extraction containers **4026**. The extraction containers **4026** can be connected via one or more foil strips **4023**. The foil strip **4023** is penetrable with a pipette tip prior to the addition of a sample. Each extraction container **4026** may contain Ferric Oxide (“FOX”) particles to extract polynucleotides such as DNA from samples. The extraction container holder **4020** can include an upper portion **4022** with a plurality of openings **4021**. The strip **4023** can be aligned within the openings **4021**. The upper portion **4022** can include one or more ribs **4024**. The ribs **4024** can extend in a direction transverse to the foil strips **4023** of the extraction containers **4026**. The ribs **4024** can provide structural stiffness to extraction container holder **4020**. The lower portion **4025** allows the extraction containers **4026** to partially extend there through. The extraction containers **4026** extend through the extraction container holder **4020** to allow processing by the extractor module **4125**. A barcode can be located on upper portion **4022** which helps track information such as lot, expiration date, and serial number of the contents of the extraction containers **4026**. The extraction container holder **4020** can be assembled with enough extraction

containers **4026** to perform a single run. In the embodiment depicted, the extraction container holder **4020** can house **32** extraction containers **4026**. The extraction containers **4026** can be arranged along four foil strips **4023**. The extraction containers **4026** can be arranged in a grid.
[0044] The pipette tips are provided in the pipette tip holder **4060**. The pipette tip holder **4060** can be configured to house **96** pipette tips. The pipette tips can be arranged in a grid. In some embodiments of the analyzer **4000**, four 1000-μL tips are used to process each sample. In addition, a single reagent pipette tip can be used with each batch of samples. This helps reduce the number of tips utilized as the reagent pipette tip does not come into direct contact with samples.
[0045] FIG. **4**F shows the amplification plate **4040**. The amplification plate **4040** can include a plate body **4041**. The plate body **4041** can include one or more engagement openings **4044***a*, **4044***b* that extend into respective sides **4042***a*, **4042***b* of the body **4041**. The engagement openings **4044***a*, **4044***b* can allow a gripper of the multipurpose robot **4300** to engage amplification plate assembly **4040** from opposing sides thereof. For example, the openings **4044***a* extend through the side **4042***a* and a side directly opposite that of the side **4042***a*. In addition, the openings **4044***b* extend through the side **4042***b* and through a side directly opposite that of the side **4042***b*. These openings allow the multipurpose robot **4300** to grip and lift the amplification plate **4040** while the amplification plate **4040** is in different orientations. The plate body **4041** can include a plurality of wells that define amplification compartments **4045**. The compartments **4054** can be provided with dried reagents that are utilized for amplification of a target. The amplification plate **4040** can have a visual identification of the reagents contained in compartments **4045** of the amplification plate **4040**, such as a color coding.
[0046] When each drawer **4120** is extend from the analyzer **4000**, the user removes and replaces the used amplification container holders **4020** and empty tip holders **4060**. The user also adds an unused amplification plate **4040** to the drawer **4120**. Once drawer **4120** is reinserted, the instrument **00** can inventory that particular drawer **4120** to check for loading errors. The instrument **00** can be updated to indicate the drawer **4120** as ready for an extraction.
[0047] Referring back to FIG. **4**A, the processing deck **4014** also includes the tip drawer **4110**. The tip drawer **4110** can configured to hold one or more pipette tip holders **4060**. The tip drawer **4110** can house five pipette tip holder **4060**. Each pipette tip holder **4060** can be a 96-well tip carrier. The tip drawer **4110** can be similarly constructed to the drawers **4120** in that it includes visual indicators on a front end thereof. The pipette tip holders **4060** in the tip drawer **4110** can provide the pipette tip utilized for each sample extraction conducted in the consumable drawers **4120**, along with reagent tips and any excess tips that may be needed due to pick-up failures or clogs. The tip drawer **4110** can be disposed to the left of the consumable drawers **4120**.
[0048] These drawers **4110**, **4120** can be accessed from the front of analyzer **4000** by a user. The access to the drawers **4110**, **4120** can be automated. The tip drawer **4110** can be automatically locked or unlocked by analyzer **4000**. The tip drawer **4110** can be locked or unlocked depending on the present status of the tip drawer **4110**. The tip drawer **4110** can be locked or unlocked depending on the present status of the analyzer **4000**. Each drawer **4120** can be automatically locked or unlocked by analyzer **4000**. Each drawer **4120** can be locked or unlocked depending on the present status of the drawer **4110**. Each drawer **4120** can be locked or unlocked depending on the present status of the analyzer **4000**. The tip drawer **4110** and the one or more drawers **4120** can be locked and unlocked simultaneously. The tip drawer **4110** and the one or more drawers **4120** can be locked and unlocked independently. The drawer **4110**, **4120** can include a latching feature that locks the drawer **4110**, **4120** in the fully open position. The drawer **4110**, **4120** can include a latching feature that locks the drawer **4110**, **4120** in the fully closed position. The drawer **4110**, **4120** can include a latching feature that locks the drawer **4110**, **4120** in both the fully open position and the fully closed position. The latching mechanism can be a push-to-close latch. The latching mechanism can be fully closed by a simple push or other action of the user. The latching mechanism can be spring loaded. The latching mechanism can hold the drawer **4110**, **4120** securely within the analyzer **4000**.

The latching mechanism can be built-in. The latching mechanism can include a trigger that is biased toward a locking configuration. The trigger can be depressed to unlock the drawer. The trigger can be depressed automatically by a module of the analyzer **400**. The trigger can be depressed by a user. The drawer **4120** can be considered a single lane drawer. The drawer **4120** can include one latching mechanism to lock and unlock the drawer **4120**.

[0049] Referring back to FIG. **2**, the supplementary deck **4012** is disposed adjacent the bottom of analyzer **4000** and is located beneath processing deck **4014**. The supplementary deck **4012** houses electronic components and waste repositories. For example, supplementary deck **4012** can include the liquid waste repository **4002** that receives and houses all liquid waste, such as from the extraction containers **4026** during extraction processes and from the trough assembly **4050** during an emptying process. The supplementary deck **4012** also includes one or more waste repositories **4004** that sit below each of waste chutes **4210** that extend through processing deck **4014**, as shown in FIG. **4**A. For example, a single waste repository **4004** may be located under waste chutes **4210** and may collect all solid waste. In another example, two waste repositories **4004** may be used to collect used pipette tips and used amplification plates **4040**, respectively. Each waste repository **4004** may contain a sensing apparatus for detecting waste level. The sensing apparatus can include an optical or ultrasonic sensor, for example.

[0050] In the embodiment depicted, the processing deck **4014** includes six consumable drawer assemblies **4120**. Each drawer assembly **4120** is a single lane drawer. There are a total of six drawers **4120**. In some cases, this drawer arrangement increases cost and there is a need to reduce costs. In some cases, this drawer arrangement is complex to manufacture or service and there is a need to reduce complexity in manufacturing and service. For example, each drawer **4120** includes its own extractor module **4125**. For another example, each drawer **4120** includes its own latching feature. There is a need to reduce components and thus costs related to the drawer assemblies. The drawers described herein can include any of the features of the drawer **4120**.

[0051] FIGS. **5**A-**5**C are views of an embodiment of a two lane drawer **4130** and corresponding extractor module **4135** according to the present disclosure. The two lane drawer **4130** can include any of the features of the drawer **4120**. The two lane drawer **4130** can include advantageous features. The two lane drawer **4130** can be more cost effective. The two lane drawer **4130** can hold the same number of consumables as two of the drawers **4120**. The two lane drawer **4130** can advantageously have only one extractor module **4135**. The two lane drawer **4130** can advantageously have only one set of telescoping slides to facilitate the movement of the two lane drawer **4130**. The two lane drawer **4130** can advantageously have only one indicator related to the use of the two lane drawer **4130**. The two lane drawer **4130** can advantageously have only one latching feature that prevents withdrawal of the two lane drawer **4130** during use. The two lane drawer **4130** can advantageously have only one retention feature to retain the consumables within the two lane drawer **4130**. Referring back to FIG. **4**A, the analyzer **4000** can include six lanes of consumables with six drawers **4120**, six corresponding extractor modules **4125**, and six corresponding latching mechanisms. With the two lane drawer **4130**, the same analyzer **4000** can hold six lanes of consumables but with only three of the two lane drawers **4130**, three extractor modules **4135**, and three corresponding latching mechanisms. The two lane drawer **4130** can reduce the number of parts. The two lane drawer **4130** can reduce costs. The two lane drawer **4130** can be reduce complexity in manufacturing and servicing. The two lane drawer **4130** does not impact total throughput since the number of consumables is the same, and thus the number of samples processed is the same. The two lane drawer **4130** does not impact customer walk-away time since the number of consumables is the same, and thus the number of samples processed is the same.

[0052] The two lane drawer **4130** is configured to house the majority of the consumables utilized in an assay workflow. The two lane drawer **4130** can include a pipette tip station **4134**. The two lane drawer **4130** can include an extraction container station **4136**. The two lane drawer **4130** can

include an amplification plate station **4138**. The pipette tip station **4134** is configured to hold two pipette tip holders **4060**. The extraction container station **4136** is configured to hold two extraction container holders **4020**. The amplification plate station **4138** is configured to hold two amplification plates **4040**. The two lane drawer **4130** can be configured to hold the same types of consumables described herein. The two lane drawer **4130** can hold twice the number of consumables as the drawer **4120**.

[0053] The stations **4134**, **4136**, **4138** can be arranged linearly. The arrangement can be from front to back, the pipette tip station **4134** in the front, the extraction container station **4136** in the middle, and the amplification plate station **4138** in the back. The two lane drawer **4130** can hold two pipette tip holders **4060** side-by-side in the front. The two lane drawer **4130** can hold two extraction container holders **4020** side-by-side in the middle. The two lane drawer **4130** can hold two amplification plates **4040** side-by-side in the back.

[0054] The arrangement can allow the consumables to interface with other components of the analyzer **4000**. The analyzer **4000** can include three of the two lane drawers **4130**. The two lane drawers **4130** can sit at the front of analyzer **4000** between two detector **4260***a*, **4260***b*. The extraction container station **4136** can facilitate the extraction of polynucleotides from samples. The extraction container station **4136** can be located in relation to the extractor module **4135**. Once extraction is finished, the extracted polynucleotides in the extraction containers **4026** are used to rehydrate a reagent, for example a master mix reagent, in one of the amplification plates **4040** in the amplification plate station **4138**. The amplification plates **4040** can be prepared for amplification, such as PCR. The prepared amplification plates **4040** can be moved to the appropriate reader **4260***a*, **4260***b*. This process can be achieved through use of multifunctional robot **4300**, the plate sealer **4220**, and orbital mixer **4230**. The two lane drawer **4130** can include a visual indicator that indicates the current status of the two lane drawer **4130**.

[0055] The two lane drawer **4130** houses the extractor module **4135** within a housing **4132**. The two lane drawer **4130** can include one extractor module **4135**. In some embodiments, the extractor module **4135** can process samples from two lanes simultaneously. In some embodiments, the extractor module **4135** can process samples from two extraction container holders **4020** simultaneously. In some embodiments, the extractor module **4135** can process twice the number of samples as the extractor module **4125**. The extractor module **4135** can move up and down relative to two extraction container holders **4020** simultaneously. In some embodiments, the extractor module **4135** can process samples from two lanes sequentially, for instance, depending on when samples are inserted into the extraction containers **4026**. In some embodiments, the extractor module **4135** can process samples from two extraction container holders **4020** sequentially. In some embodiments, the extractor module **4135** can process samples from two lanes independently, for instance, depending on when samples are inserted into the extraction containers **4026**. In some embodiments, the extractor module **4135** can process samples from two extraction container holders **4020**) independently. In some embodiments, pipettors are only extracting polynucleotides from one of the extraction container holders **4020**. In some embodiments, the workflow does not process samples from two extraction container holders **4020**. The software can be limited to processing one extraction container holder **4020**. The pipettors can be limited to processing one extraction container holder **4020**. The instrument can be limited to processing one extraction container holder **4020**. The workflow timing can be limited to processing one extraction container holder **4020**.

[0056] The extractor module **4135** includes magnets **4136**. The magnets **4136** can be arranged to apply a magnetic field on opposite sides of extraction containers. The magnets **4136** provide the magnetic field that is utilized to extract polynucleotides from the samples. The extractor module **4135** is movable vertically. The extractor module **4135** can move the magnets **4136**, and thus the corresponding magnetic field relative to the extraction containers **4026** of the two extraction container holders **4020** located in the extraction container station **4136**. The extractor module **4135**

can be positioned beneath the extractor container station **4136**. The extractor module **4135** can be selectively moveable in an up-down direction along one or more rails **4137**. The rail **4137** can be disposed on a sidewall separating the extraction container station **4136** and the amplification plate station **4138**. As depicted in FIG. **5**C, the extractor module **4135** is in an extended position. The magnets **4136** can be near the extraction containers **4026**. The extractor module **4135** can be lowered to be below the extraction containers **4026**. The extractor module **4135** is housed in the two lane drawer **4130**. In some embodiments, the analyzer **4000** can include three of the two lane drawers **4130** and three extractor modules **4135**.

[0057] This movement of magnets **4136** of the extractor module **4135** can facilitate processing of samples. To help isolate the polynucleotides that are extracted from the sample, the polynucleotides can bound to ferric oxide ("FOX") particles located within the extraction containers **4026**. The particles allow for the magnetic capture of the polynucleotides. This enables the polynucleotides to be isolated from the rest of the unwanted sample, which can be washed away from the eluate using a wash buffer located in the trough assembly **4050**. In order to perform this isolation, a magnetic field is applied to the extraction containers **4026** of the two extraction container holders **4020**. The magnetic field is applied through the use of the extractor module **4135**. The extractor module **4135** includes magnets **4136** positioned to ensure that each row of extraction containers **4026** is subjected to the magnetic field. In some embodiments, magnets **4136** are disposed on both sides of the extraction container **4026**. The magnets **4136** are selectively moved from a position entirely below the extraction containers **4026** to a position adjacent to the extraction containers **4026**. In some embodiments, the magnets **4136** can generally lie in a plane. The extraction containers **4026** can intersect that plane in an extraction mode. The extraction containers **4026** can be entirely below the plane in other modes. In some embodiments, the magnets **4136** overlap with the extraction containers **4026**. The extractor module **4135** applies the magnetic field which captures the bound polynucleotides to a side of the extraction containers **4026**.

[0058] The two lane drawer **4130** can include a hinged retention feature **4131**. The retention feature **4131** can be a spring loaded plate. The retention feature **4131** can be hingedly connected to the housing **4132**. The hinge **4133** of the retention feature **4131** can be positioned behind extraction container station **4136**. The hinge **4133** of the retention feature **4131** can be positioned in front of the amplification plate station **4138**. The retention feature **4131** has a retention position and consumable replacement position. In the retention position, as shown in FIG. **5**A, the retention feature **4131** extends over the pipette tip station **4134** and the extraction container station **4136**. In this position, the retention feature **4131** is configured to extend over at least a portion of the two pipette tip holders **4060** and the two extraction container holders **4020** that are located in the pipette tip station **4134** and the extraction container station **4136**, respectively. The retention feature **4131** can cover the perimeter of the two pipette tip holders **4060** and the perimeter the two extraction container holders **4020** while allowing access thereto via openings in retention feature **4131**. The retention feature **4131** functions as a cover to limit movement of the two extraction container holders **4020** and the two pipette tip holders **4060** during operation, such as pipetting operations. The hinged retention feature **4131** can include a locking feature that locks retention feature **4131** in the retention position.

[0059] When consumables in the two lane drawer **4130** need to be removed and replaced with new consumables, the two lane drawer **4130** can be extended. The locking feature that locks retention feature **4131** in the retention position can be released upon extension of the two lane drawer **4130**. The locking feature that locks retention feature **4131** in the retention position can be a magnet. When the two lane drawer **4130** is open, the retention feature **4131** can also be lifted. The retention feature **4131** is not dependent on the extension of the two lane drawer **4130**. Under the bias of a torsion spring, the retention feature **4131** can rotate about the hinge **4133** to the consumable replacement position. The consumable replacement position opens the retention feature **4131** to provide clearance for a user to replenish consumables within the two lane drawer **4130**. The two

lane drawer **4130** can be extended along telescoping slides. The two lane drawer **4130** can include an assembly of extensions that slide relative to each other. The slides can be metal. The slides can include ball bearings. The slides can be full extension slides. The slides can extend in sections. The slides can extend in stages. The housing **4132** of the two lane drawer **4130** can include tab and slot weldments. The tab and slot arrangement can join one surface to another through an elongated hole.

[0060] The two lane drawer **4130** can include a latching feature that locks the two lane drawer **4130** to prevent extension of the two lane drawer **4130** from the analyzer **400**. The two lane drawer **4130** can including a latching feature that locks the two lane drawer **4130** in the fully open position. The two lane drawer **4130** can including a latching feature that locks the two lane drawer **4130** in the fully closed position. The latching mechanism can be a push-to-close latch. In some embodiments, the latching mechanism does not lock in the open position. In some embodiments, the latching mechanism does not accommodate being locked in the open position. In some embodiments, the latching mechanism can be locked in the open position with different telescoping slides. The latching mechanism can be fully closed by a simple push or other action of the user. The latching mechanism can be spring loaded. The latching mechanism can hold the two lane drawer **4130** securely within the analyzer **4000**. The latching mechanism can be built-in. The latching mechanism can include a trigger that is biased toward a locking configuration. The trigger can be depressed to unlock the drawer. The trigger can be depressed automatically by a module of the analyzer **4000**. The trigger can be depressed by a user. The two lane drawer **4130** can include one latching mechanism to lock and unlock the two lane drawer **4130**.

[0061] The two lane drawer **4130** can include a kick out mechanism. The kick-out mechanism can facilitate the sliding extension of the two lane drawer **4130**. The kick-out mechanism can extend along the bottom of the two lane drawer **4130**. The purpose of the kick-out mechanism can be to open the two lane drawer **4130** at least a short distance after the two lane drawer **4130** has been unlocked for easy access to the handle. The kick-out mechanism can open the two lane drawer **4130** by 0.5″, 1″, 1.5″, 2″, 2.5″, 3″, 3.5″, 4″, at least 0.5″, at least 1″, at least 1.5″, at least 2″, at least 2.5″, at least 3″, at least 3.5″, at least 4″, or any range of two of the foregoing values. In some embodiments, the kick-out mechanism can open the two lane drawer by at least two inches. The purpose of the kick-out mechanism can be to push the two lane drawer **4130** against the latch when locked for positional repeatability. In some embodiments, the kick-out mechanism is not able to release the latch mechanism. In some embodiments, the user does not interact with the kick-out mechanism. The kick-out mechanism can allow the two lane drawer **4130** to slide relative to the analyzer **4000**.

[0062] FIGS. **6**A-**6**C are view of the two lane drawer **4130** in relation to the analyzer **4000** according to the present disclosure. FIG. **6**A is an example of the analyzer **4000**. The analyzer **4000** can include three of the two lane drawers **4130**. The two lane drawer **4130** can house consumables, as described herein. The analyzer **4000** can include the tip drawer **4110**. The tip drawer **4110** can house pipette tip holders **4060**, as described herein.

[0063] FIG. **6**B is a view of analyzer **4000** which includes the structural frame **4011** which is configured to support and define various decks or levels for sample processing and analysis. The analyzer **4000** can include the supplementary deck **4012**, the processing deck **4014**, and the multipurpose robot deck **4016**, as described herein. The analyzer **4000** can includes a housing or shell that surrounds the internal components, as shown in FIG. **6**A.

[0064] FIGS. **6**A-**6**C illustrate the analyzer **4000** including three of the two lane drawers **4130**. The two lane drawers **4130** can be adjacent. The two lane drawers **4130** can slide relative to a single drawer plate **4140**. The drawer plate **4140** can remain stationary as the two lane drawers **4130** pull out individually relative to the plate **4140**. The two lane drawers **4130** can extend relative to the drawer plate **4140**. Each of the two lane drawers **4130** can slide relative to the drawer plate **4140**. Each of the two lane drawers **4130** can include telescoping slides to allow the two lane drawer

4130 to slide relative to the drawer plate **4140**. Each two lane drawer **4130** can slide independently of another two lane drawer **4130**. Each two lane drawer **4130** can slide sequentially with another two lane drawer **4130**. Each two lane drawer **4130** can slide simultaneously with another two lane drawer **4130**. Each two lane drawer **4130** can include a latching mechanism. Each two lane drawer **4130** can include a kick-out mechanism. Each two lane drawer **4130** can include the retention feature **4131** that extends over the corresponding pipette tip station **4134** and the extraction container station **4136**. The two lane drawers **4130** can be identical. The two lane drawers **4130** can be stacked side-by-side. The two lane drawers **4130** can include tab and slot weldments.

[0065] FIG. **7** is a view of an embodiment of a two lane drawer **4150** according to the present disclosure. The two lane drawer **4150** can include any feature of the drawers described herein. The two lane drawer **4150** can be used in combination with the extractor module **4135**. The two lane drawer **4150** can hold the same number of consumables as the two lane drawer **4130**. The two lane drawer **4150** can hold the same number of consumables as two of the drawers **4120**. The two lane drawer **4150** only has one extractor module, similar to the drawer **4130**. The two lane drawer **4150** only has one latching feature, similar to the drawer **4130**. This results in the ability to hold six lanes of consumables but with only three extractors. This results in the ability to hold six lanes of consumables but with only three latching features. The two lane drawer **4150** can reduce the number of parts. The two lane drawer **4150** can reduce costs. The two lane drawer **4150** can reduce complexity in manufacturing and servicing.

[0066] The two lane drawer **4150** is configured to house the majority of the consumables utilized in an assay workflow. The two lane drawer **4150** includes a pipette tip station **4154**, an extraction container station **4156**, and an amplification plate station **4158**. The pipette tip station **4154** is configured to hold two pipette tip holders **4060**. The extraction container station **4156** is configured to hold two extraction container holders **4020**. The amplification plate station **4158** is configured to hold two amplification plates **4040**.

[0067] The analyzer **4000** can include a stationary retention housing **4161**. In the depicted embodiment, the stationary retention housing **4161** can be a cover positioned relative to the two lane drawer **4150**. The stationary retention housing **4161** extends over the pipette tip station **4154** and the extraction container station **4156**. In this position, the stationary retention housing **4161** is configured to extend over at least a portion of the two pipette tip holders **4060** and over at least a portion of the two extraction container holders **4020** that are located in the pipette tip station **4154** and the extraction container station **4156**, respectively. The stationary retention housing **4161** can cover a perimeter of the two pipette tip holders **4060** and the two extraction container holders **4020** while allowing access thereto via openings in the stationary retention housing **4161**. The stationary retention housing **4161** functions to limit movement of the extraction container holder **4020** and the pipette tip holder **4060** during operation. In some embodiments, the stationary retention housing **4161** does not cover the amplification plates **4040** located in the amplification plate station **4158**. The stationary retention housing **4161** can be fixed relative to a drawer plate **4160**. The two lane drawer **4150** can extend relative to the drawer plate **4160**.

[0068] When consumables in drawer **4150** need to be removed and replaced with new consumables, the two lane drawer **4150** is extended while the stationary retention housing **4161** does not move relative to the two lane drawer **4150**. The two lane drawer **4150** slides relative to the stationary retention housing **4161**. The two lane drawer **4150** can include a latching feature. The two lane drawer **4150** can include a kick-out mechanism. The two lane drawer **4150** can extended along telescoping slides. The stationary retention housing **4161** can include sheet metal with tab and slot weldments.

[0069] FIG. **8** is a view of an embodiment of a three lane drawer **4170** according to the present disclosure. The three lane drawer **4170** can include any feature of the drawers described herein. The three lane drawer **4170** can be used in combination with an extractor module. The extractor module can move relate to the three lanes. In some embodiments, the extractor module can apply a

magnetic field to three extraction container holders **4020**. The three lane drawer **4170** can hold the same number of consumables as three of the drawers **4120**. The three lane drawer **4170** can have only one extractor module. The three lane drawer **4170** can have only one latching feature. This results in the ability to hold six lanes of consumables but with only two extractors and two latching mechanisms. The three lane drawer **4170** can reduce the number of parts. The three lane drawer **4170** can reduce costs. The three lane drawer **4170** can reduce complexity in manufacturing and servicing.

[0070] The three lane drawer **4170** is configured to house the majority of the consumables utilized in an assay workflow. The three lane drawer **4170** includes a pipette tip station **4174**, an extraction container station **4176**, and an amplification plate station **4178**. The pipette tip station **4174** is configured to hold three pipette tip holders **4060**. The extraction container station **4176** is configured to hold three extraction container holders **4020**. The three extraction container holders **4020** can be positioned side-by-side. The amplification plate station **4178** is configured to hold three amplification plates **4040**.

[0071] The analyzer **4000** can include a stationary retention housing **4181**. The stationary retention housing **4181** can be a stationary cover positioned relative to the three lane drawer **4170**. The stationary retention housing **4181** extends over the pipette tip station **4174** and the extraction container station **4176**. In this position, the stationary retention housing **4181** is configured to extend over at least a portion of the three pipette tip holders **4060** and at least a portion of the three extraction container holders **4020** that are located in the pipette tip station **4174** and the extraction container station **4176**, respectively. The stationary retention housing **4181** can cover the perimeters of the pipette tip holders **4060** and the perimeters of the extraction container holders **4020** while allowing access thereto via openings in the stationary retention housing **4181**. The stationary retention housing **4181** functions to limit movement of the extraction container holders **4020** and the pipette tip holders **4060** during operation. In some embodiments, the stationary retention housing **4181** does not cover the amplification plates **4040** located in the amplification plate station **4178**.

[0072] When consumables in three lane drawer **4170** need to be removed and replaced with new consumables, the three lane drawer **4170** is extended while the stationary retention housing **4181** does not move relative to the three lane drawer **4170**. The three lane drawer **4170** can include a latching feature. The three lane drawer **4170** can include a kick-out mechanism. The three lane drawer **4170** can extended along telescoping slides. The stationary retention housing **4181** can include sheet metal with tab and slot weldments.

[0073] FIGS. **9**A-**9**B are views an embodiment of a six lane drawer **4190** according to the present disclosure. The six lane drawer **4190** can be used in combination with the tip drawer **4110**. The tip drawer **4110** can be configured to hold multiple pipette tip holders **4060**. The tip drawer **4110** can house five pipette tip holders **4060**. The six lane drawer **4190** and the tip drawer **4110** can be arranged side by side. In some embodiments, the six lane drawer **4190** and the tip drawer **4110** can be unitary. The six lane drawer **4190** and the tip drawer **4110** can move together to extend from the analyzer **4000**.

[0074] The six lane drawer **4190** can include any feature of the drawers described herein. The six lane drawer **4190** can be used in combination with an extractor module. The extractor module can move relate to six lanes. The extractor module can apply a magnetic field to one extraction container holder **4020**. The extractor module can apply a magnetic field to two or three extraction container holders **4020**. The extractor module can apply a magnetic field to six extraction container holders **4020**. The extractor module can move along an axis relative to the six lane drawer **4190**. The extractor module can include a slide **4270**. The slide **4270** can be a rail along which the extractor module slides. The slide **4270** is described in more detail below with reference to FIG. **10**A. The six extraction container holders **4020** can be positioned side-by-side. The six lane drawer **4190** can hold the same number of consumables as six of the drawers **4120**. The six lane drawer

4190 can have only one extractor module. The six lane drawer **4190** can have only one latching feature. This results in the ability to hold six lanes of consumables but with only one extractor module and one latching mechanism. The six lane drawer **4190** can reduce the number of parts. The six lane drawer **4190** can reduce costs. The six lane drawer **4190** can reduce complexity in manufacturing and servicing.

[0075] The six lane drawer **4190** is configured to house the majority of the consumables utilized in an assay workflow. The six lane drawer **4190** includes a pipette tip station **4194**, an extraction container station **4196**, and an amplification plate station **4198**. The pipette tip station **4194** is configured to hold six pipette tip holders **4060**. The extraction container station **4196** is configured to hold six extraction container holders **4020**. The amplification plate station **4198** is configured to hold six amplification plates **4040**.

[0076] The analyzer **4000** can include a stationary retention housing **4115**. The stationary retention housing **4115** can be a single unitary structure that extends over the tip drawer **4110**, at least a portion of the pipette tip station **4191**, and at least a portion of the extraction container station **4196**. The stationary retention housing **4115** can be a stationary cover positioned relative to the tip drawer **4110**. The stationary retention housing **4115** can be a stationary cover positioned relative to the six lane drawer **4190**. The stationary retention housing **4115** can extend over the pipette tip station **4194** and the extraction container station **4196**. In this position, the stationary retention housing **4115** is configured to extend over at least a portion of the six pipette tip holders **4060** that are located in the pipette tip station **4194** of the six lane drawer **4190**. In this position, the stationary retention housing **4115** is configured to extend over at least a portion of the five pipette tip holders **4060** of the tip drawer **4110**. In this position, the stationary retention housing **4115** is configured to extend over at least a portion of the six extraction container holders **4020** that are located in the extraction container station **4196**, respectively. The stationary retention housing **4115** can be a single unitary structure that retains consumables within the tip drawer **4110** and the six lane drawer **4190**.

[0077] The stationary retention housing **4115** can cover the perimeters of the pipette tip holders **4060** and the perimeters of the extraction container holders **4020** while allowing access thereto via openings in the stationary retention housing **4115**. The stationary retention housing **4115** functions to limit movement of the extraction container holders **4020** and the pipette tip holders **4060** during operation. In some embodiments, the stationary retention housing **4115** does not cover the amplification plates **4040** located in the amplification plate station **4198**. The stationary retention housing **4115** can include a section for the tip drawer **4110**. The stationary retention housing **4115** can include sheet metal with tab and slot weldments. The stationary retention housing **4115** can include a separate top plate mounted on the outside of supports. The stationary retention housing **4115** can include supports mounted to the sides of a base **4116**. The stationary retention housing **4115** can include vertical supports to resist warping.

[0078] When consumables in the six lane drawer **4190** need to be removed and replaced with new consumables, the six lane drawer **4190** is extended while the stationary retention housing mechanism **4115** does not move relative to the six lane drawer **4190**. The six lane drawer **4190** can include a latching feature. The six lane drawer **4190** can include a kick-out mechanism. The six lane drawer **4190** can extend along telescoping slides. In some embodiments, each lane of the six lane drawer **4190** slides together. The six lane drawer **4190** can include a single drawer front. In an alternate embodiment that is not illustrated, each lane of the six lane drawer **4190** can slide individually when each lane is associated with a respective one of a plurality of drawer fronts. Each lane can include an individual sliding sub drawer. The six lane drawer **4190** can be associated with an extractor having any of the features described herein. In some embodiments, when a run is in process on a lane, the extractor can move up and lock the lane so that the lane cannot be opened.

[0079] FIGS. **10**A-**10**C are views of an extractor module **4200** according to the present disclosure. The extractor module **4200** can be utilized with any drawer described herein. The extractor module

4200 can include a scissor lift design. The scissor lift can include a platform or plate **4202**. The plate **4202** can be coupled to a plurality of magnets **4204**. The magnets **4204** can apply a magnetic field to the extraction containers **4026** of the extraction container holder **4020** as described herein. The plate **4202** can include magnets **4204** configured to apply a magnetic field to extraction containers **4026** positioned in a single lane. The plate **4202** can include magnets configured to apply a magnetic field to a single extraction container holder **4020**. The scissor lift can include a base **4206**. The base **4206** and the plate **4202** can be structures having the same or similar shape. The base **4206** and the plate **4202** can have a mirror image configuration. The scissor lift can move in the vertical direction. The scissor lift can include scissor legs **4208**. The scissor legs **4208** are the crisscross struts that bridge the gap between the base **4206** and the plate **4202**. One of the scissor legs **4208** is fixed to the plate **4202** and movable relative to the base **4206**. The other scissor leg **4208** is fixed to the base **4206** and movable relative to the plate **4202**. The scissor lift moves upward by extending the scissor legs **4208** from a generally horizontal orientation toward a generally vertical orientation. The scissor lift moves downward by extending the scissor legs **4208** from a generally vertical orientation toward a generally horizontal orientation. The extractor module **4200** can include the slide **4270**. The slide **4270** can allow the extractor module **4200** to move relative to the corresponding drawer. The extractor module **4200** can include a linear drive **4272**. The linear drive **4272** can move the extractor module **4200** relative to the slide **4270**.

[0080] FIG. **10**B illustrates the extractor module **4200** relative to the two lane drawer **4130**. FIG. **10**B shows three of the two lane drawers **4130**. The extractor module **4200** can be used with any of the drawers described herein. The extractor module **4200** can be used with a three lane drawer **4170**. The extractor module **4200** can be used with a six lane drawer **4190**. The two lane drawers **4130** can include the extraction container station **4136**. The extraction container station **4136** can hold two extraction container holders **4020**. The extraction container holders **4020** can be side-by-side. The extractor module **4200** can be in a first position to apply a magnetic field to a first extraction container holder **4020** of the first two lane drawer **4130**, as shown in FIG. **10**B. The extractor module **4200** can move up and down relative to the first extraction container holder **4020** in the first position. The extractor module **4200** can apply a magnetic field to a single extraction container holder **4020** in the extraction container station **4136** of the first two lane drawer **4130**. The extractor module **4200** can move from the first position to a second position. The extractor module **4200** can be in the second position to apply a magnetic field to a second extraction container holder **4020** of the first two lane drawer **4130**. The extractor module **4200** can move along the slide **4270** to the second extraction container holder **4020**. The extractor module **4200** can move up and down relative to the second extraction container holder **4020** in the second position.

[0081] The extractor module **4200** can move along the slide **4270** to the second two lane drawer **4130**. The extractor module **4200** can move from the second position to a third position. The extractor module **4200** can be in the third position to apply a magnetic field to a third extraction container holder **4020** of the second two lane drawer **4130**. The extractor module **4200** can move along the slide **4270** to the third extraction container holder **4020**. The extractor module **4200** can move up and down relative to the third extraction container holder **4020** in the third position. The extractor module **4200** can move from the third position to a fourth position. The extractor module **4200** can be in the fourth position to apply a magnetic field to a fourth extraction container holder **4020** of the second two lane drawer **4130**. The extractor module **4200** can move along the slide **4270** to the fourth extraction container holder **4020**. The extractor module **4200** can move up and down relative to the fourth extraction container holder **4020** in the fourth position.

[0082] The extractor module **4200** can move along the slide **4270** to the third two lane drawer **4130**. The extractor module **4200** can move from the fourth position to a fifth position. The extractor module **4200** can be in the fifth position to apply a magnetic field to a fifth extraction container holder **4020** of the third two lane drawer **4130**. The extractor module **4200** can move along the slide **4270** to the fifth extraction container holder **4020**. The extractor module **4200** can

move up and down relative to the fifth extraction container holder **4020** in the fifth position. The extractor module **4200** can move from the fifth position to a sixth position. The extractor module **4200** can be in the sixth position to apply a magnetic field to a sixth extraction container holder **4020** of the third two lane drawer **4130**. The extractor module **4200** can move along the slide **4270** to the sixth extraction container holder **4020**. The extractor module **4200** can move up and down relative to the sixth extraction container holder **4020** in the sixth position. The extractor module **4200** can move from the sixth position back to the first position, and between any two of the first, second, third, fourth, fifth, or sixth positions. While the extractor module **4200** is shown in relation to the three of the two lane drawers **4130**, the extractor module **4200** can be utilized with any drawer described herein.

[0083] FIG. **10**A shows the extractor module **4200** in an extended or up configuration. FIG. **10**C shows the extractor module **4200** in a collapsed or down configuration. The extractor module **4200** can move up and down to change the position of the magnetic field relative to the extraction containers **4026** of the extraction container holder **4020**. The assembly can include three of the two lane drawers **4130**. The two lane drawers **4130** can be positioned side-by-side. In some embodiments, each two lane drawers **4130** can include the extractor module **4200**. The assembly can include three extractor modules **4200**. The extractor module **4200** can move between lanes of the two lane drawers **4130**. In some embodiments, the assembly can include one extractor module **4200**. The extractor module **4200** can move between all of the two lane drawers **4130**. The extractor module **4200** can move between three of the two lane drawers **4130**. The extractor module **4200** can move between all six lanes. In some methods of use, the extractor module **4200** can be collapsed relative to the first two lane drawer **4130** after applying magnetic field to the extraction container holders **4020** in a first two lane drawer **4130**. Then the extractor module **4200** can move to a second two lane drawer **4130**, then extend to apply a magnetic field to the extraction container holders **4020** in the second two lane drawer **4130**, and then collapsed relative to the second two lane drawer **4130**. Then the extractor module **4200** can move to a third two lane drawer **4130**, then extend to apply a magnetic field to the extraction container holders **4020** in the third two lane drawer **4130**, and then collapsed relative to the third two lane drawer **4130**. The extractor module **4200** can move to any two lane drawer **4130** in any order.

[0084] FIG. **11** is a view of an extractor module **4300** according to the present disclosure. The extractor module **4300** can be utilized with any drawer described herein. The extractor module **4300** can include a pusher design. The pusher can include a platform or plate **4302**. The plate **4302** can be coupled to a plurality of magnets **4304**. The plate **4302** can include magnets **4304**. The magnets **4304** apply a magnetic field to extraction containers **4020**. The magnets **4304** can be arranged to apply a magnetic field to two lanes. The magnets **4304** can be arranged to apply a magnetic field two extraction container holders **4020**. In some embodiments, the plate **4302** with the magnets **4304** can stay in the two lane drawer **4130** at all times. In some embodiments, there can be one plate **4302** with the magnets **4304** in each two lane drawer **4130**. The extractor module **4300** can include a pusher arm **4308**. The pusher arm **4308** can rotate counterclockwise as viewed in FIG. **11** to move the plate **4302** upward and rotate clockwise as viewed in FIG. **11** to move the plate **4302** downward. The drawer **4130** can includes a plate **4310** having a slot **4312** through which the pusher arm **4308** rotates. The extractor module **4300** can include a slide **4370**. The slide **4370** can allow the extractor module **4300** to move relative to the corresponding drawer. The extractor module **4300** can include a linear drive **4372**. The linear drive **4372** can move the extractor module **4300** relative to the slide **4370**. In some embodiments, the magnets **4304** are not directly attached to the linear drive **4372** or the pusher arm **4308**.

[0085] FIG. **11** illustrates the extractor module **4300** relative to the two lane drawer **4130**. The two lane drawer **4130** includes the pipette tip station **4134**, the extraction container station **4136**, and the amplification plate station **4138**. The pipette tip station **4134** is configured to hold two pipette tip holders **4060**. The extraction container station **4136** is configured to hold two extraction

container holders **4020**. The amplification plate station **4138** is configured to hold two amplification plates **4040**. The extraction containers **4020** can be side-by-side. The extractor module **4300** can be in an up position to apply a magnetic field to a first extraction container holder **4020** and a second extraction container holder **4020**. The extractor module **4300** can move up and down relative to the extraction container holders **4020**. The extractor module **4300** can apply a magnetic field to two extraction container holders **4020** in the extraction container station **4136**.
[0086] Referring back to FIG. **6**C, the assembly can include three of the two lane drawers **4130**. The two lane drawers **4130** can be positioned side-by-side. The extractor module **4300** can be collapsed relative to the first two lane drawer **4130**. The extractor module **4300** can move to a second two lane drawer **4130**. The extractor module **4300** can move along the slide **4370** to the second two lane drawer **4130**. The extractor module **4200** can be in a second position to apply a magnetic field to the extraction container holders **4020** of the second two lane drawer **4130**. The extractor module **4300** can move up and down relative to the second two lane drawer **4130** in the second position. The extractor module **4300** can be collapsed relative to the second two lane drawer **4130**. The extractor module **4300** can move to a third two lane drawer **4130**. The extractor module **4300** can move along the slide **4370** to the third two lane drawer **4130**. The extractor module **4200** can be in a third position to apply a magnetic field to the extraction container holders **4020** of the third two lane drawer **4130**. The extractor module **4300** can move up and down relative to the third two lane drawer **4130** in the third position. While the extractor module **4300** is shown in relation to the two lane drawer **4130**, the extractor module **4300** can be utilized with any drawer described herein. The extractor module **4300** can move between drawers. The extractor module **4300** can reduce the total number of extractor modules needed in a multi-drawer assembly of the analyzer **4000**. The extractor module **4300** can reduce costs. The extractor module **4300** can reduce complexity in manufacturing and complexity. This can allow one extractor module **4300** to reside in the analyzer **4000**.
[0087] FIGS. **12**A-**12**F depict a plate sealer **4400** according to the present disclosure. The plate sealer **4400** can have any of the features of the plate sealer **4220** shown in FIG. **3**. The plate sealer **4400** can be located at the rear left corner of the analyzer **4000**, similar to the plate sealer **4220**. The plate sealer **4400** can have an opening that receives an inoculated amplification plate **4040**.
[0088] Although the plate sealer **4400** can be located in the rear of analyzer **4000**, the sealer **4400** can be accessed from the front of analyzer **4000** for replenishment of seal material. The ability to access components in the rear of analyzer **4000** through the front of analyzer **4000** allows analyzer **4000** to be placed directly against a wall in a laboratory. This placement of the analyzer **4000** can help to conserve floor space. To facilitate frontal access, the plate sealer can include one or more panels **4403** that can be removed. The panel **4403** is removed in FIG. **12**B. The panel **4403** allows the plate sealer **4400** to be accessed from the front of the analyzer **4000**.
[0089] The plate sealer **4400** is configured to bond a clear, optical seal to the top of the amplification plate **4040**. The plate sealer **4400** is configured to seal multiple amplification plates during a processing cycle. In some embodiments, the plate sealer **4400** is configured to seal one amplification plate **4040** at a time. In some embodiments, the plate sealer **4400** is configured to seal a plurality of amplification plates **4040** per day. The plate sealer **4400** can be configured to seal a number of amplification plates **4040** per day, such as 6, 12, 18, 24, at least 6, at least 12, at least 18, at least 24, or any range of two of the foregoing values. In some embodiments, the plate sealer **4400** is configured to seal six amplification plates **4040** sequentially, corresponding to six plates loaded in the drawers in a non-limiting embodiment. In order to provide sealing capability for multiple amplification plates **4040** upon a single load, the sealer **4400** utilizes a roll-based seal material. The seal material can be provided by a single roll **4404**. The seal material can be a film. The seal material can be a qPCR film. The seal material can be sheet of material. The seal material can be optically transparent. The seal material can be foil. The seal material can include a polypropylene layer. The seal material can be foil with a polypropylene layer. The plate sealer **4400**

can apply seal material to components other than the amplification plate **4040**. The plate scaler **4400** can apply seal material to any container. The single roll **4404** can be any length of material including 100 meters, 200 meters, 300 meters, 400 meters, 500 meters, 600 meters, 700 meters, 800 meters, 900 meters, 1000 meters, 1100 meters, 1200 meters, or any range of two of the foregoing values. The single roll **4404** can be loaded at one time. The single roll **4404** can be utilized for a plurality of processing cycles without needing to be replaced. The single roll **4404** can last numerous days, weeks, or months with regular processing. The single roll **4404** can be sufficient to seal amplification plates **4040** for a full year for most applications.

[0090] The plate sealer **4400** can include a sensor **4406**. The sensor **4406** can be a low film sensor. The sensor **4406** can be configured to sense when the amount of seal material drops beneath a certain threshold level indicating that the single roll **4404** should be replaced. The sensor **4406** can be an optical sensor. The sensor **4406** can be mounted relative to the single roll **4404**.

[0091] The plate sealer **4400** can include a rear housing **4408**. The rear housing **4408** can be positioned near the rear of the analyzer **4000**. The rear housing **4408** can include support for one or more internal components of the plate sealer **4400**. The plate sealer **4400** can include a roll holder **4410**. The roll holder **4410** can hold the single roll **4404** relative to the rear housing **4408**. The roll holder **4410** can allow the single roll **4404** to rotate to feed seal material as described herein.

[0092] The plate sealer **4400** can include an idler roller **4412**. The idler roller **4412** can be positioned relative to the rear housing **4408**. The idler roller **4412** can be a simple conveyor roller. The idler roller **4412** can be configured to support the seal material as the seal material is moved in position. The idler roller **4412** can change the direction of the seal material from a generally vertical orientation to a generally horizontal orientation. The idler roller **4412** can be important for the smooth and efficient movement of the seal material. The idler roller **4412** can allow the single roll **4404** to feed seal material as described herein.

[0093] The plate sealer **4400** can include a feed plate **4414**. The feed plate **4414** can advance the seal material. The feed plate **4414** can pull the seal material. The seal material can have sufficient rigidity to be pulled by the feed plate **4414** without stretching. The feed plate **4414** can pull the seal material causing the single roll **4404** to rotate relative to the roll holder **4410**. The feed plate **4414** can pull the seal material causing the seal material and the idler roller **4412** to rotate.

[0094] The plate sealer **4400** can include a rear clamp assembly **4416**. In some embodiments, the rear clamp assembly **4416** is movable. In some embodiments, the rear clamp assembly **4416** can move simultaneously with the feed plate **4414**. In some embodiments, the rear clamp assembly **4416** can move independently of the feed plate **4414**. The plate sealer **4400** can include a front clamp assembly **4418**. In some embodiments, the front clamp assembly **4418** can be stationary.

[0095] The rear clamp assembly **4416** can clamp a portion of the seal material. The feed plate **4414** can advance the seal material until the seal material reaches the front clamp assembly **4418**. The rear clamp assembly **4416** can advance with the feed plate **4414** while the seal material is clamped by the rear clamp assembly **4416**. The front clamp assembly **4418** can clamp a portion of the seal material. The rear clamp assembly **4416** can open while the front clamp assembly **4418** clamps the seal material. The feed plate **4414** can retract while the front clamp assembly **4418** clamps the seal material. The rear clamp assembly **4416** can retract while the front clamp assembly **4418** clamps the seal material. The rear clamp assembly **4416** can clamp a portion of the seal material just behind the amplification plate **4040**.

[0096] The rear clamp assembly **4416** and the front clamp assembly **4418** can clamp the seal material simultaneously. The rear clamp assembly **4416** and the front clamp assembly **4418** can clamp the seal material during sealing. The rear clamp assembly **4416** and the front clamp assembly **4418** can clamp the seal material during cutting. The rear clamp assembly **4416** and the front clamp assembly **4418** can clamp the seal material sequentially. The rear clamp assembly **4416** can clamp the seal material and then the front clamp assembly **4418** can clamp the seal material. The front clamp assembly **4418** can clamp the seal material and then the rear clamp assembly **4416**

can clamp the seal material. The rear clamp assembly **4416** and the front clamp assembly **4418** can clamp the seal material independently. The rear clamp assembly **4416** and the front clamp assembly **4418** can clamp the seal material at different locations. The rear clamp assembly **4416** and the front clamp assembly **4418** can clamp the seal material at different times. The rear clamp assembly **4416** can clamp the seal material and move the seal material. The front clamp assembly **4418** can clamp the seal material at a single location. The rear clamp assembly **4416** can clamp the seal material at two locations. The seal material can be held between the rear clamp assembly **4416** and the front clamp assembly **4418**.

[0097] The plate sealer **4400** can have a moveable platform **4402** that receives an inoculated amplification plate **4040**. Wells in the inoculated amplification plate **4040** can contain fluids including extracted nucleic acids and reagents for amplification. The amplification plate **4040** can be deposited on the moveable platform **4402** of the plate sealer **4400**. The amplification plate **4040** can be deposited by the multifunctional robot **4300** shown in FIG. **3**. The multifunctional robot **4300** can be disengaged from the amplification plate **4040**. The moveable platform **4402** can move the amplification plate **4040** into the plate sealer **4400**. To apply the plate seal, the moveable platform **4402** positions the amplification plate **4040** within the plate sealer **4400**. The moveable platform **4402** can position the amplification plate **4040** between the rear clamp assembly **4416** and the front clamp assembly **4418**.

[0098] Turning now to FIG. **12**C, the plate sealer **4400** can include a heated press plate **4420**. The heated press plate **4420** can be positioned between the rear clamp assembly **4416** and the front clamp assembly **4418**. The moveable platform **4402** can position the amplification plate **4040** under the heated press plate **4420**. The heated press plate **4420** can be the same or similar shape as the amplification plate **4040**. The heated press plate **4420** can be configured to apply heat to the entire top surface of the amplification plate **4040**. The heated press plate **4420** can be configured to apply heat to the majority of the top surface of the amplification plate **4040**. The heated press plate **4420** can be configured to apply pressure to the entire top surface of the amplification plate **4040**. The heated press plate **4420** can be configured to apply pressure to the majority of the top surface of the amplification plate **4040**.

[0099] The plate sealer **4400** can include a motor assembly **4422**. The motor assembly **4422** can raise and lower the heated press plate **4420** relative to the amplification plate **4040**. The motor assembly **4422** can facilitate the application of pressure to the heated press plate **4420**.

[0100] The plate sealer **4400** can include a linear rail **4424**. The feed plate **4414** can move along the linear rail **4424**. The linear rail **4424** can guide the movement of the feed plate **4414** relative to the heated press plate **4420**. The linear rail **4424** can guide the movement of the feed plate **4414** relative to the amplification plate **4040**. The plate sealer **4400** can include additional rails to allow movement. An additional linear rail can guide the movement of the moveable platform **4402** into and out of the plate sealer **4400**. The linear rail for the moveable platform **4402** can be mounted upside down. In some embodiments, the carriage or nest is fixed and the rail moves. The linear rail for the moveable platform **4402** can be located under the nest. The plate sealer **4400** can include a hinged door **4426**. The hinged door **4426** can close when the moveable platform **4402** is disposed within the housing **4403**, **4408**. The hinged door **4426** can form an enclosure to prevent unwanted material from entering the plate sealer **4400**.

[0101] The plate sealer **4400** can include a knife assembly **4430**. The knife assembly **4430** can cut the seal material. The knife assembly **4430** can cut the seal material simultaneously with the seal material being bonded to the amplification plate **4040**. The knife assembly **4430** can be lowered relative to the seal material. The knife assembly **4430** can be lowered relative to the amplification plate **4040**. The knife assembly **4430** can lower with the heated press plate **4420**. In some embodiments, there is a stationary knife **4431** in addition to the knife assembly **4430** that moves. The knife assembly **4430** and the stationary knife **4431** can shear the seal material. The action of cutting the seal material can be combined with sealing the seal material. The rear clamp assembly

4416 can be positioned behind the knife assembly **4430**. The rear clamp assembly **4416** can clamp the seal material as the knife assembly **4430** cuts the material. The rear clamp assembly **4416** can clamp the free end of the seal material as the seal material is cut. The feed plate **4414** can maintain contact with the seal material as the knife assembly **4430** cuts the material. The cut end of the single roll **4404** is held in a position by the rear clamp assembly **4416** to allow repeated sealing operations.

[0102] The plate sealer **4400** can include a spring loaded nest assembly **4432**. The spring loaded nest assembly **4432** moves the amplification plate **4040** which includes the plate body **4041**. The body **4041** can be arranged on a nest **4043**. The spring loaded nest assembly **4432** can bias the amplification plate **4040** and the nest **4043** upward toward the heated press plate **4420**.

[0103] Once the eluted DNA is transferred into the amplification plate **4040**, the amplification plate **4040** is moved to plate sealer **4400** where it is sealed. The analyzer **4000** uses the automated plate sealer **4400** to seal the amplification plate **4040** following elution. To transport the amplification plate **4040**, the multifunctional robot **4300** is positioned such that a gripper mechanism hovers over the amplification plate **4040**. The gripper arms are opened, the gripper is lowered, and the gripper arms close to engage the amplification plate **4040**. The sensors in the gripper arms indicate when the gripper has engaged the amplification plate **4040**. Once engaged, the amplification plate **4040** is lifted and transported by the robot to the moveable platform **4402**. The moveable platform **4402** can include the nest **4043** upon which the amplification plate **4040** is positioned. The moveable platform **4402** moves relative to the linear rail **4424** into the plate sealer **4404**. The moveable platform **4402** positions the amplification plate **4040** relative to rear clamp assembly **4416** and the front clamp assembly **4418**. The moveable platform **4402** positions the amplification plate **4040** relative to the heated press plate **4420**. The moveable platform **4402** positions the amplification plate **4040** relative to the knife assembly **4430**. The hinged door **4426** can close.

[0104] The feed plate **4414** is configured to feed a section of seal material from the single roll **4404**. The feed plate **4414** moves the seal material relative to the heated press plate **4420**. The feed plate **4414** moves the seal material relative to knife assembly **4430**. The feed plate **4414** moves the seal material relative to the rear clamp assembly **4416** and the front clamp assembly **4418**. The seal material can move prior to the amplification plate **4040** being moved in position. The seal material can move after the amplification plate **4040** is moved in position. The seal material can move simultaneously with the amplification plate **4040** being moved in position.

[0105] The amplification plate **4040** is moved into position for a sealing operation. The amplification plate **4040** is below the heated press plate **4420**. The amplification plate **4040** is between the rear clamp assembly **4416** and the front clamp assembly **4418**. In some embodiments, the rear clamp assembly **4416** closes on the seal material. The seal material is clamped in at least one location during movement. In some embodiments, the rear clamp assembly **4416** and the feed plate **4414** move together. In some embodiments, the rear clamp assembly **4416** and the feed plate **4414** move forward. The rear clamp assembly **4416** and the feed plate **4414** move forward to feed the seal material over the top of the amplification plate **4040**. The rear clamp assembly **4416** and the feed plate **4414** move toward the front clamp assembly **4418**. The front clamp assembly **4418** is open when the rear clamp assembly **4416** and the feed plate **4414** move. The front clamp assembly **4418** clamps front edge of seal material. The rear clamp assembly **4416** opens releasing seal material. The rear clamp assembly **4416** and the feed plate **4414** retract leaving the seal material in place. The rear clamp assembly **4416** closes to capture the seal material just behind the amplification plate **4040**.

[0106] The rear clamp assembly **4416** and the front clamp assembly **4418** can be actuated to clamp the seal material. The seal material can be clamped by the rear clamp assembly **4416** prior to the amplification plate **4040** being moved in position. The seal material can be clamped by the front clamp assembly **4418** after the amplification plate **4040** is moved in position. The seal material can be clamped by the rear clamp assembly **4416** after the amplification plate **4040** is moved in

position. The seal material can be clamped simultaneously by the rear clamp assembly **4416** and the front clamp assembly **4418** after the amplification plate **4040** is moved in position. The seal material can be clamped simultaneously by the rear clamp assembly **4416** and the front clamp assembly **4418** while the amplification plate **4040** is moved in position.

[0107] The heated press plate **4420** can be heated. The heated press plate **4420** can be heated before the amplification plate **4040** is moved in position. The heated press plate **4420** can be heated after the amplification plate **4040** is moved in position. The heated press plate **4420** can be heated while the amplification plate **4040** is moved in position. The heated press plate **4420** can be lowered relative to the seal material. The seal material is positioned over the amplification plate **4040** when the heated press plate **4420** is lowered. The seal material is clamped between the rear clamp assembly **4416** and the front clamp assembly **4418** when the heated press plate **4420** is lowered. The heated press plate **4420** can be lowered relative to the amplification plate **4040**, thereby pressing the seal material onto the top surface of the amplification plate **4040**. The heated press plate **4420** is configured to use heat and pressure to bond the seal material to amplification plate **4040**.

[0108] The knife assembly **4430** lowers with the heated press plate **4420**. The knife assembly **4430** cuts the seal material. The knife assembly **4430** cuts material that extends beyond the amplification plate **4040**. The knife assembly **4430** cuts between the rear clamp assembly **4416** and the front clamp assembly **4418**. The rear clamp assembly **4416** clamps the free end of the seal material as the seal material is being cut. The rear clamp assembly **4416** maintains the position of the free end of the seal material. The rear clamp assembly **4416** enables continuous feeding of the seal material. After sealing, the amplification plate **4040** is moved out of the plate sealer **4400**. The hinged door **4426** can open. The moveable platform **4402** moves relative to the linear rail **4424** out of the plate sealer **4400**. The sealed amplification plate **4040** is available for transport within the analyzer **4000**.

[0109] The analyzer **4000** uses the automated plate sealer **4400** to seal the amplification plate **4040** prior to plate mixing. The analyzer **4000** uses the automated plate sealer **4400** to seal the amplification plate **4040** prior to target amplification. The analyzer **4000** uses the automated plate scaler **4400** to seal the amplification plate **4040** prior to detection.

[0110] The plate sealer **4400** can utilize a roll of seal material. The seal material can be a film. The plate sealer **4400** can be configured to heat seal a length of the seal material to the top of the amplification plate **4040**. The amplification plate **4040** can be an HPV PCR plate. The seal material is sealed to the amplification plate **4040** using a combination of heat and pressure. Each of the **96** wells of the amplification plate **4040** can be individually sealed. The seal material can completely encircle the open end of the well. The seal material can prevent contamination between wells of the amplification plate **4040**. The seal material can prevent evaporation during amplification. The seal material can be optically transparent to allow for detection.

[0111] The plate sealer **4400** can be a self-contained assembly. The plate sealer **4400** can be a sub-assembly that is powered with AC power and communicates to software through a serial interface. The software can provide high level commands to the processor inside the plate sealer **4400**. The plate sealer **4400** can include the roll holder **4410** with the sensor **4406**. The sensor **4406** can detect when the seal material is low. The plate sealer **4400** can include a sensor for detecting seal material over the amplification plate **4040**. The sensor can be near the knife assembly **4430**. The sensor can be pointed toward the amplification plate **4040**. The plate sealer **4400** can include the idler roller **4412**. The plate sealer **4400** can include guides to control the seal material. The plate sealer **4400** can include the moveable platform **4402**. The moveable platform **4402** can function as a drawer to extend the nest **4043** in and out of the scaler so amplification plate **4040** can be picked up by the multifunctional robot **4300**. The plate sealer **4400** can include the feed plate **4414** to feed the seal material over the amplification plate **4040**. The plate sealer **4400** can include the rear clamp assembly **4416** for holding the seal material against the amplification plate **4040**) when the seal material is advanced. The plate sealer **4400** can include the front clamp assembly **4418** for holding

the seal material against the amplification plate **4040** while the feed plate **4414** retracts. The plate sealer **4400** can include the heated press plate **4420** for sealing the seal material against the amplification plate **4040**. The plate sealer **4400** can include the knife assembly **4430** for cutting the seal material. The plate sealer **4400** can include an internal control system. The plate sealer **4400** can be automated to seal the amplification plate **4040**. The plate sealer **4400** can reduce costs. The plate sealer can reduce complexity in manufacturing and servicing.

[0112] The plate sealer **4400** seals and cuts in the same operation. The knife assembly **4430** moves with the heated press plate **4420**. The knife assembly **4430** and the heated press plate **4420** are lowered simultaneously. The knife assembly **4430** and the heated press plate **4420** cut the seal material and bond the seal material to the amplification plate **4040**. The cutting of the seal material and sealing of the seal material occurs in one motion. The cutting of the seal material and sealing of the seal material occurs simultaneously. Sealing and cutting at the same time allows for a more streamlined workflow. Sealing and cutting at the same time allows for less complex hardware.

[0113] The plate sealer **4400** does not cut the seal material prior to sealing. The plate sealer **4400** does not handle a cut piece of seal material. It is noted that handling a cut piece of seal material is challenging. The plate sealer **4400** moves the free end of the seal material in position. The seal material is sealed to the amplification plate **4040** and a new free end is formed by the knife assembly **4430**. The new free end of the seal material is held in position by the rear clamp assembly **4416** and/or the feed plate **4414**. The seal material only has one free end. The seal material is continuously in position to seal another amplification plate **4040**. In some embodiments, a longer seal material is utilized for each amplification plate **4040** to allow for the seal material to be cut with sealing.

[0114] There are many different ways to accomplish the motions required for the plate sealer **4400**. The heated press plate **4420** can utilize an integrated ball screw actuator. The heated press plate **4420** can utilize a cam mechanism. The heated press plate **4420** can utilize a rack and pinion gear design. The heated press plate **4420** can utilize a timing belt design. The moveable platform **4402** can be actuated by integrated lead screw motor assemblies. In some embodiments, stepper motors can be used for the axes, but brushless DC motors could be used instead. The rear clamp assembly **4416** and the front clamp assembly **4418** can be actuated with solenoids, but this motion could be accomplished with lead screws. The amplification plate **4040** can moved in and out of the plate sealer **4400** to allow the multifunctional robot **4300** to pick it up. The plate sealer **4400** can utilize heat-sealing technology. The plate sealer **4400** can utilize roll handling technology.

[0115] In some embodiments, a workflow is provided. The plate sealer **4400** is powered on. The high-throughput system **00**, such as the pre-analytical system **10**, can include a processor and a memory storing instructions for operating the plate sealer **4400**. The high-throughput system **00** instructs plate sealer **4400** to reach a set temperature for the heated plate **4420**. The high-throughput system **00** instructs plate sealer **4400** to initiate plate sealing operations at a set temperature. The heated press plate **4420** can be heated to the set temperature. The heated press plate **4420** can take a few minutes to get to the set temperature. In some embodiments, the heated press plate **4420** is heated before the amplification plate **4040** is positioned within the plate scaler **4400**.

[0116] In some embodiments, the hinged door **4426** can open. The moveable platform **4402** can extend outward. The moveable platform **4402** can include the nest **4043**. The nest **4043** is configured to accept the amplification plate **4040**. The multifunctional robot **4300** places the amplification plate **4040** on the nest **4043**. The moveable platform **4402** can move inward toward the heated press plate **4420**. In some embodiments, the heated press plate **4420** is at the set temperature before the amplification plate **4040** is moved inward on the moveable platform **4402**. The hinged door **4426** can close. The moveable platform **4402** can position the amplification plate **4040** under the heated press plate **4420**. The heated press plate **4420** can be at the set temperature.

[0117] In some embodiments, the feed plate **4414**, the rear clamp assembly **4416**, and the front clamp assembly **4418** undergo a series of steps to position the seal material. In some embodiments,

the rear clamp assembly **4416** clamps the seal material. The feed plate **4414** moves forward to feed the seal material over the top of the amplification plate **4040**. In some embodiments, the rear clamp assembly **4416** and the feed plate **4414** are coupled for movement. In some embodiments, the rear clamp assembly **4416** and the feed plate **4414** move independently. In some embodiments, the rear clamp assembly **4416** clamps the seal material before the feed plate **4414** moves forward. The feed plate **4414** moves forward to feed the seal material toward the front clamp assembly **4418**.

[0118] Next, the front clamp assembly **4418** clamps front edge of seal material. In some embodiments, the rear clamp assembly **4416** clamps the seal material and the front clamp assembly **4418** clamp the seal material simultaneously. Next, the rear clamp assembly **4416** opens releasing seal material. The front clamp assembly **4418** remains clamped to the seal material. Next, the feed plate **4414** retracts leaving the seal material in place. In some embodiments, the rear clamp assembly **4416** retracts. The front clamp assembly **4418** remains clamped to the seal material. Next, the rear clamp assembly **4416** closes to capture the seal material just behind the amplification plate **4040**. The rear clamp assembly **4416** closes just behind the knife assembly **4430**. In some embodiments, the rear clamp assembly **4416** clamps the seal material and the front clamp assembly **4418** clamps the seal material simultaneously.

[0119] The heated press plate **4420** and the knife assembly **4430** lower onto amplification plate **4040** to cut and apply the seal material. The rear clamp assembly **4416** and the front clamp assembly **4418** clamp the seal material as the heated press plate **4420** is lowered. The heated press plate **4420** is configured to apply heat and pressure to the seal material to seal each well individually. The rear clamp assembly **4416** and the front clamp assembly **4418** clamp the seal material as the knife assembly **4430** is lowered. The knife assembly **4430** cuts the seal material to create a new free end. The knife assembly **4430** cuts the seal material as the heated press plate **4420** applies heat and pressure. The heated press plate **4420** raises back up. The knife assembly **4430** raises back up. In some embodiments, the rear clamp assembly **4416** clamps the seal material just behind the amplification plate **4040**. The hinged door **4426** can open. The moveable platform **4402** can extend outward away from the heated press plate **4420**. The sealed amplification plate **4040** is presented for the multifunctional robot **4300** for pickup.

[0120] In some embodiments, a plate sealer for use in a diagnostic testing apparatus is provided. The plate sealer can include a heated press plate configured to apply heat and pressure to a seal material. In some embodiments, the seal material is configured to seal against a top surface of an amplification plate. In some embodiments, the amplification plate comprises a plurality of wells that define amplification compartments for amplification. The plate sealer can include a knife assembly configured to cut the seal material. In some embodiments, the heated press plate and the knife assembly are configured to be lowered simultaneously relative to the amplification plate to cut the seal material and seal the seal material to the amplification plate.

[0121] In some embodiments, the plate sealer can include a roll of the seal material. In some embodiments, the plate sealer can include a rear clamp assembly and a front clamp assembly. In some embodiments, the rear clamp assembly and the front clamp assembly are configured to clamp the seal material when the heated press plate and the knife assembly are lowered. In some embodiments, the plate sealer can include a feed plate configured to advance the seal material. In some embodiments, the plate sealer can include a motor assembly configured to raise and lower the heated press plate and the knife assembly. In some embodiments, the plate sealer can include the amplification plate. In some embodiments, the plate sealer can include a multifunctional robot configured to position the amplification plate. In some embodiments, the plate sealer can include a movable platform configured to receive the amplification plate. In some embodiments, the plate sealer can include a hinged door.

[0122] In some embodiments, a two lane drawer assembly is provided. The two lane drawer assembly can include a two lane drawer. The two lane drawer can include a pipette tip station configured to house two pipette tip holders. The two lane drawer can include an extraction

container station configured to house two extraction container holders. The two lane drawer can include an amplification plate station configured to house two amplification plates. The two lane drawer assembly can include an extractor module positioned relative to the extraction container station. In some embodiments, the extractor module comprises magnets configured to apply a magnetic field to extraction container holders of the two extraction container holders.
[0123] In some embodiments, the extractor module is configured to process samples from the one extraction container holder. In some embodiments, the extractor module is configured to move up and down relative to the two extraction container holders. In some embodiments, the extractor module is configured to move up and down along one or more rails. In some embodiments, the two lane drawer comprises a retention feature configured to extend over a portion of the pipette tip station and the extraction container station. In some embodiments, the two lane drawer comprises a latching mechanism comprising a push-to-close latch. In some embodiments, the two lane drawer comprises a kick-out mechanism configured to facilitate the sliding extension of the two lane drawer. In some embodiments, the two lane drawer comprises telescoping slides. In some embodiments, the two lane drawer assembly can include the two pipette tip holders, the two extraction container holders, and the two amplification plates. In some embodiments, the two lane drawer assembly can include three of the two lane drawers. In some embodiments, the two lane drawer assembly can include a tip drawer configured to house five pipette tip holders.
[0124] The foregoing description is intended to illustrate various aspects of the present technology. It is not intended that the examples presented herein limit the scope of the present technology. The technology now being fully described, it will be apparent to one of ordinary skill in the art that many changes and modifications can be made thereto without departing from the spirit or scope of the appended claims.

Claims

1. A plate sealer for use in a diagnostic testing apparatus, the plate sealer comprising: a heated press plate configured to apply heat and pressure to a seal material, wherein the seal material is configured to seal against a top surface of an amplification plate, wherein the amplification plate comprises a plurality of wells that define amplification compartments for amplification; and a knife assembly configured to cut the seal material, wherein the heated press plate and the knife assembly are configured to be lowered simultaneously relative to the amplification plate to cut the seal material and seal the seal material to the amplification plate.
2. The plate sealer of claim 1, further comprising a roll of the seal material.
3. The plate sealer of claim 1, further comprising a rear clamp assembly and a front clamp assembly, wherein the rear clamp assembly and the front clamp assembly are configured to clamp the seal material when the heated press plate and the knife assembly are lowered.
4. The plate sealer of claim 1, further comprising a feed plate configured to advance the seal material.
5. The plate sealer of claim 1, further comprising a motor assembly configured to raise and lower the heated press plate and the knife assembly.
6. The plate sealer of claim 1, further comprising the amplification plate.
7. The plate sealer of claim 1, further comprising a multifunctional robot configured to position the amplification plate.
8. The plate sealer of claim 1, further comprising a movable platform configured to receive the amplification plate.
9. The plate sealer of claim 1, further comprising a hinged door.