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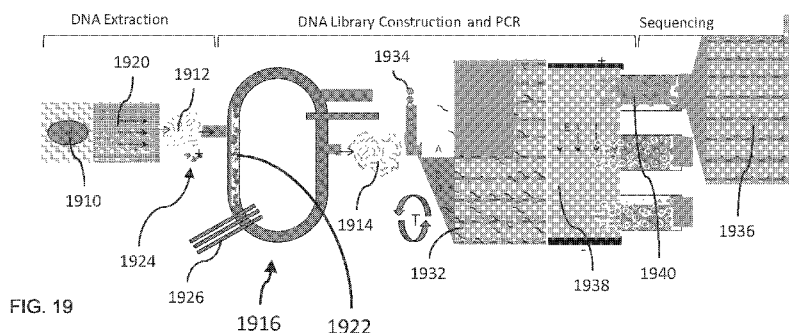
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(54) Title: SYSTEMS AND METHODS FOR AUTOMATED REUSABLE PARALLEL BIOLOGICAL REACTIONS



(57) Abstract: A method comprises magnetically holding a bead carrying biological material (e.g., nucleic acid, which may be in the form of DNA fragments or amplified DNA) in a specific location of a substrate, and applying an electric field local to the bead to isolate the biological material or products or byproducts of reactions of the biological material. For example, the bead is isolated from other beads having associated biological material. The electric field in various embodiments concentrates reagents for an amplification or sequencing reaction, and/or concentrates and isolates detectable reaction by-products. For example, by isolating nucleic acids around individual beads, the electric field can allow for clonal amplification, as an alternative to emulsion PCR. In other embodiments, the electric field isolates a nanosensor proximate to the bead, to facilitate detection of at least one of local pH change, local conductivity change, local charge concentration change and local heat. The beads may be trapped in the form of an array of localized magnetic field regions.