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(54) Title: SINGLE-MOLECULE STRAND-SPECIFIC END MODALITIES

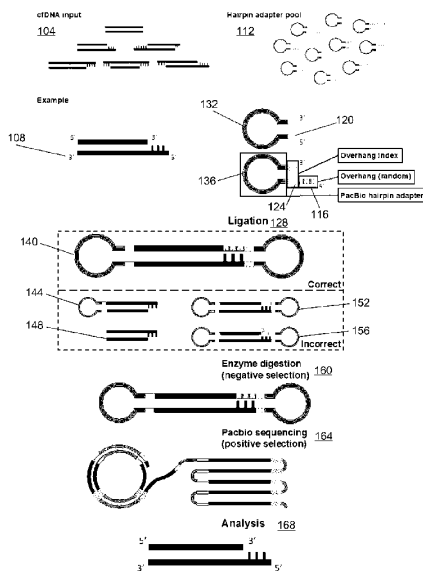


FIG. 1

(57) Abstract: The fragmentomic feature of which strand (3' or 5'), if any, overhangs the other at one or both ends double-stranded cell-free DNA fragments can be used to analyze a biological sample. The amount of fragments with the 3' strand overhanging the 5' strand, the 5' strand overhanging the 3' strand, and/or strands being even (blunt) at one or both ends can be used to determine the type of DNA or a level of condition, including cancer and nuclease activity deficiencies. Embodiments described herein allow for determining the amount of these different end modalities, unlike prior techniques. The end modality information can be paired with end motifs to further analyze biological samples. Related systems are also described.

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