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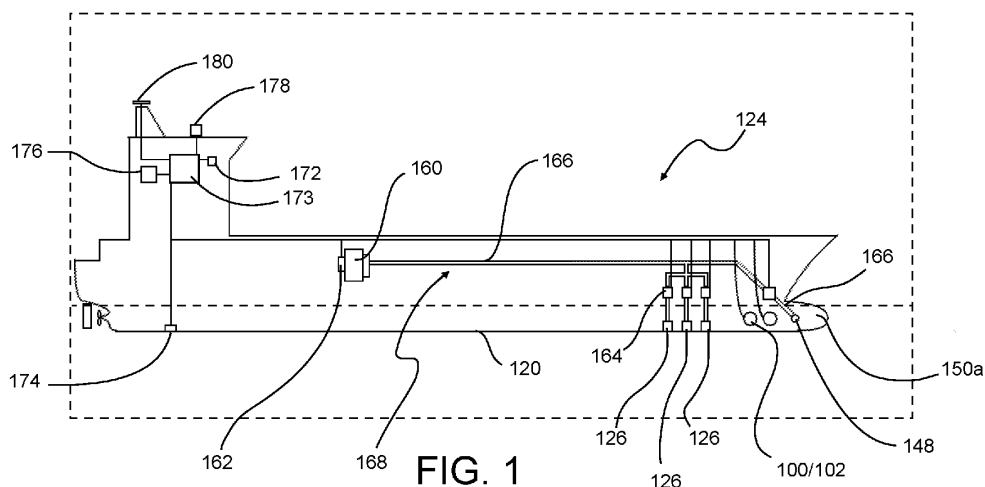


FIG. 1

(57) Abstract: A system and method for enhancing marine vessel efficiency through integrated hull optimizations is disclosed. The system includes automated bow thruster covers that reduce hull drag and condition water flow, coupled with strategically positioned air lubrication nozzles that create and maintain an air layer under the vessel. The bow thruster covers may be configured as circular doors or parallel panels, optionally incorporating air discharge ports or working in conjunction with dedicated air jets. An intelligent control system optimizes the integrated components using real-time sensor data and computational fluid dynamic analysis. The system modulates air distribution and cover positions based on sea conditions and vessel speed, maintaining optimal efficiency during operation. External surfaces may incorporate superaerophilic structures to enhance air retention and reduce drag. The comprehensive integration of these components provides improved hydrodynamic efficiency while maintaining full bow thruster functionality when required.

[Continued on next page]

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