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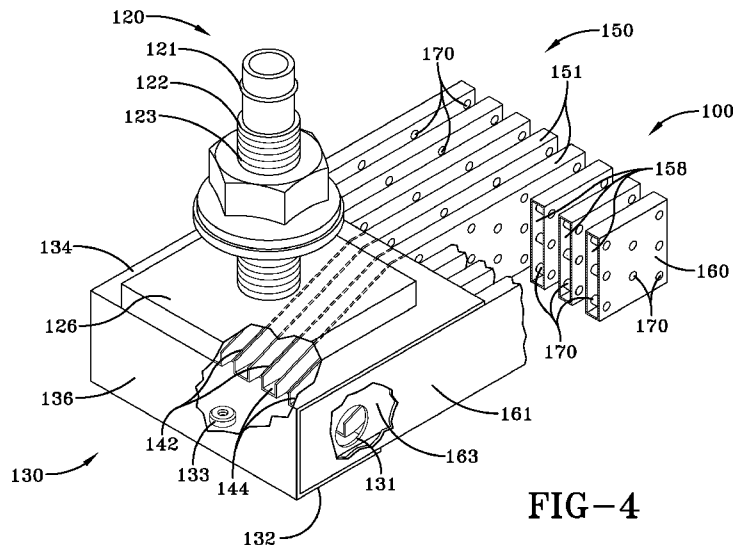


FIG-4

(57) Abstract: A keel cooler assembly comprising a coolant tube including a plurality of turbulence enhancers for improving the heat transfer of the coolant without substantially increasing pressure drop of the coolant. In one embodiment, the turbulence enhancers provide a means for generating turbulent wakes in the coolant for disrupting laminar boundary layers for improving heat transfer. In another embodiment, the turbulence enhancers provide a means for generating and propagating turbulent vortexes in the coolant to enhance mixing of the bulk coolant for improving heat transfer. In other embodiments, turbulators, including inserts or impediments, are provided having various configurations and being arranged in predetermined patterns for enhancing turbulence of the coolant for improving keel cooler heat transfer efficiency without substantially increasing pressure drop.

