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(71) Applicant: UOP LLC [US/US]; 25 East Algonquin Road,
P. O. Box 5017, Des Plaines, Illinois 60017-5017 (US).(72) Inventors: **NEGIZ, Antoine**; UOP LLC, 25 East Algonquin Road, P. O. Box 5017, Des Plaines, Illinois 60017-5017 (US). **JAMES, Robert B.**; UOP LLC, 25 East Algonquin Road, P. O. Box 5017, Des Plaines, Illinois 60017-5017 (US). **STEVENSON, Carl J.**; UOP LLC, 25 East Algonquin Road, P. O. Box 5017, Des Plaines, Illinois 60017-5017 (US). **BARGER, Paul T.**; UOP LLC, 25 East Algonquin Road, P. O. Box 5017, Des Plaines, Illinois 60017-5017 (US).(74) Agent: **MAAS, Maryann**; UOP LLC, 25 East Algonquin Road, P. O. Box 5017, Des Plaines, Illinois 60017-5017 (US).

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(54) Title: HIGH EFFICIENCY PROCESSES FOR OLEFINS, ALKYNES, AND HYDROGEN CO-PRODUCTION FROM LIGHT HYDROCARBONS SUCH AS METHANE

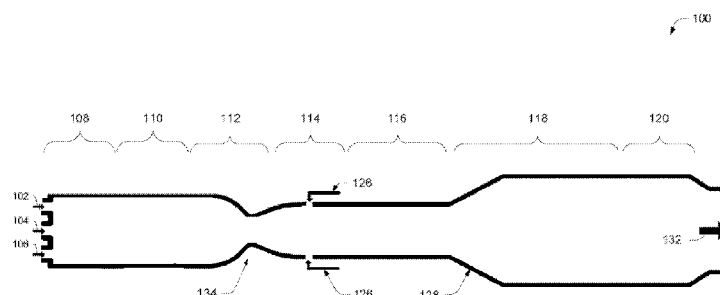


FIG. 1

(57) Abstract: High efficiency processes for producing olefins, alkynes, and hydrogen co-production from light hydrocarbons are disclosed. In one version, the method includes the steps of combusting hydrogen and oxygen in a combustion zone of a pyrolytic reactor to create a combustion gas stream, transitioning a velocity of the combustion gas stream from subsonic to supersonic in an expansion zone of the pyrolytic reactor, injecting a light hydrocarbon into the supersonic combustion gas stream to create a mixed stream including the light hydrocarbon, transitioning the velocity of the mixed stream from supersonic to subsonic in a reaction zone of the pyrolytic reactor to produce acetylene, and catalytically hydrogenating the acetylene in a hydrogenation zone to produce ethylene. In certain embodiments, the carbon efficiency is improved using methanation techniques.