

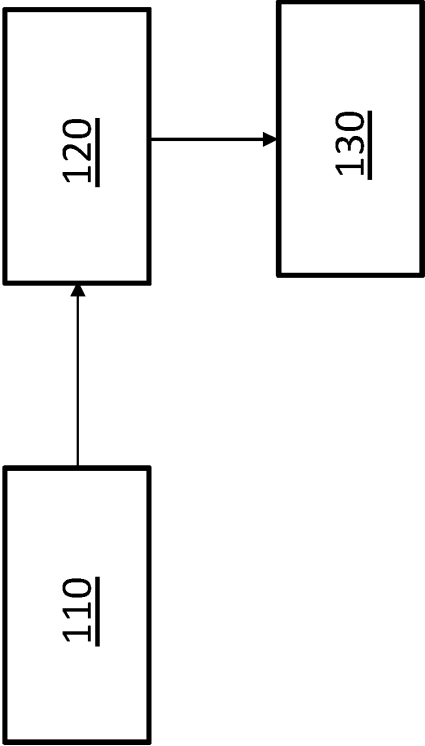


FIG. 1

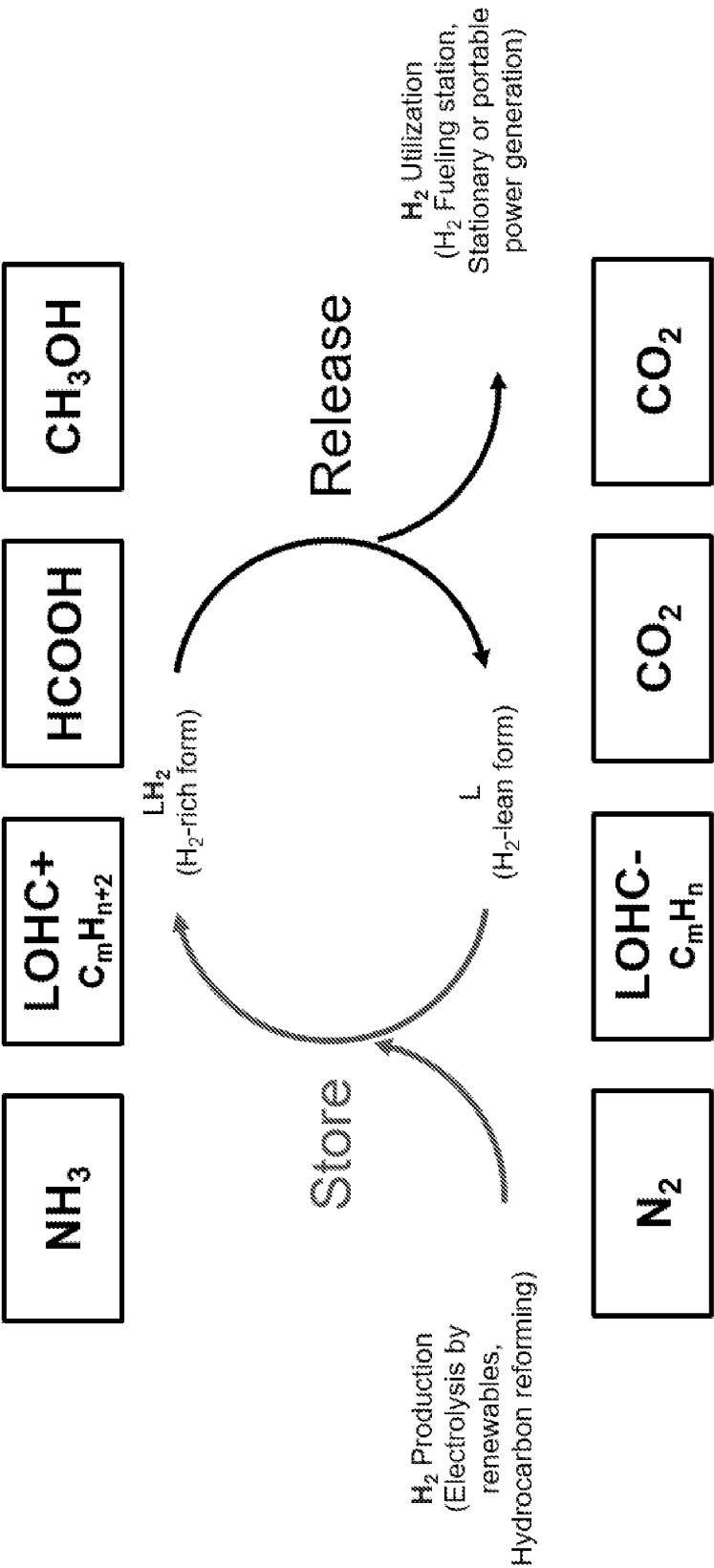


FIG. 2

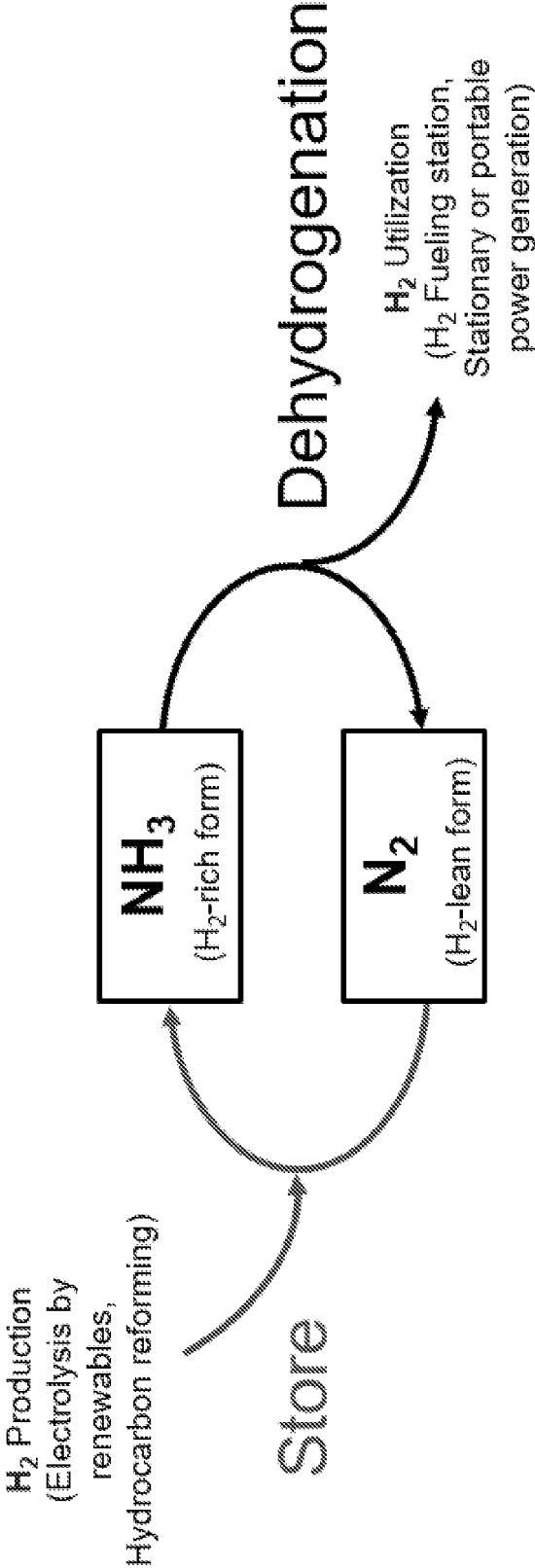


FIG. 3

Ammonia as an Energy Carrier

H₂ storage capacity of NH₃:
17.6 wt %, 120 g_{H₂} L⁻¹

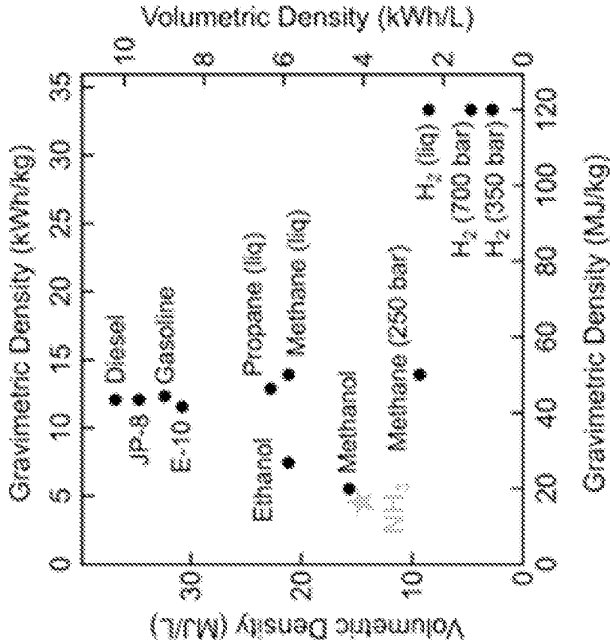


FIG. 4

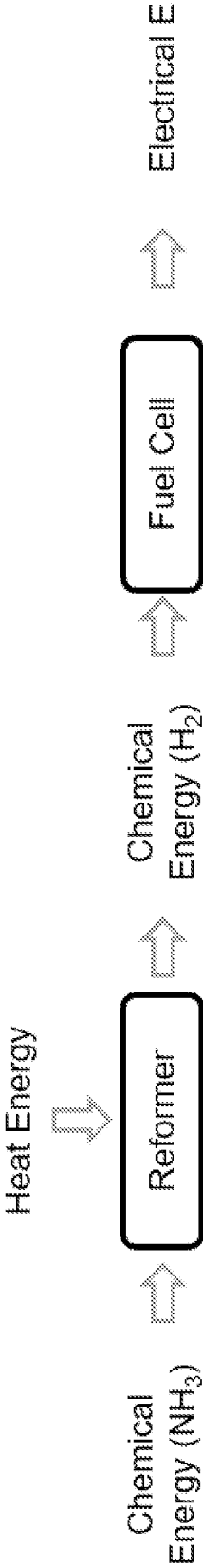


FIG. 5

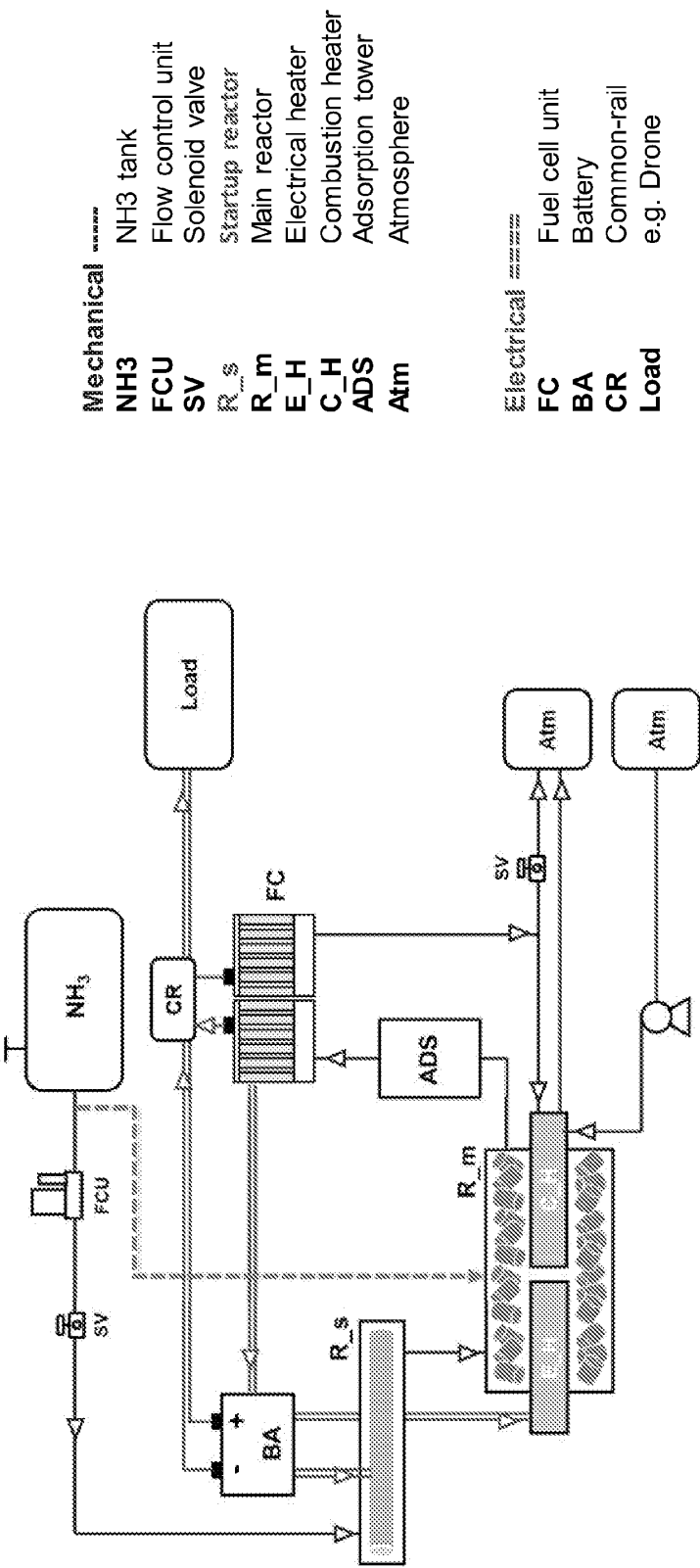


FIG. 6

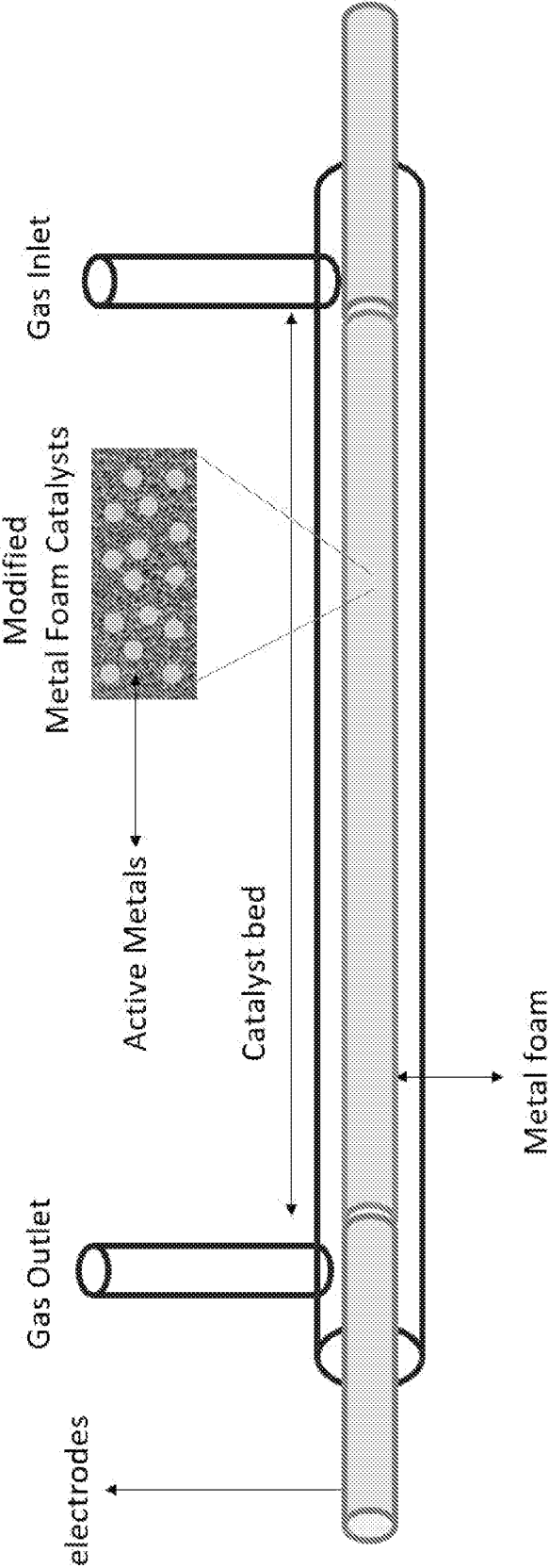


FIG. 7A

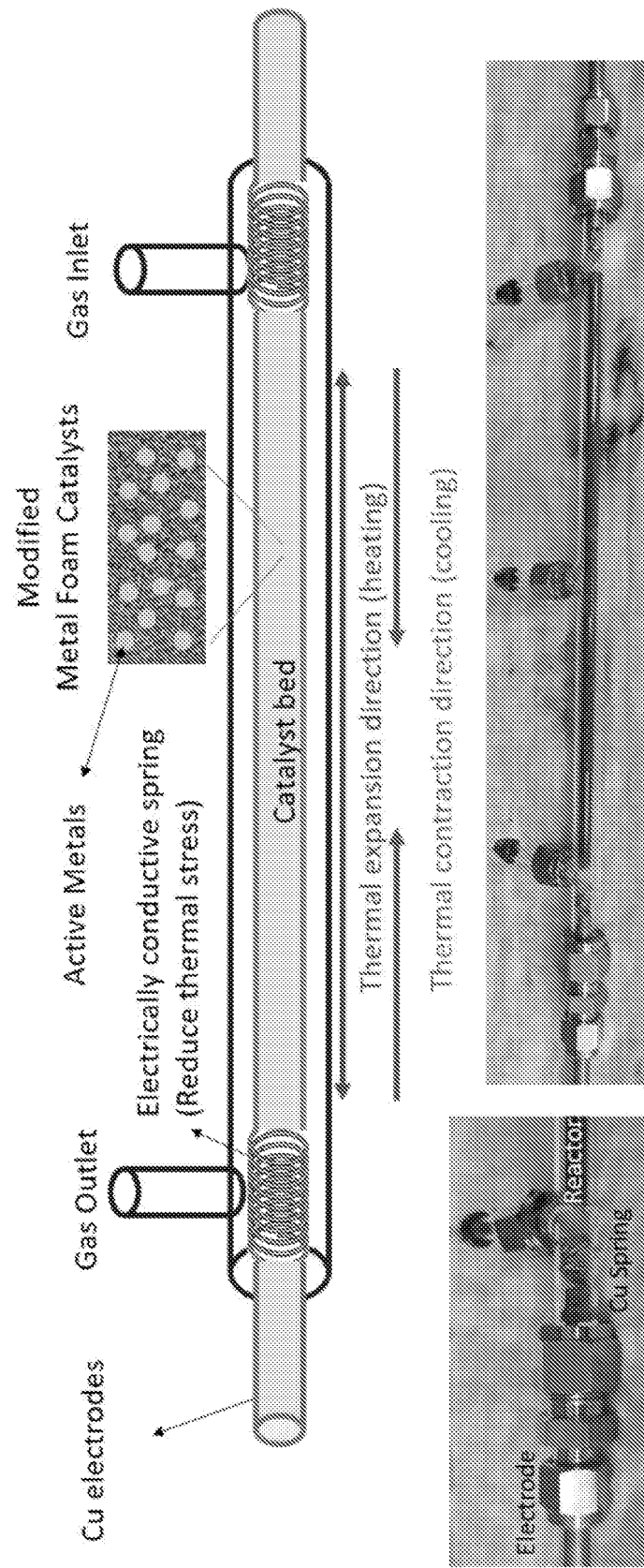
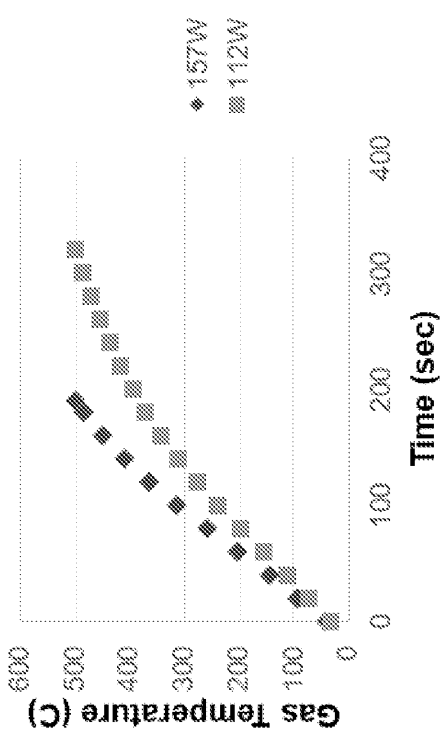
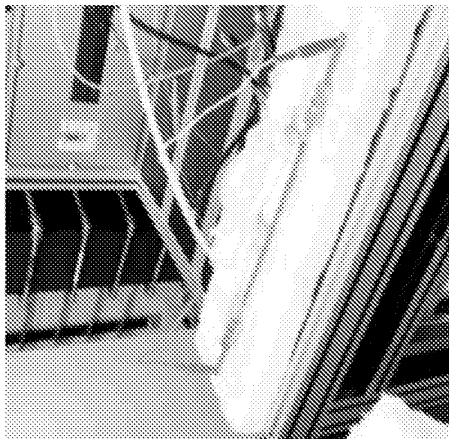


FIG. 7B



Flowing gas temperature ramp to 500C in < 5 min

FIG. 8



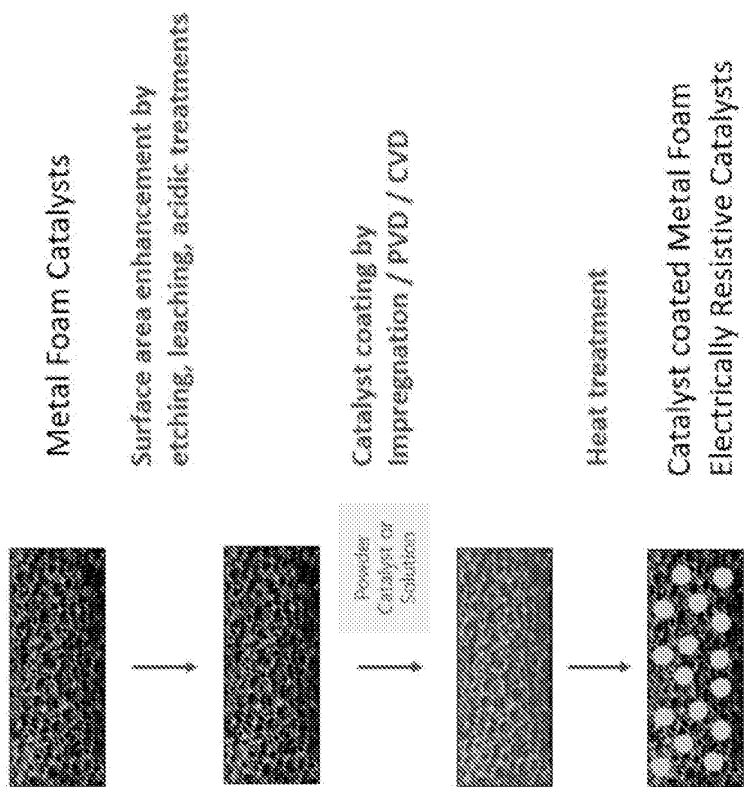


FIG. 9

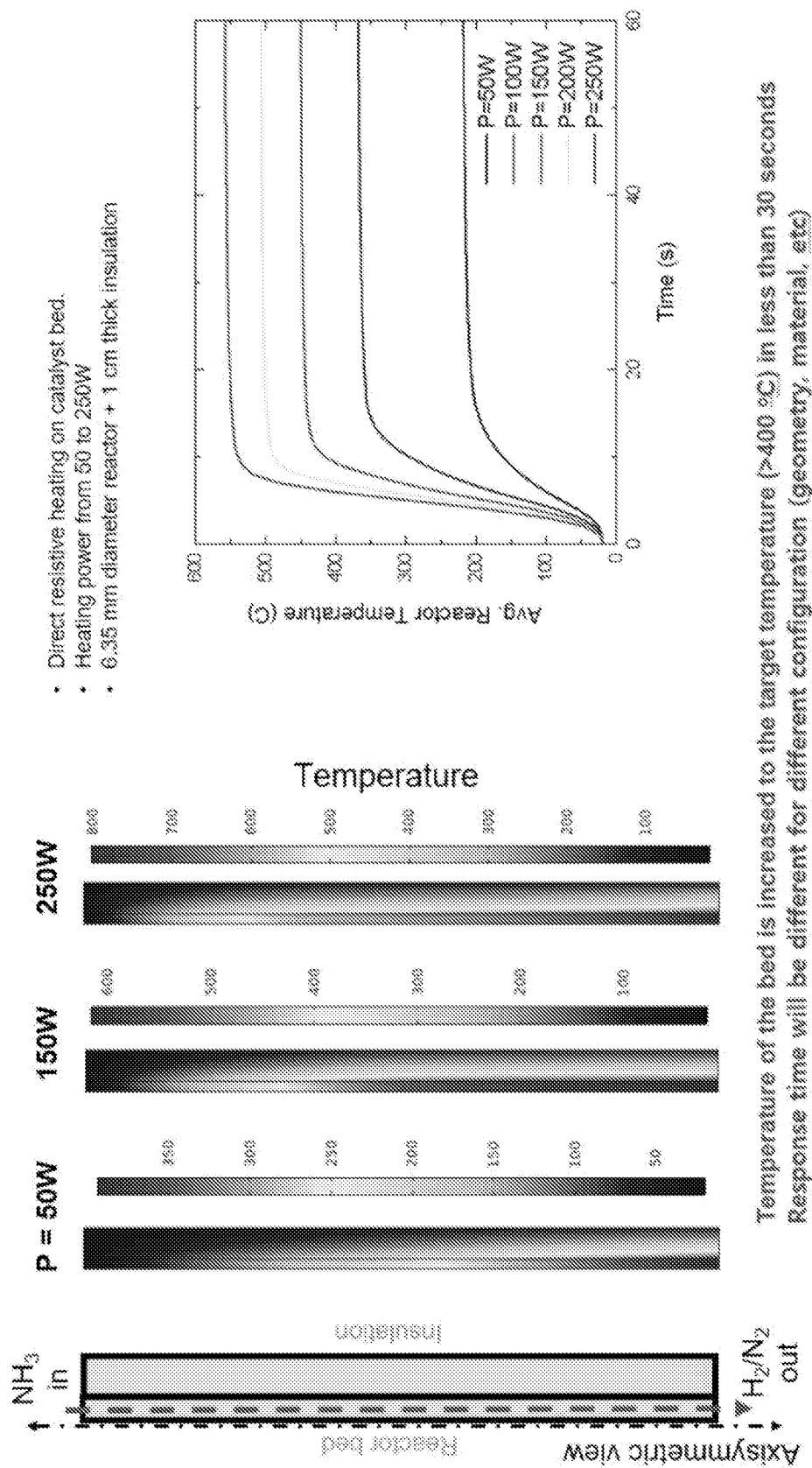


FIG. 10

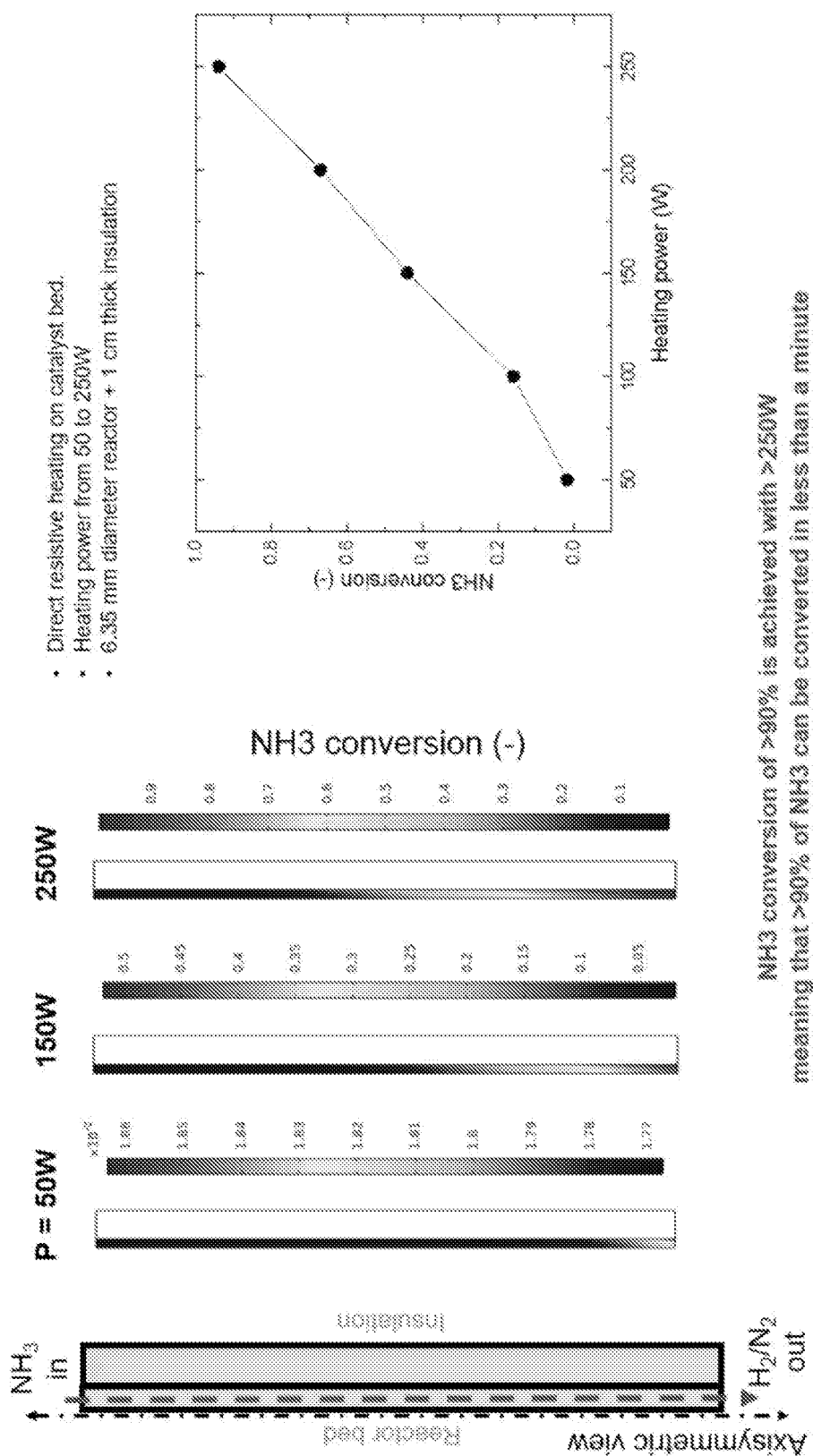


FIG. 11

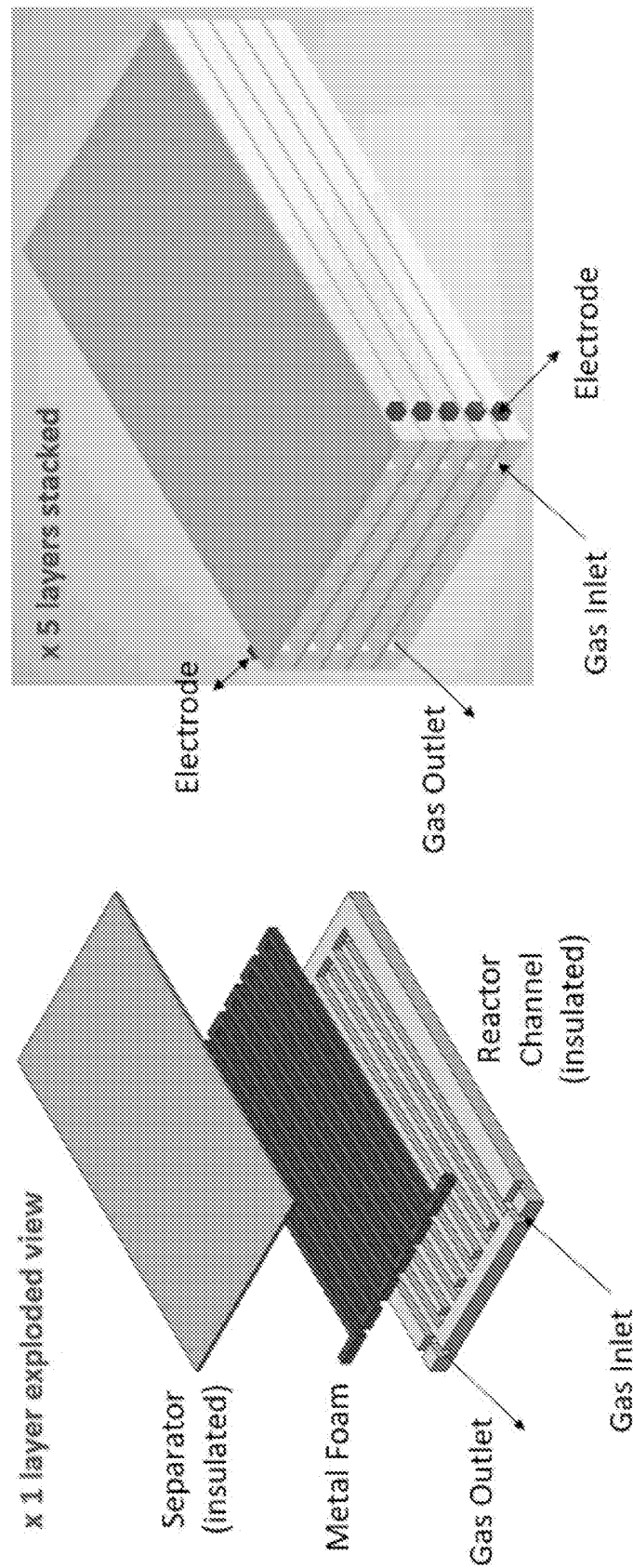


FIG. 12

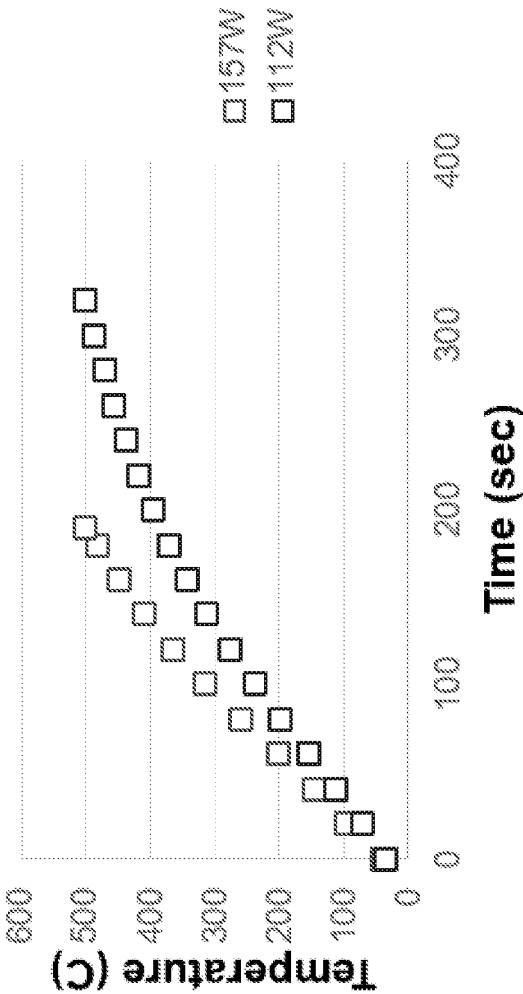


FIG. 13

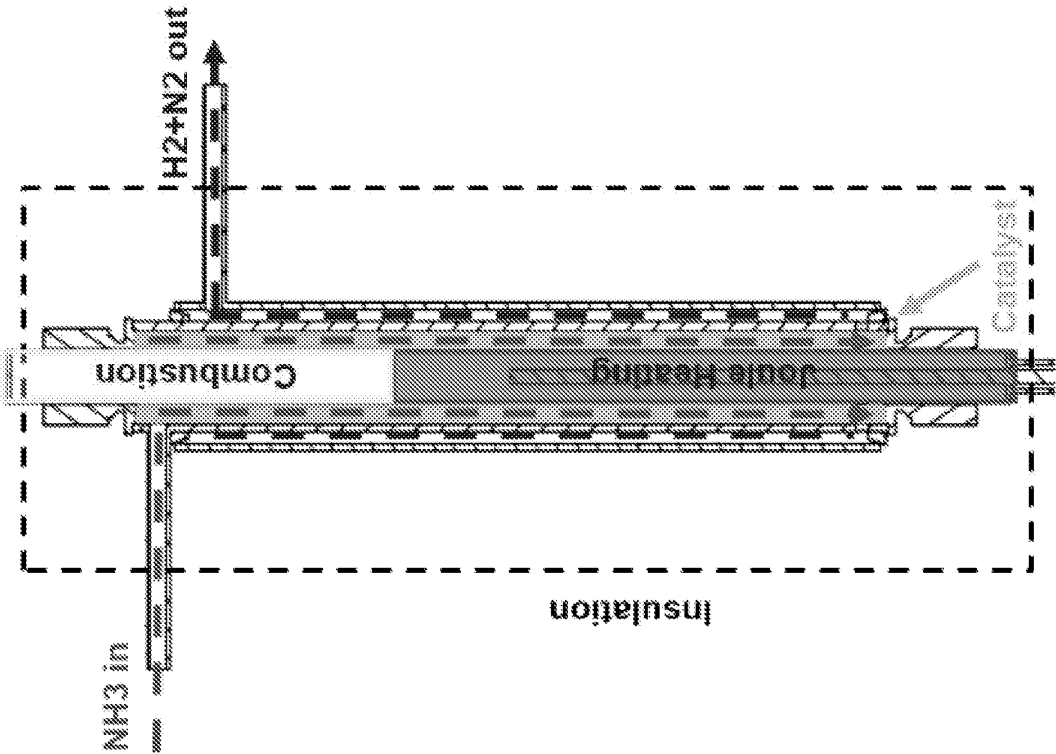


FIG. 14

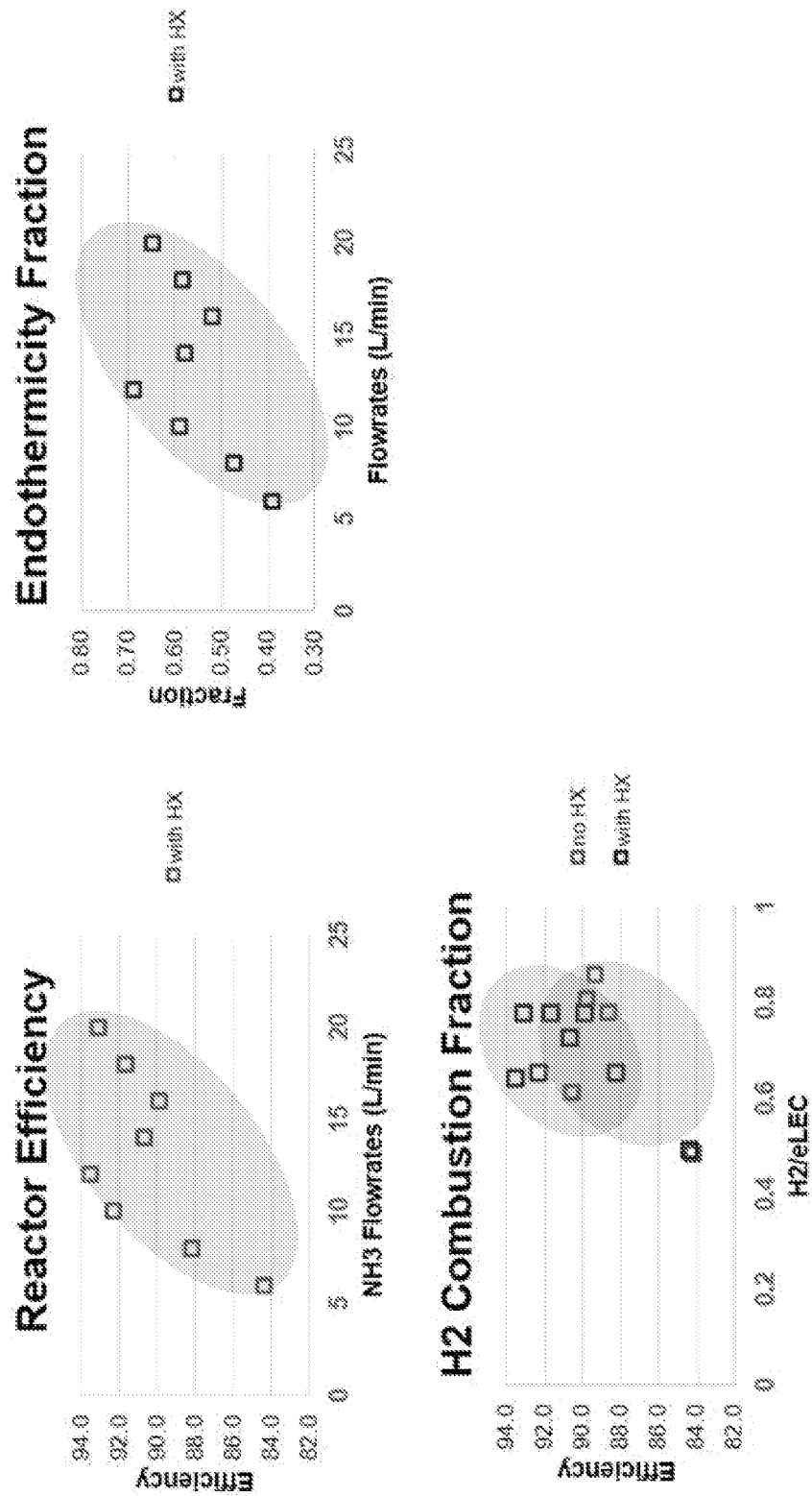


FIG. 15A

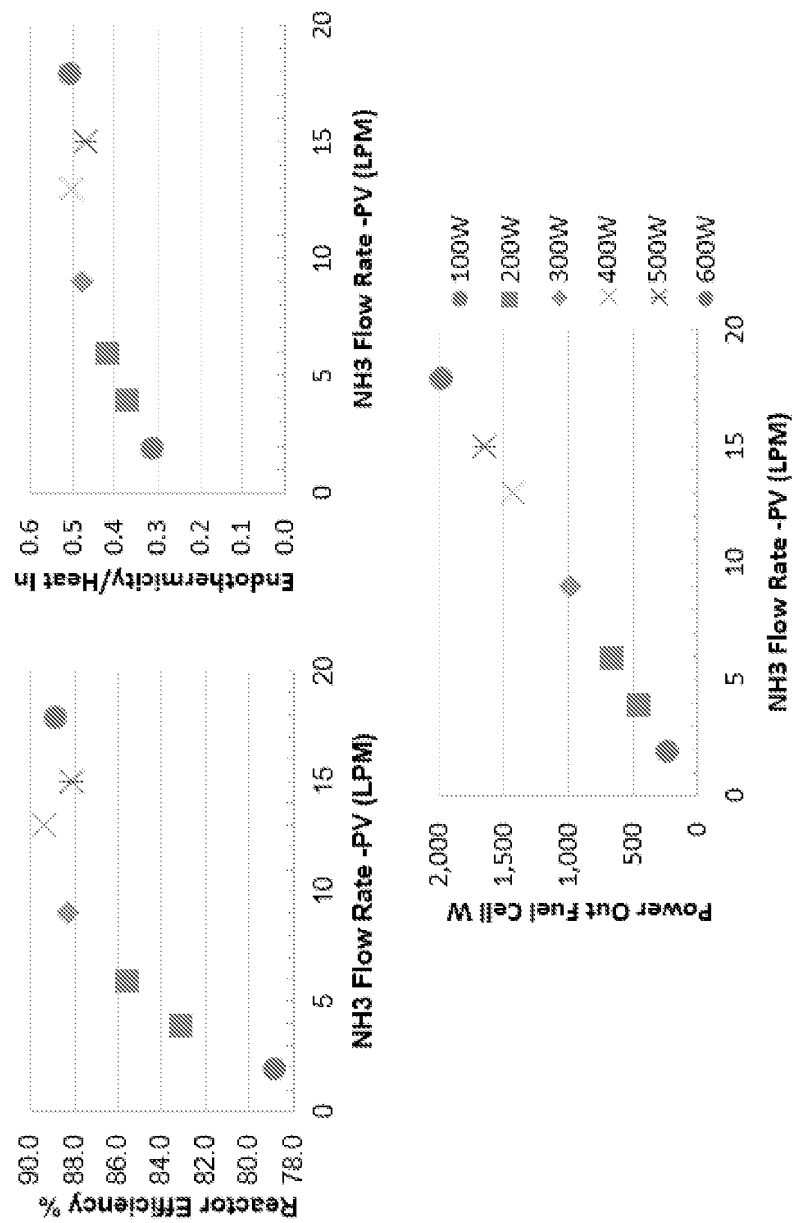


FIG. 15B

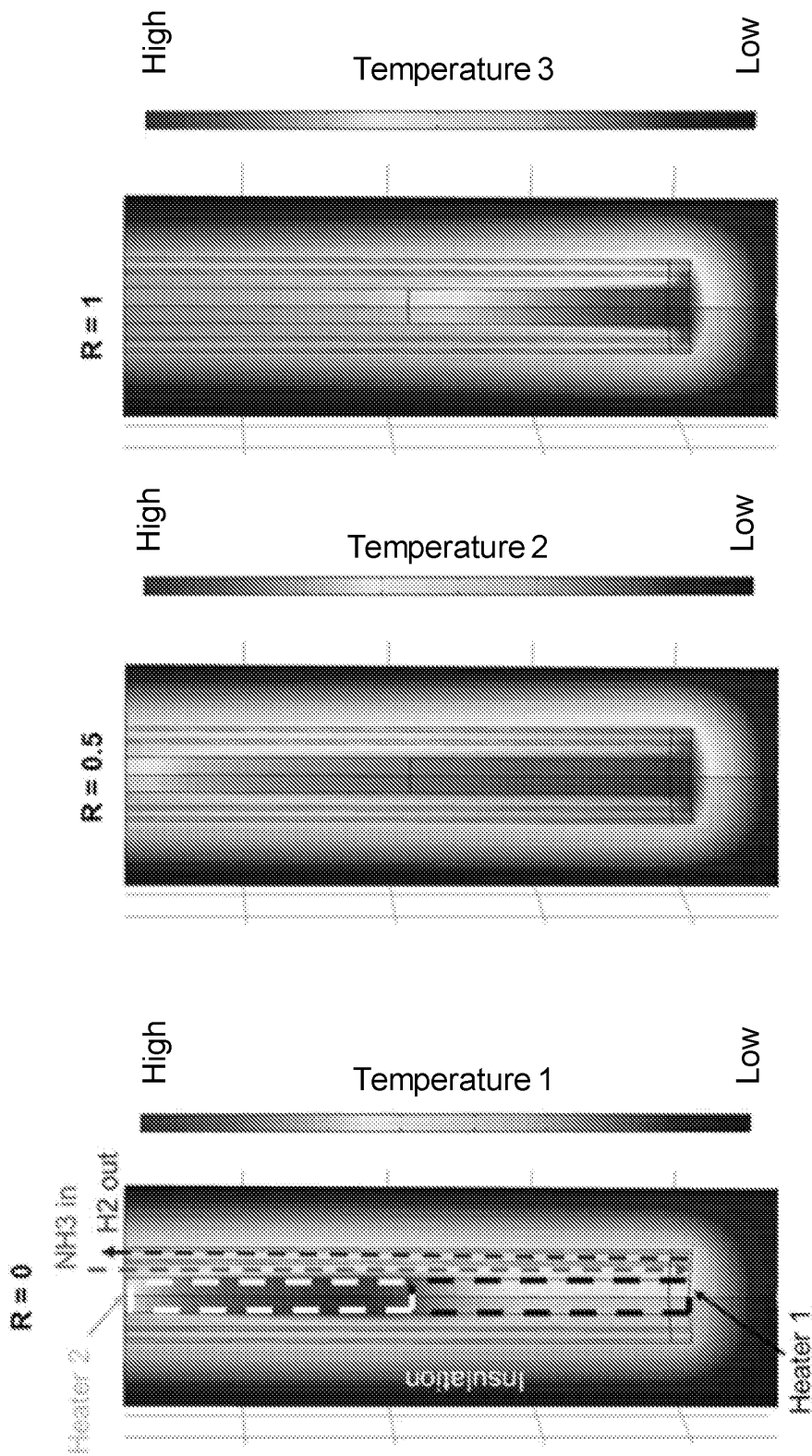


FIG. 16

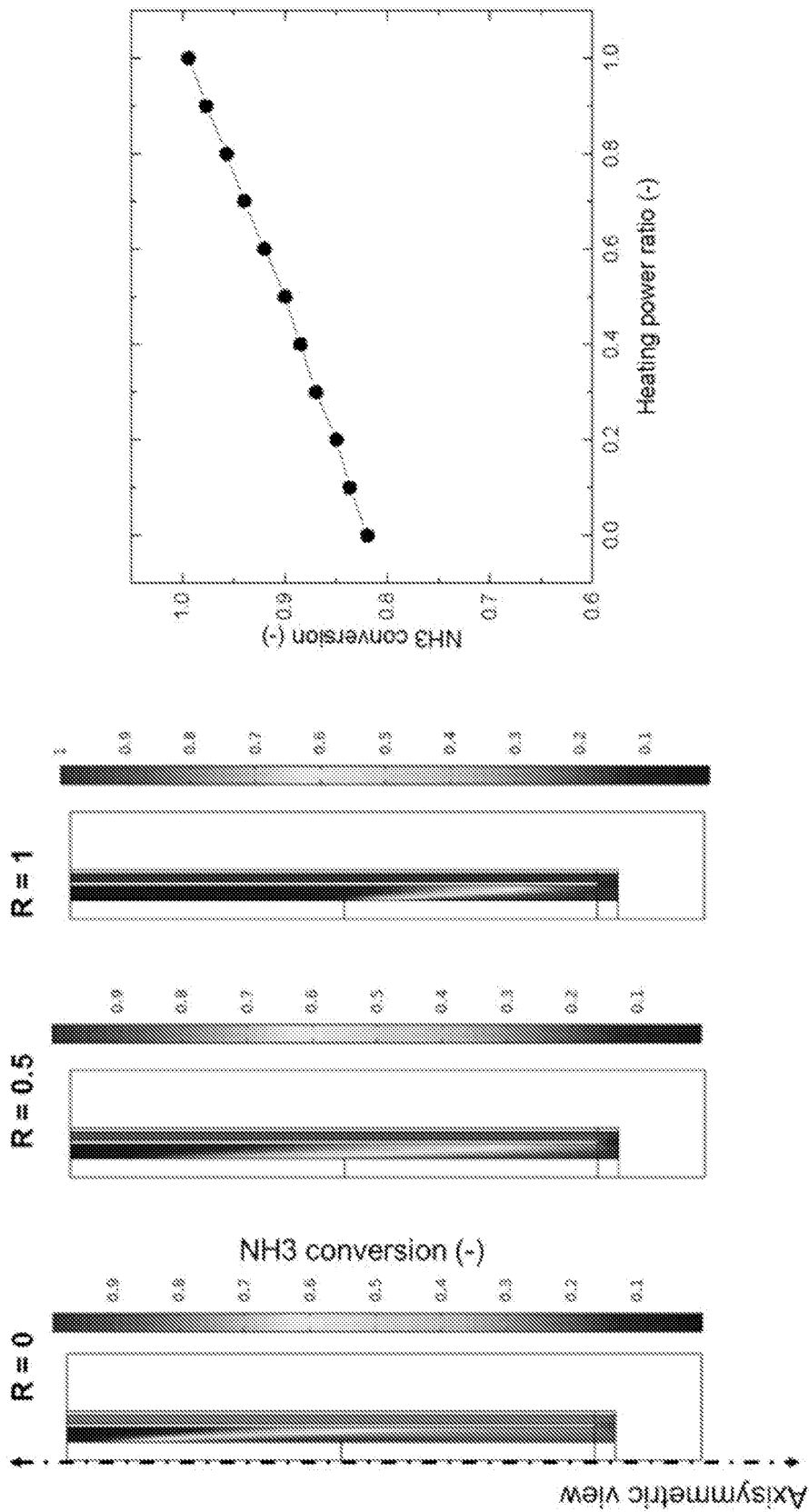


FIG. 17

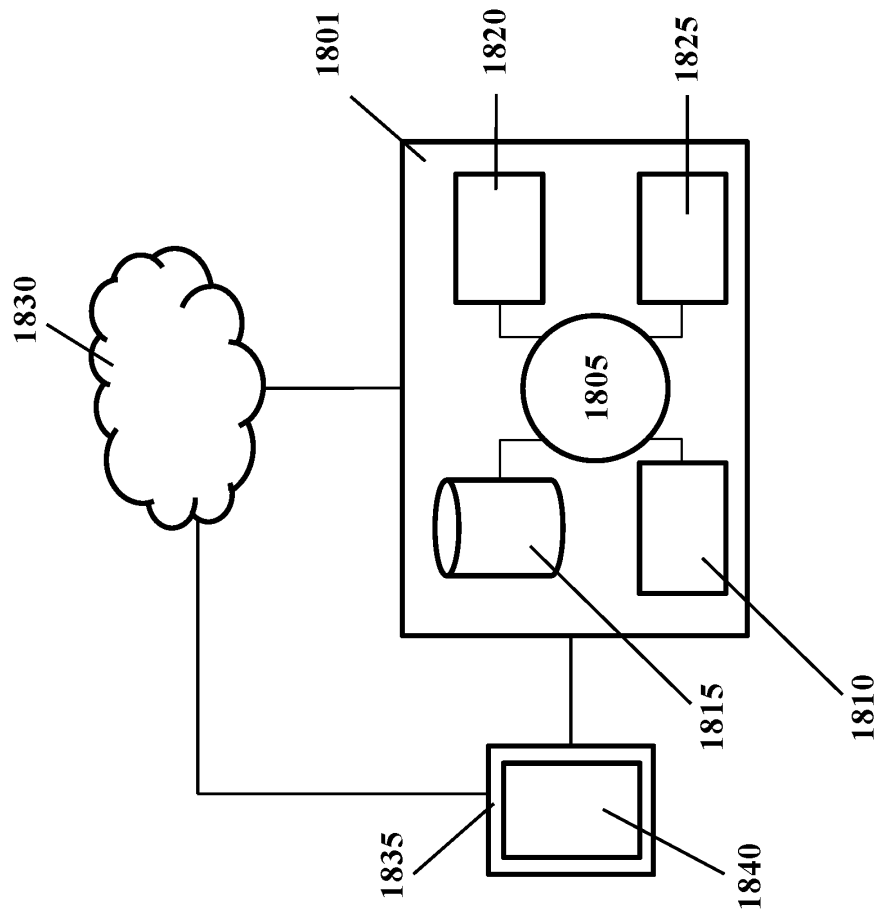


FIG. 18

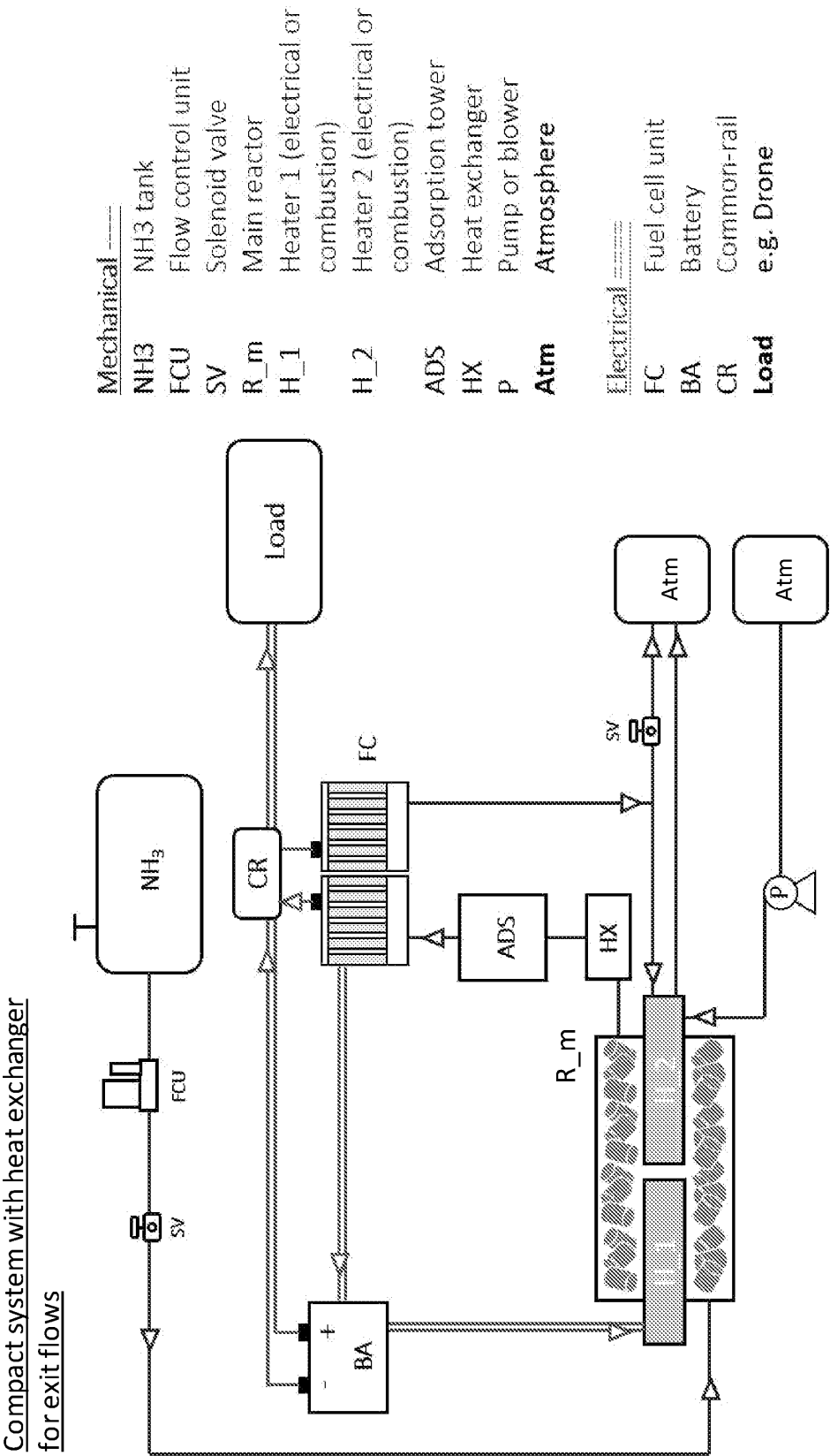


FIG. 19

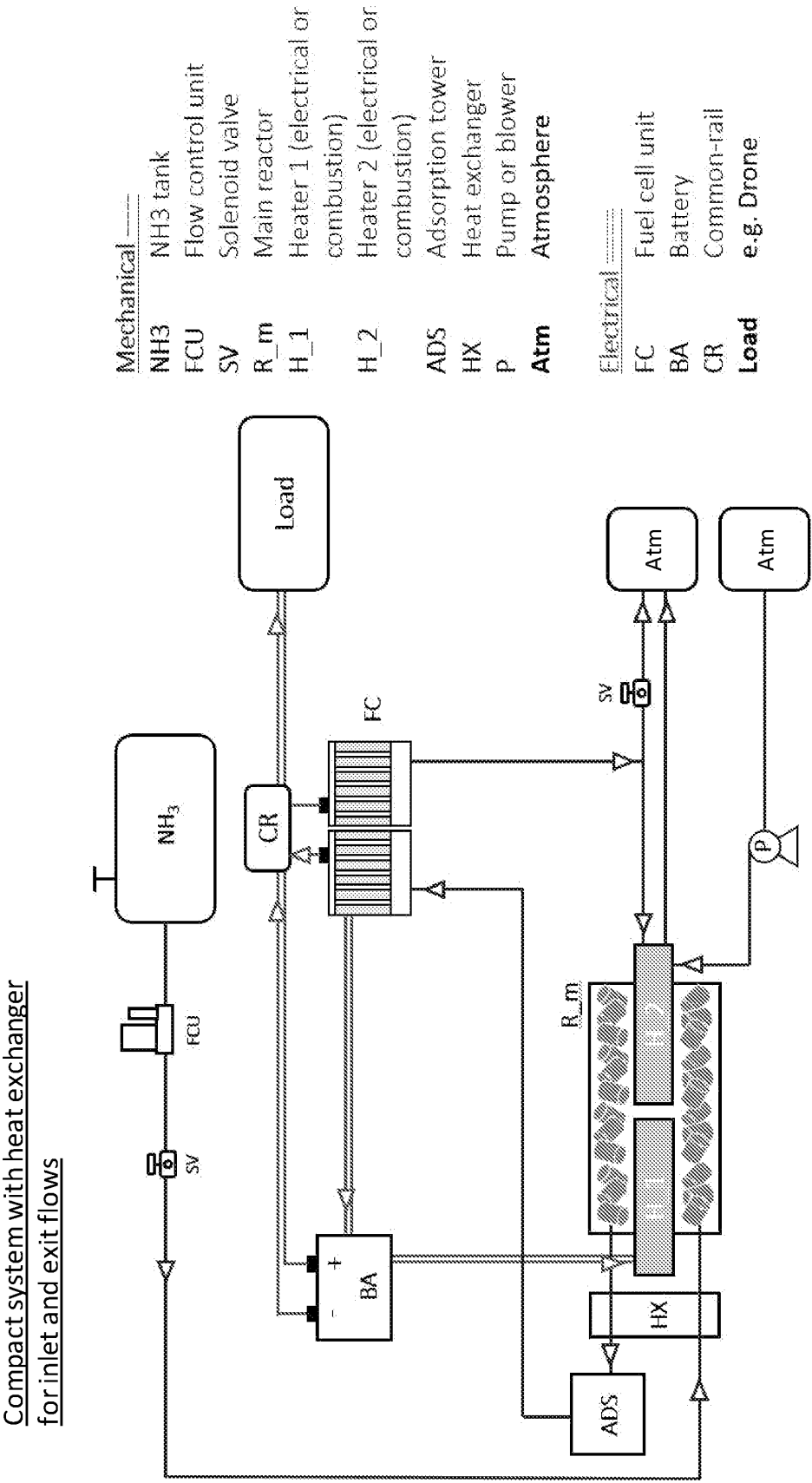


FIG. 20

Compact system with
startup reactor

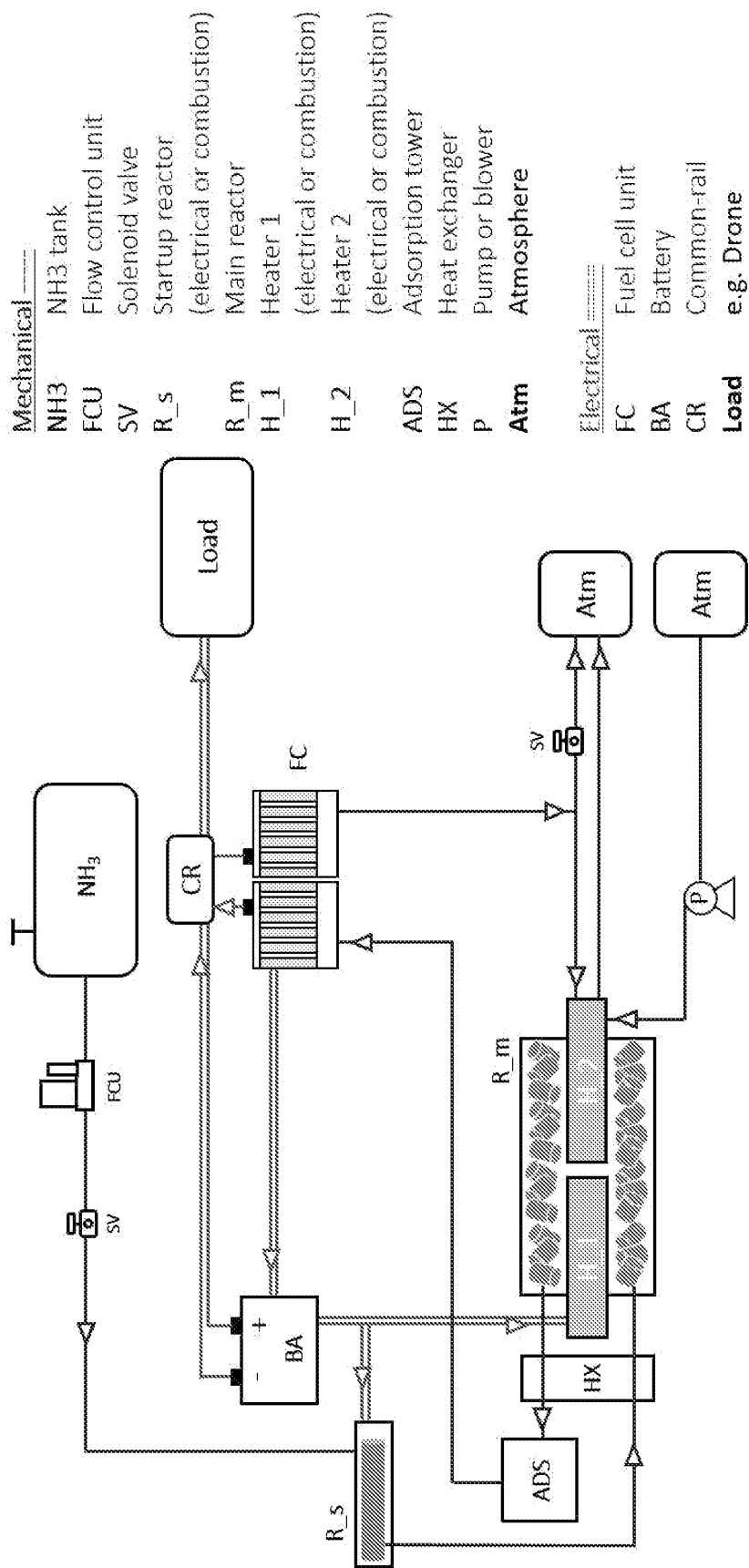


FIG. 21

Larger system with startup reactor and multiple adsorbents

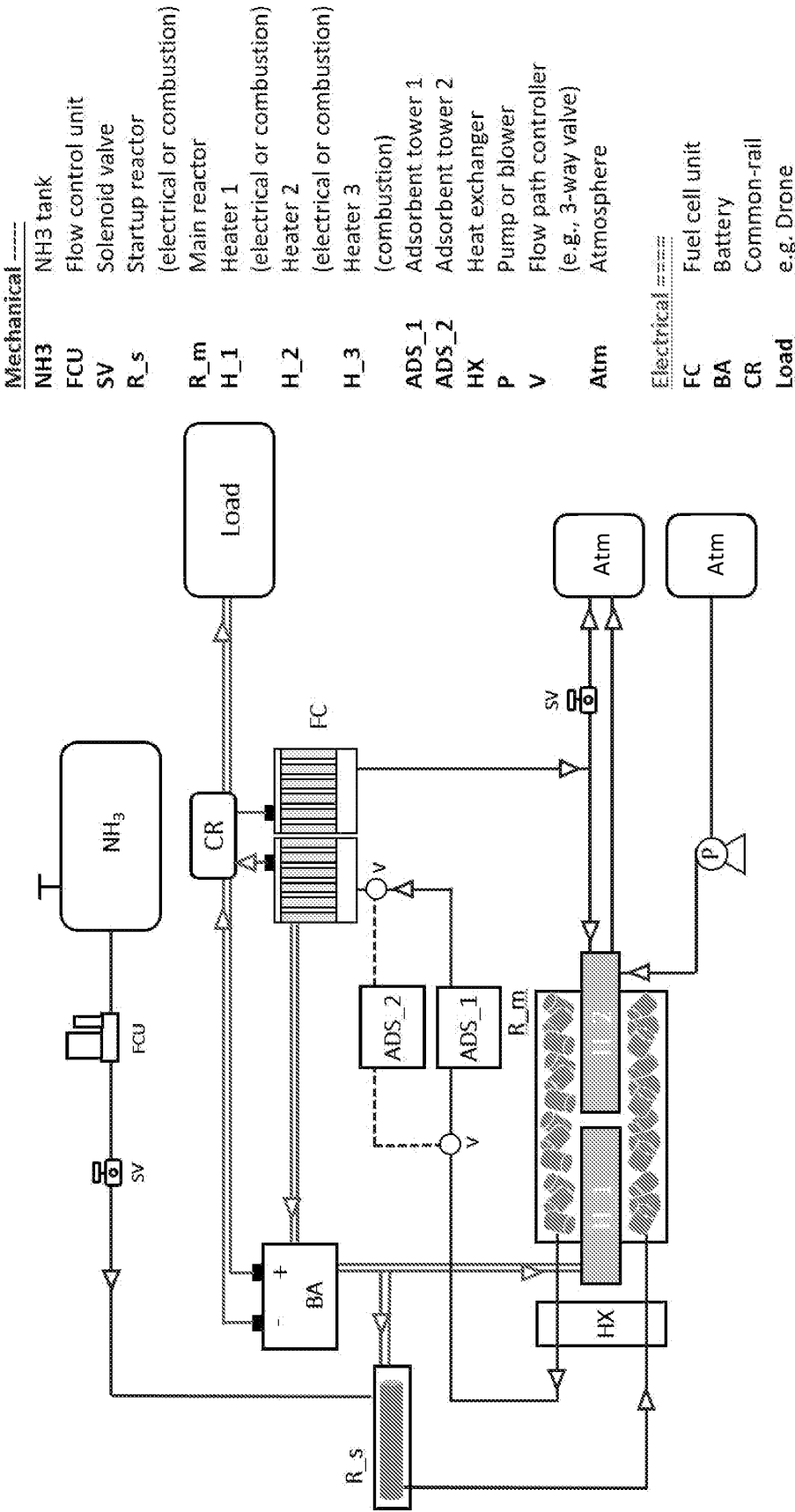


FIG. 22

Larger system (e.g., 100 kW) with startup reactor and multiple adsorbents
– adsorbent regeneration (electrical heating)

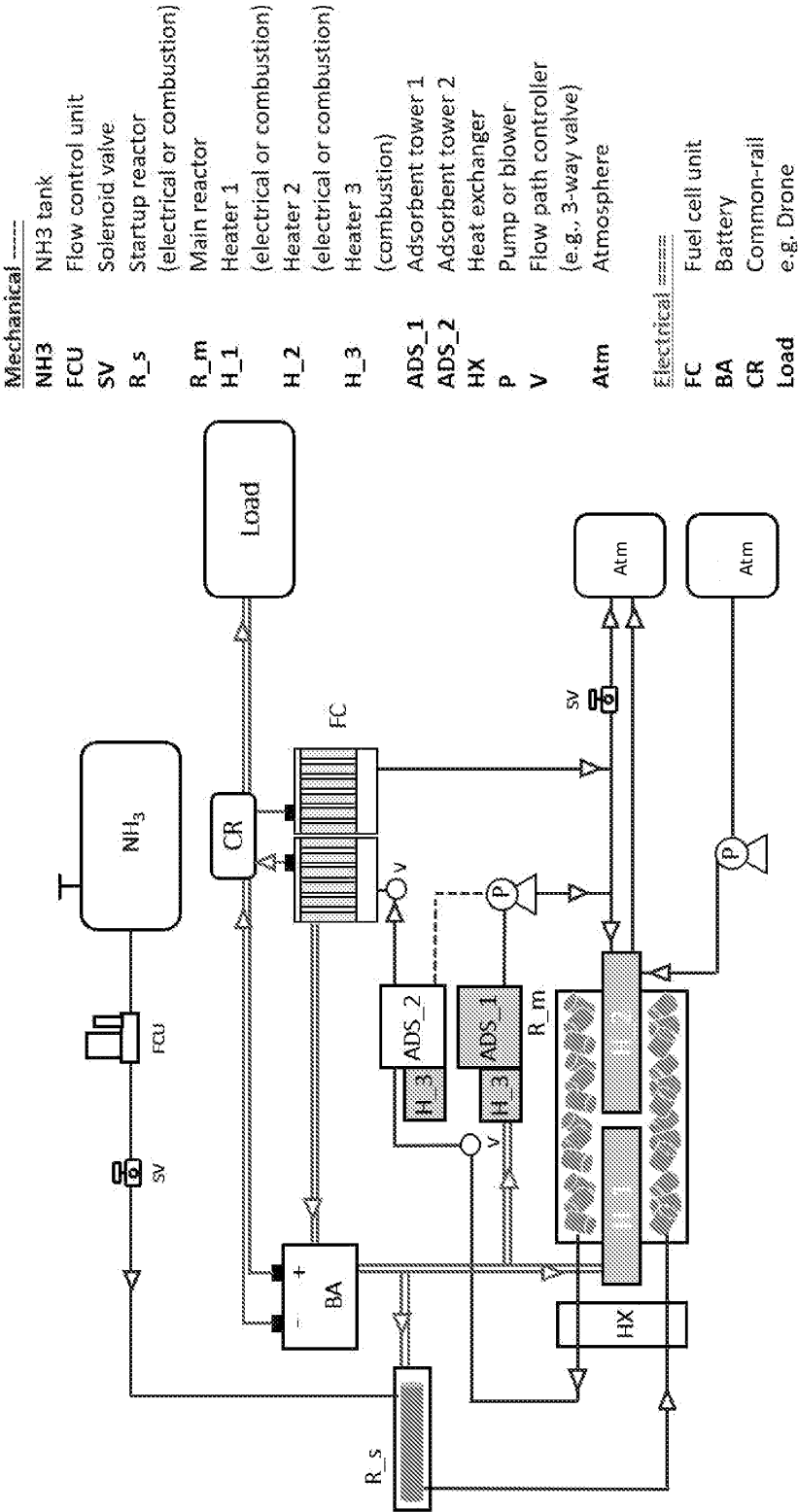


FIG. 23

Larger system (e.g., 100 kW) with startup reactor and multiple adsorbents

– adsorbent regeneration (combustion heating)

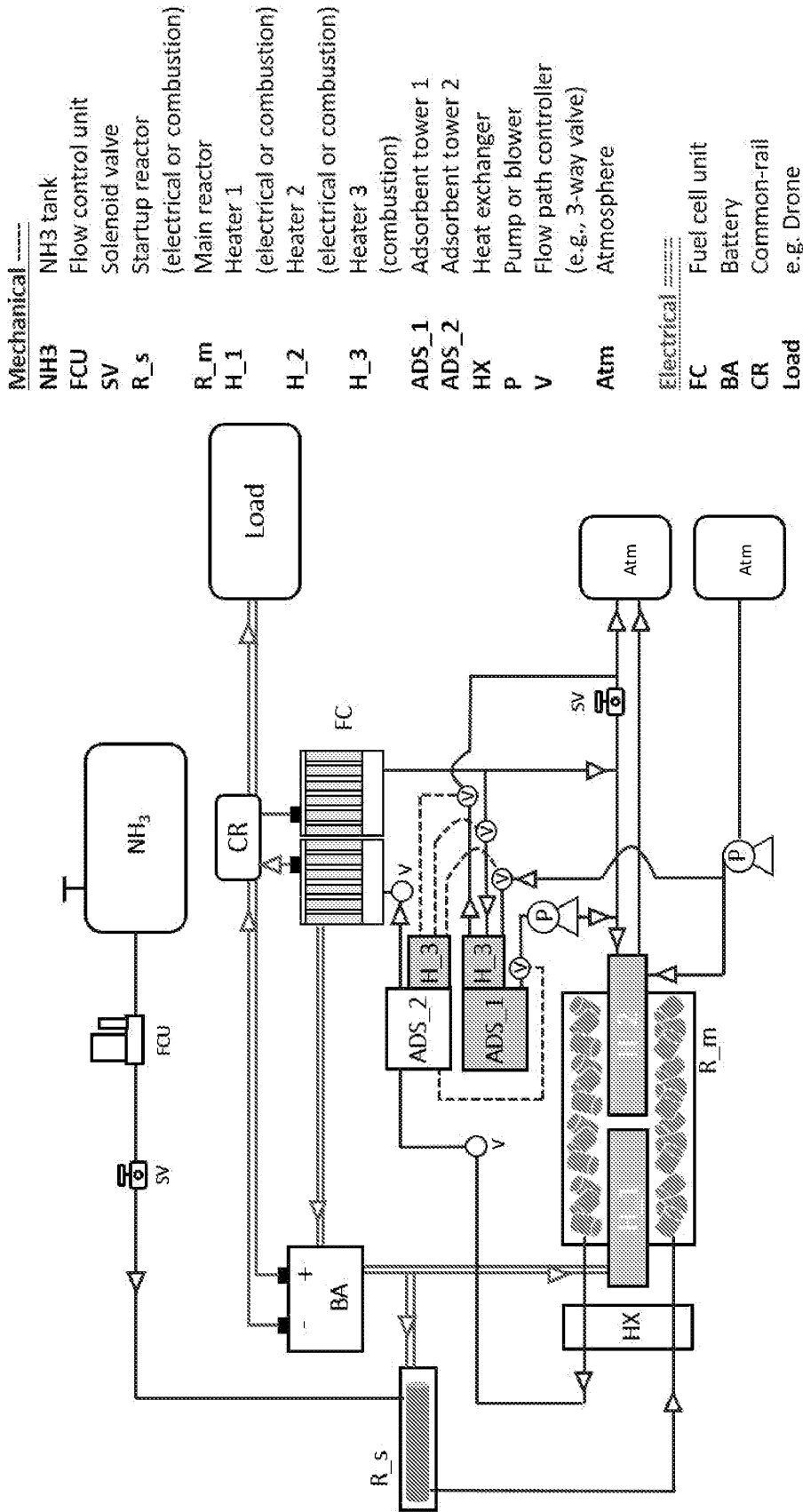


FIG. 24

Larger system (e.g., 100 kW) with startup reactor and multiple adsorbents

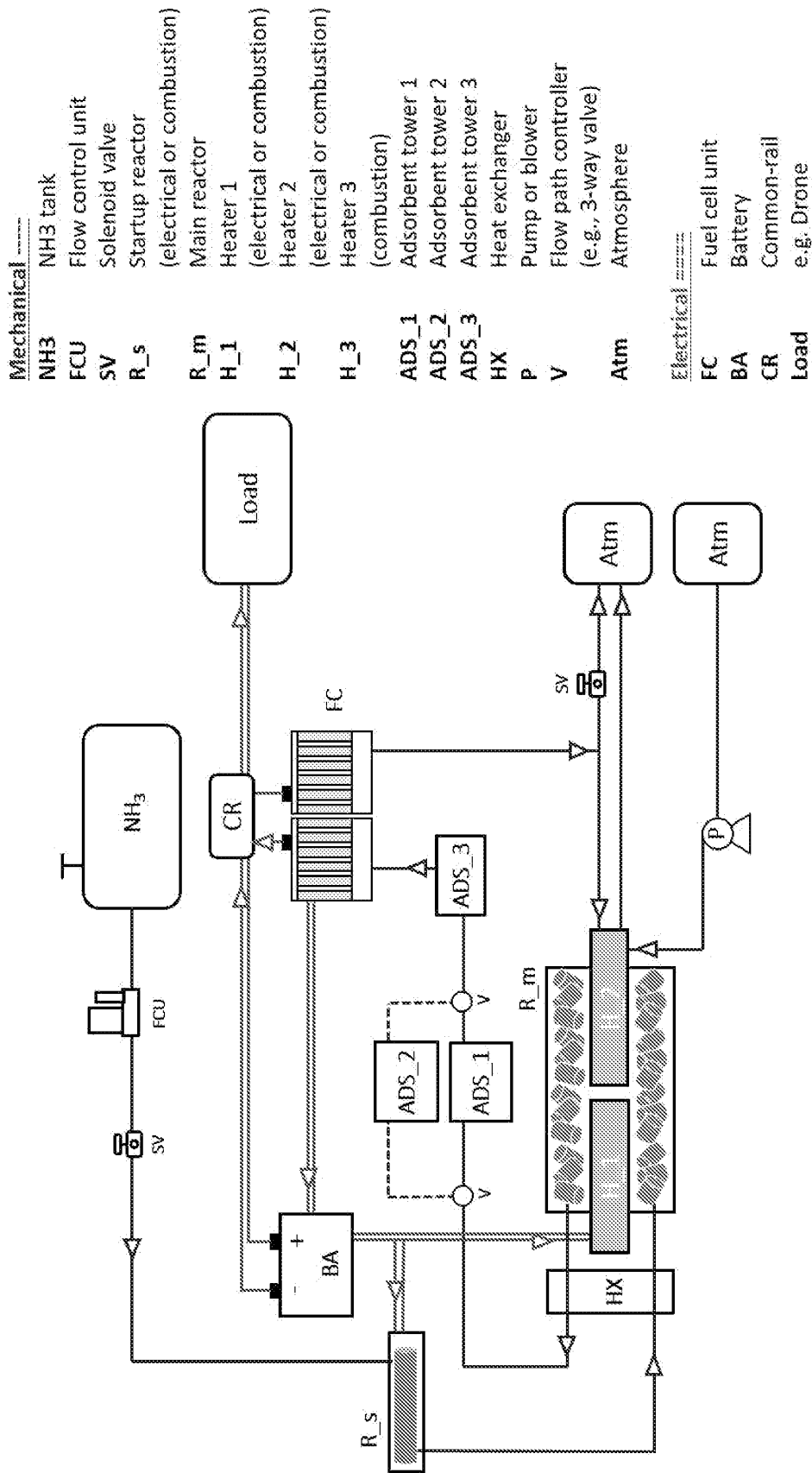


FIG. 25

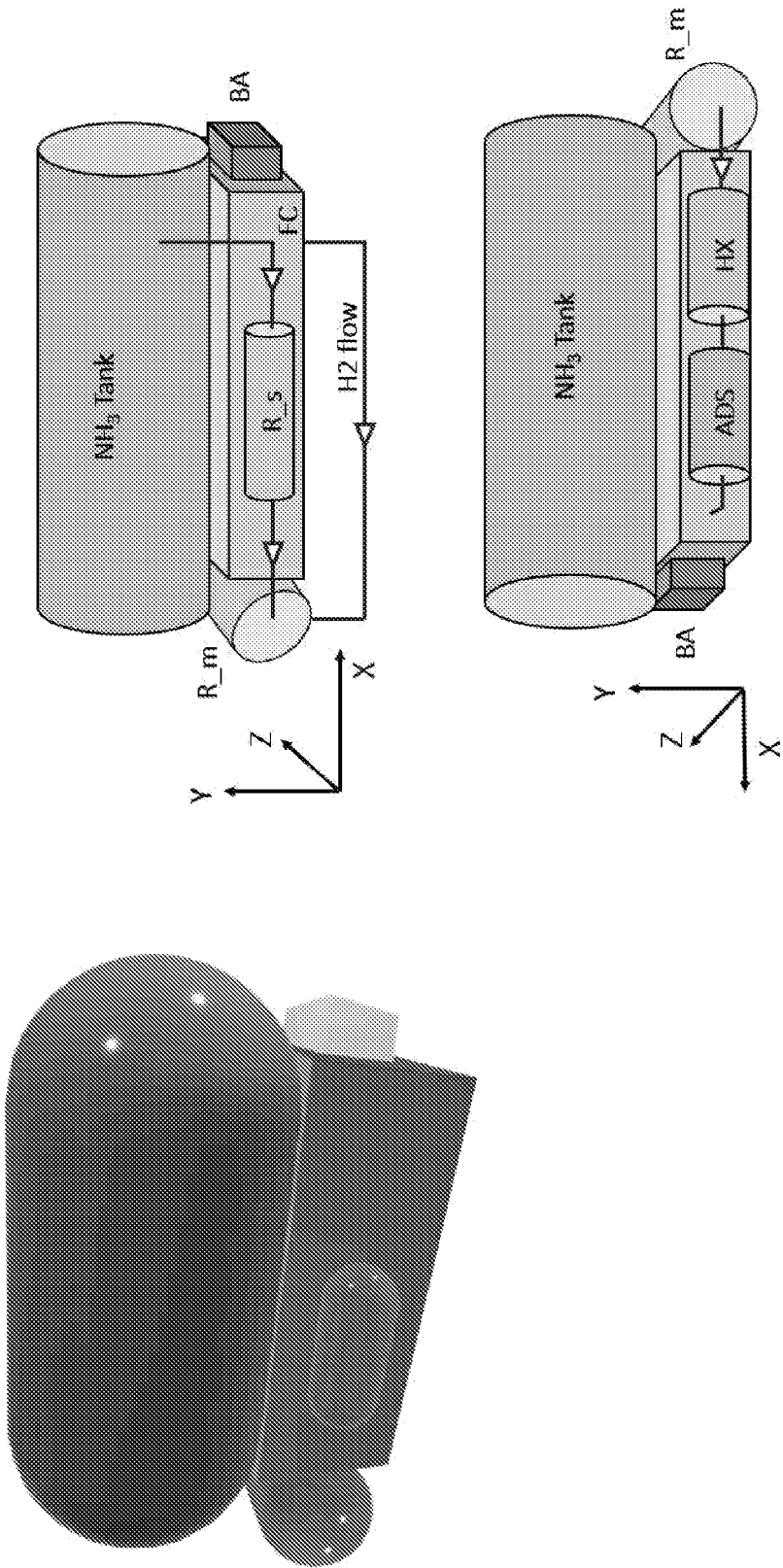


FIG. 26

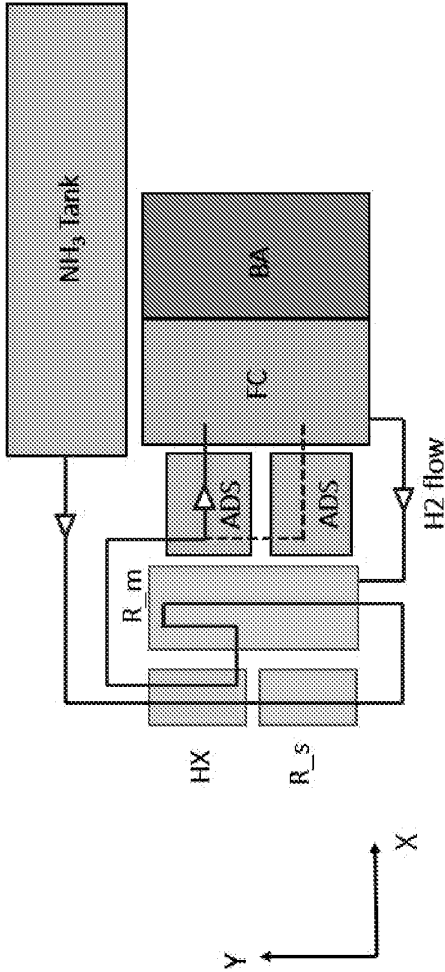
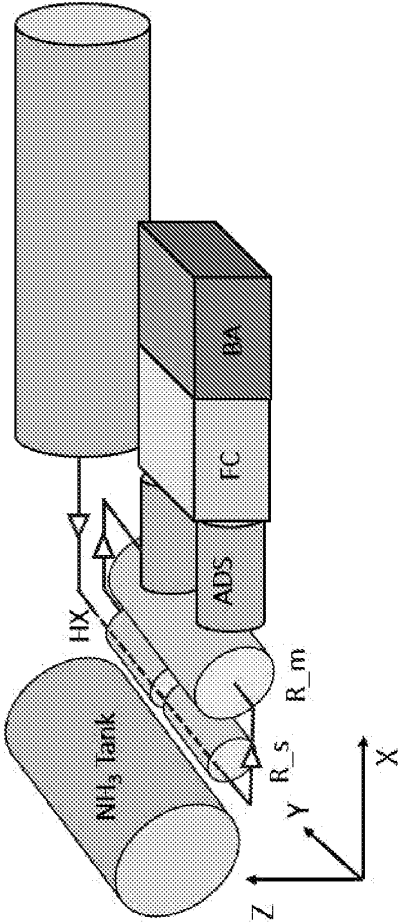


FIG. 27

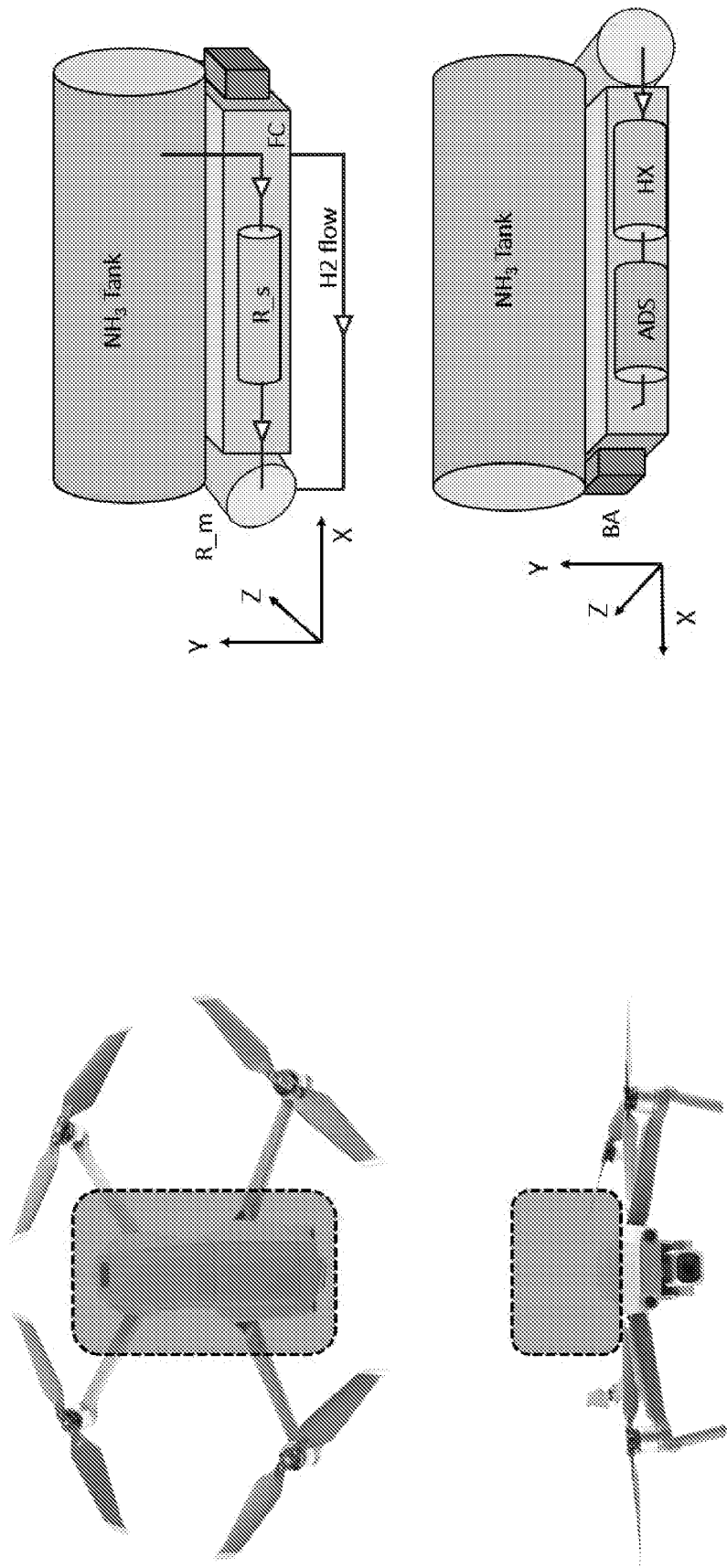


FIG. 28

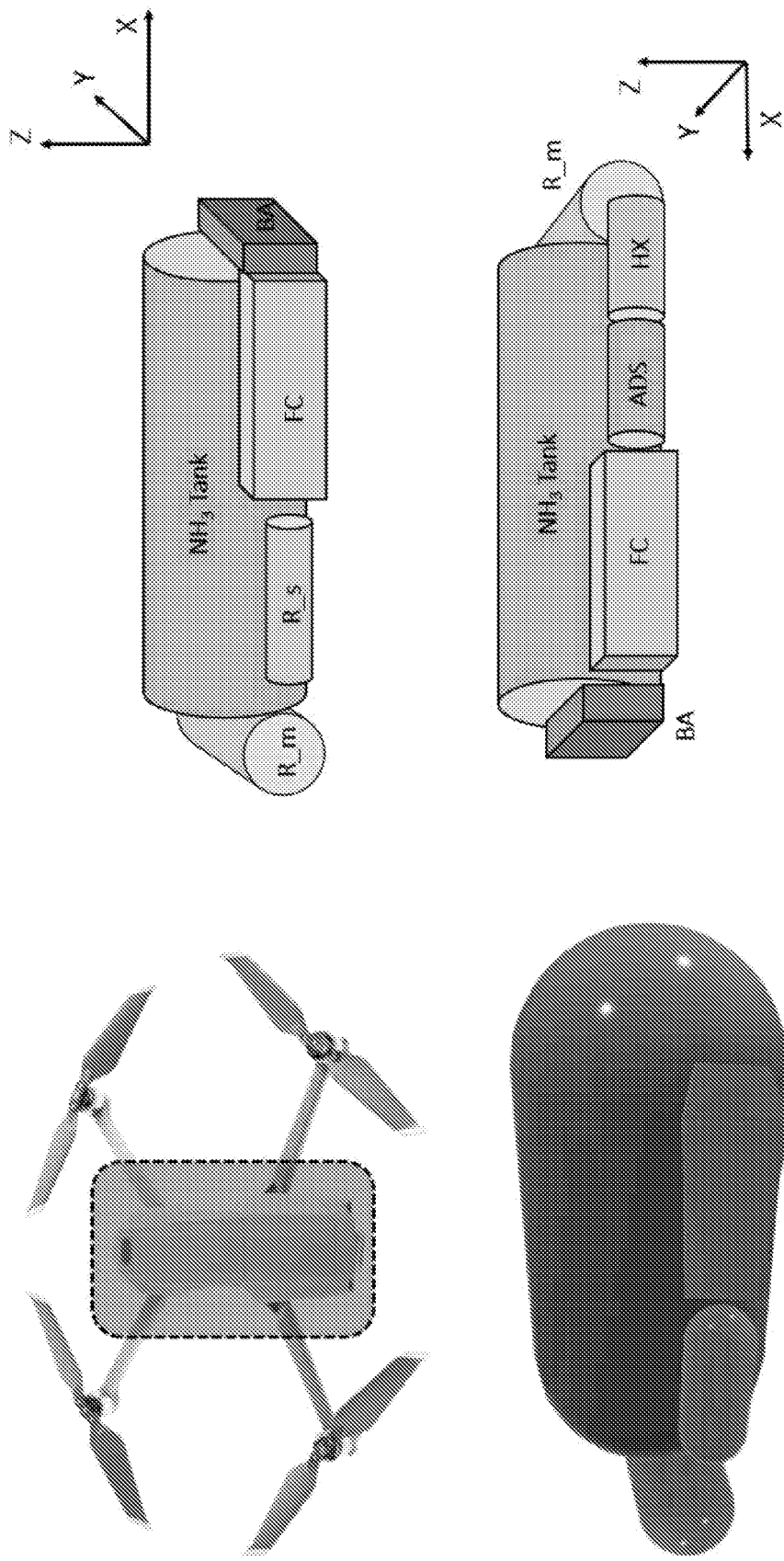


FIG. 29

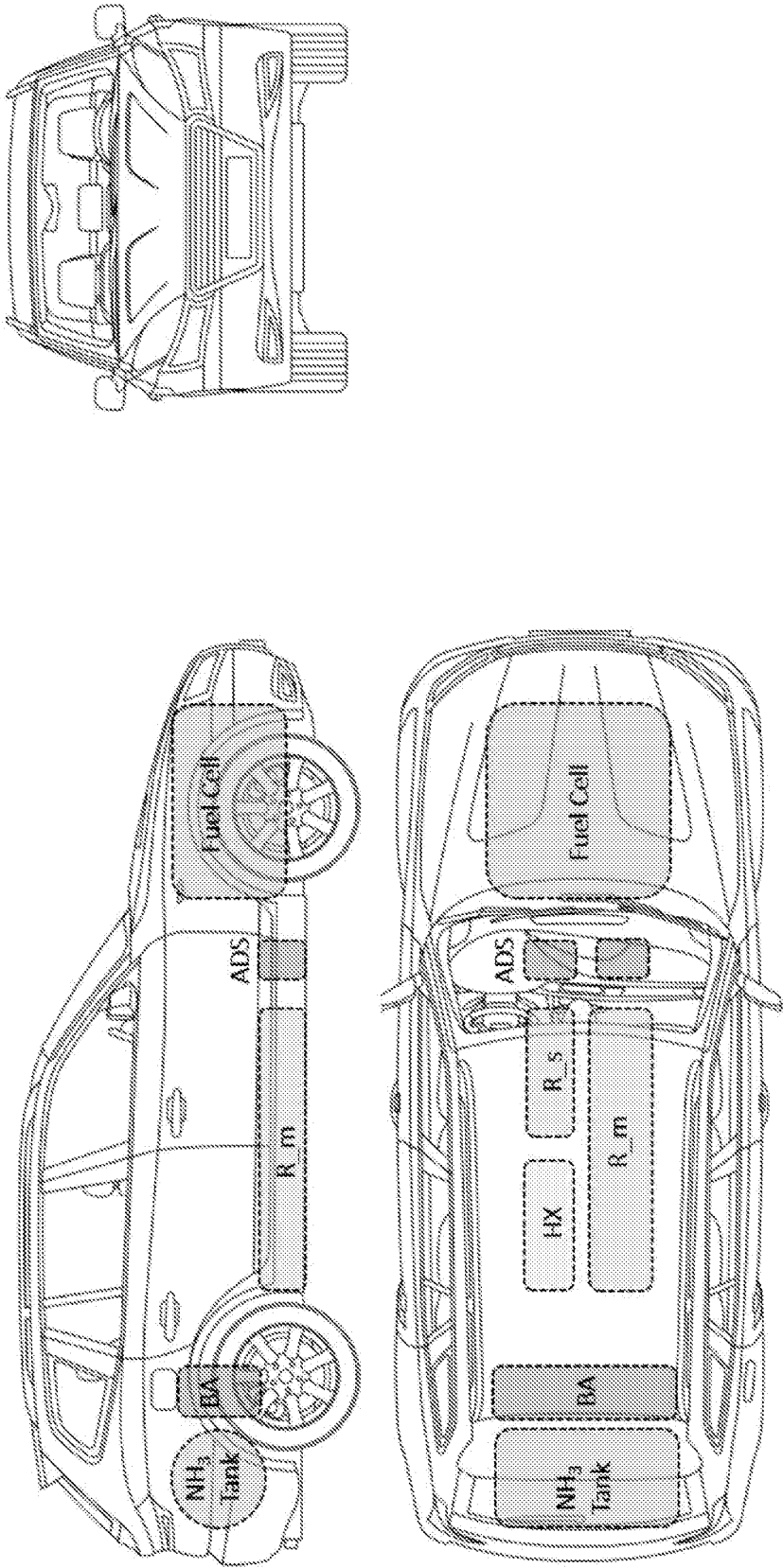


FIG. 30

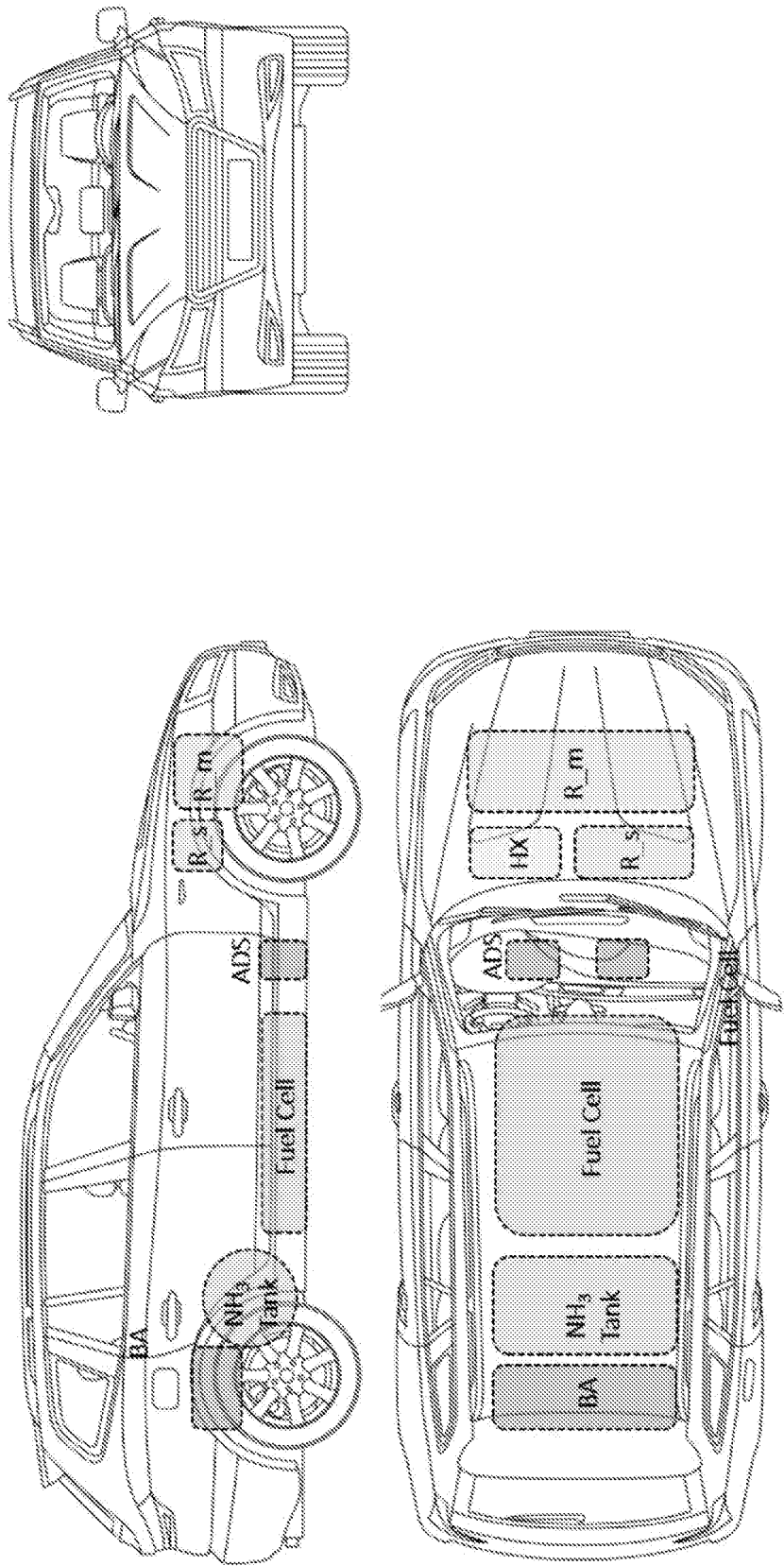


FIG. 31

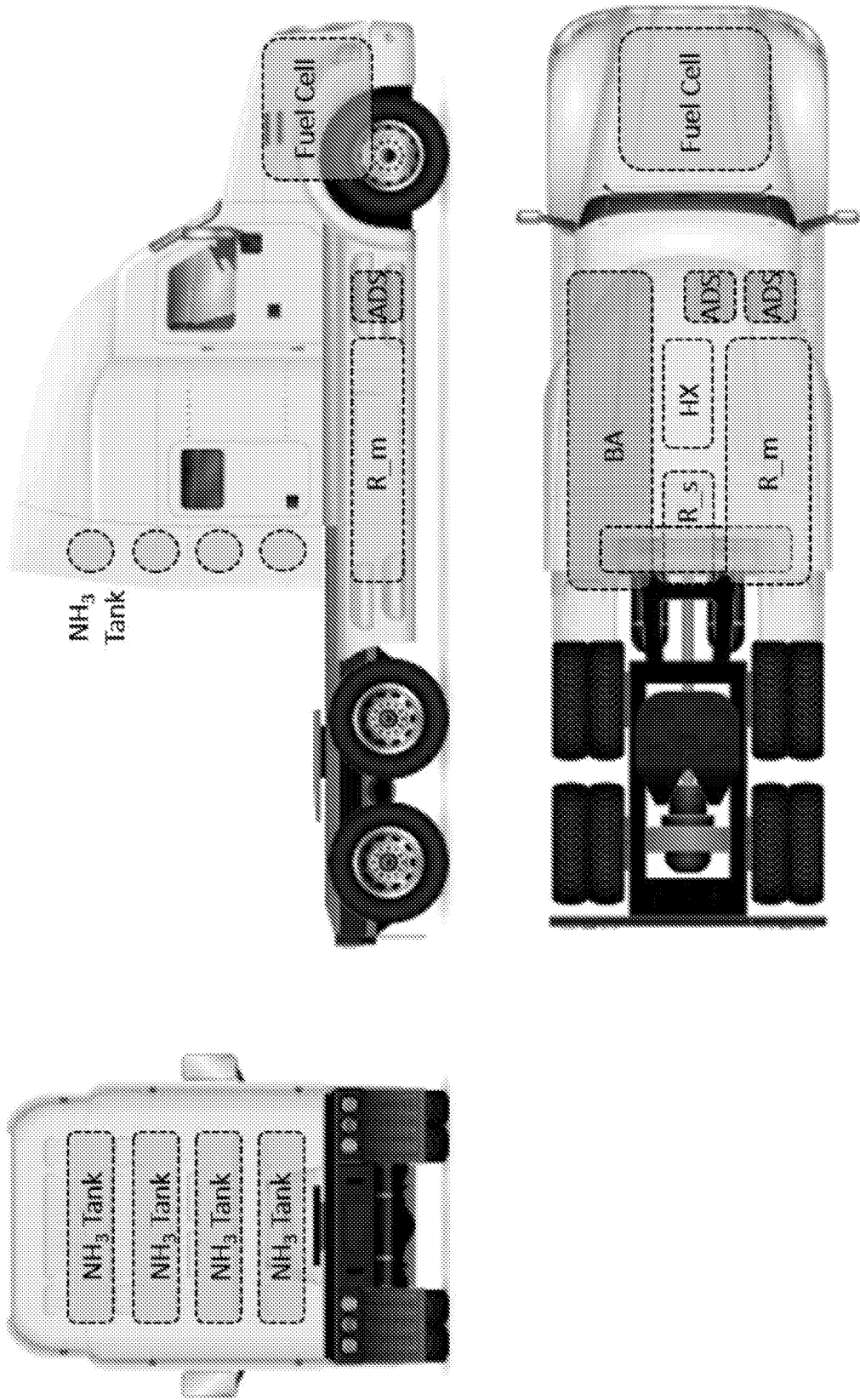


FIG. 32



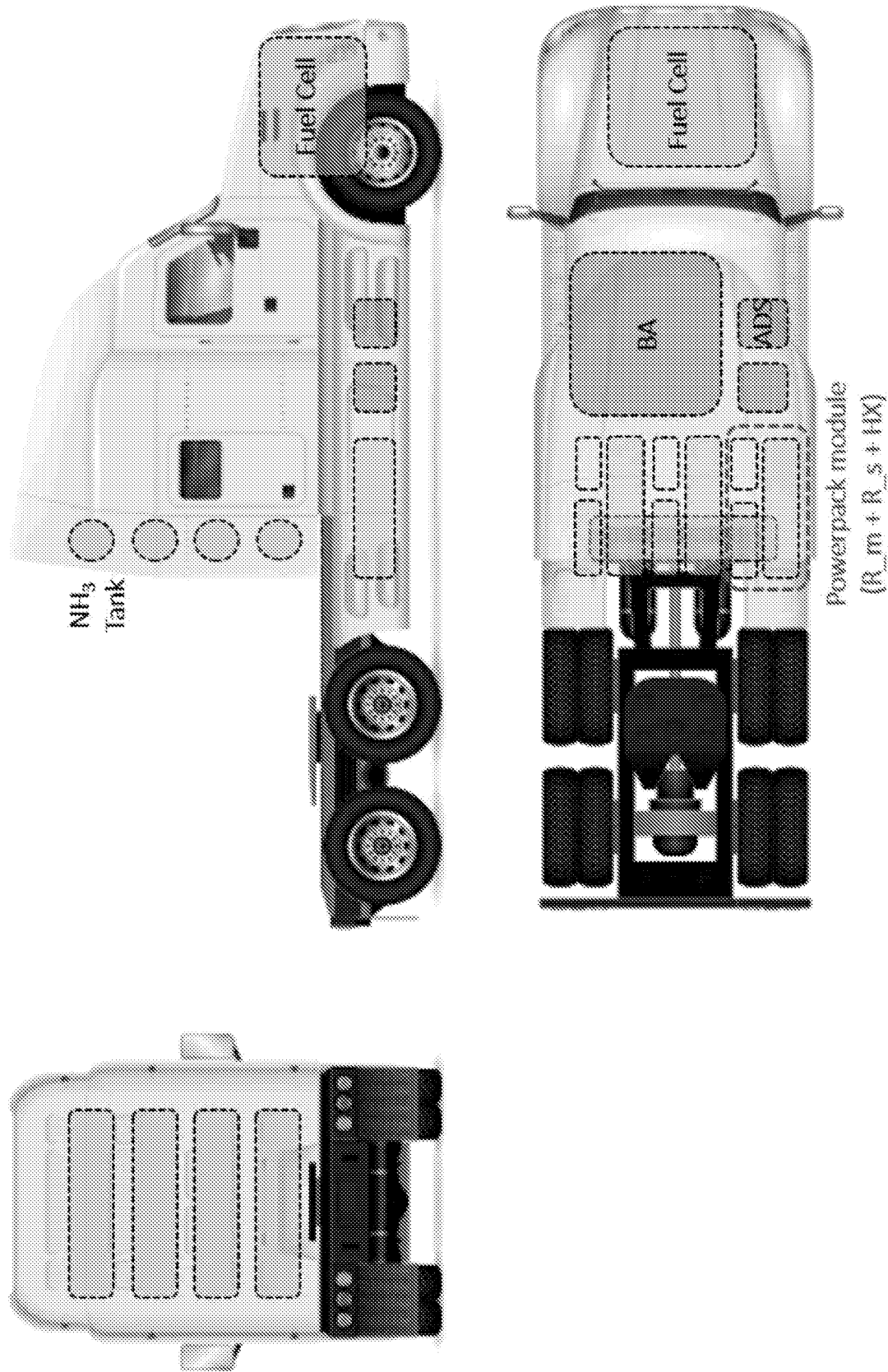


FIG. 34

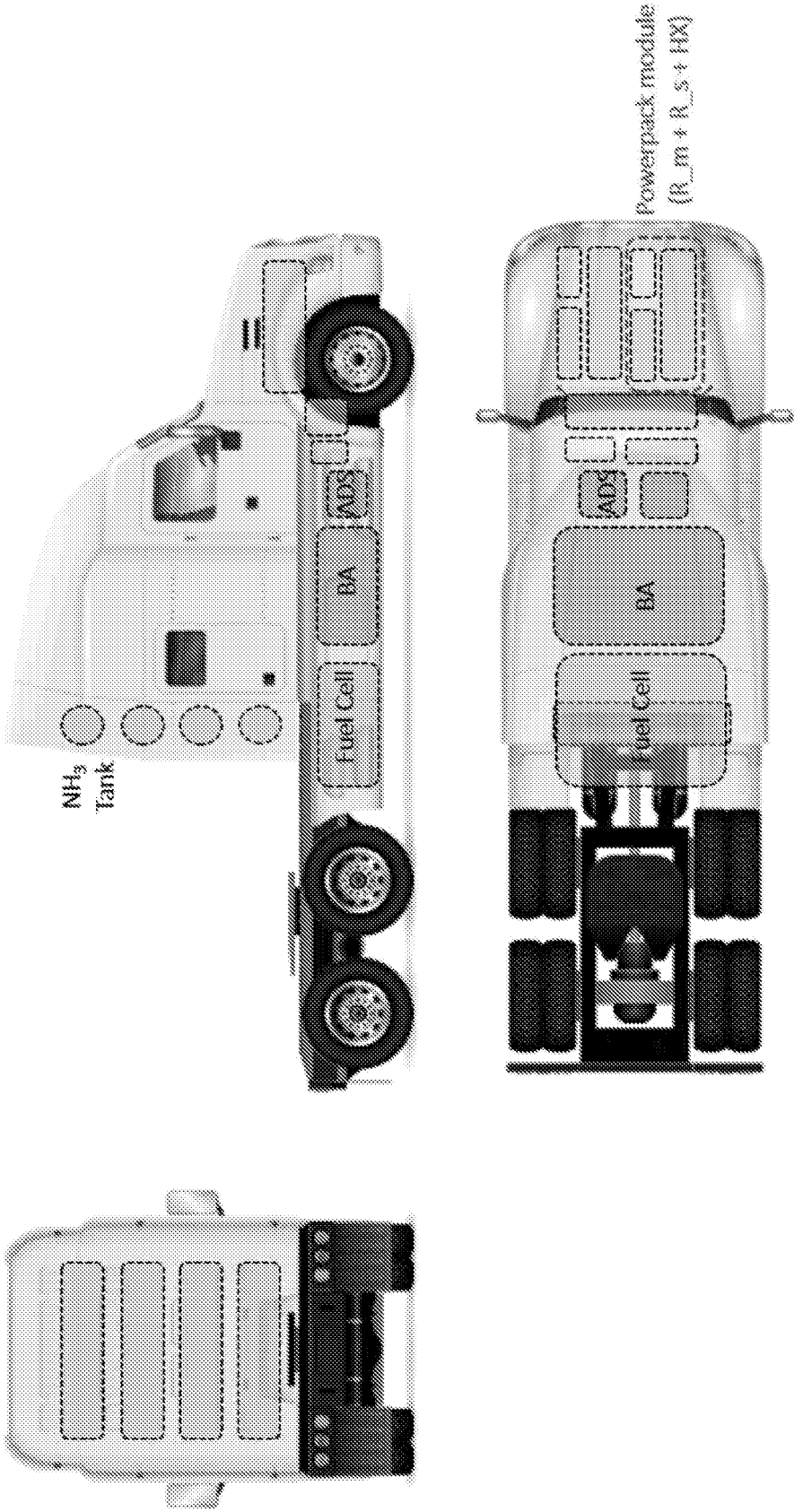


FIG. 35

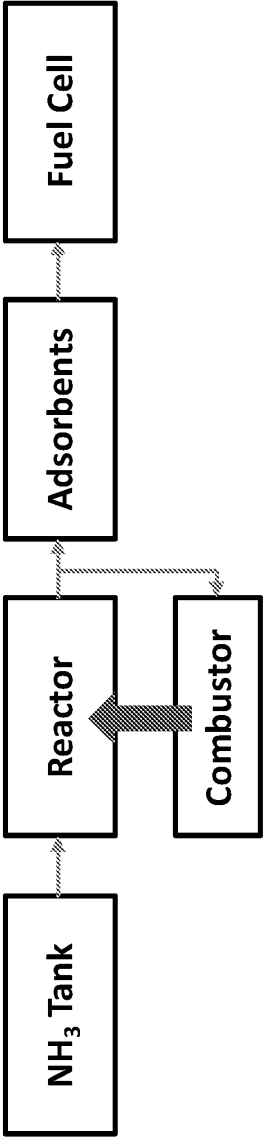


FIG. 36A

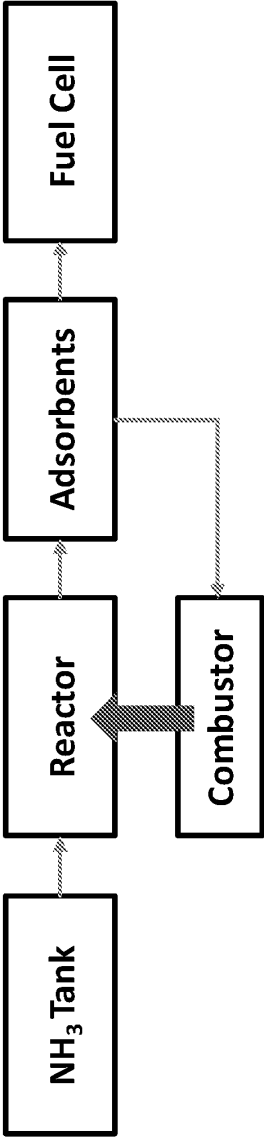


FIG. 36B

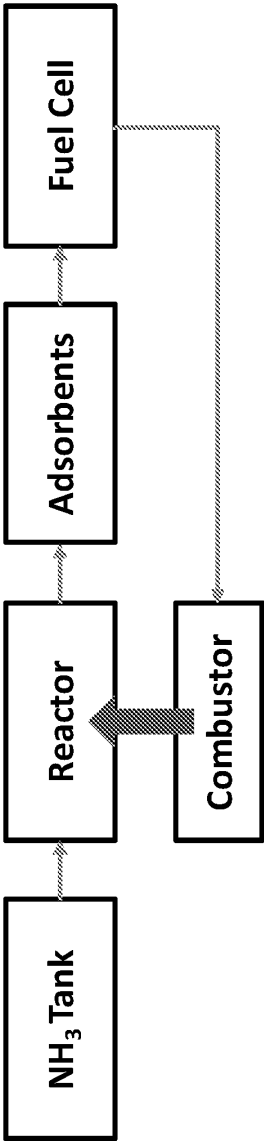


FIG. 36C

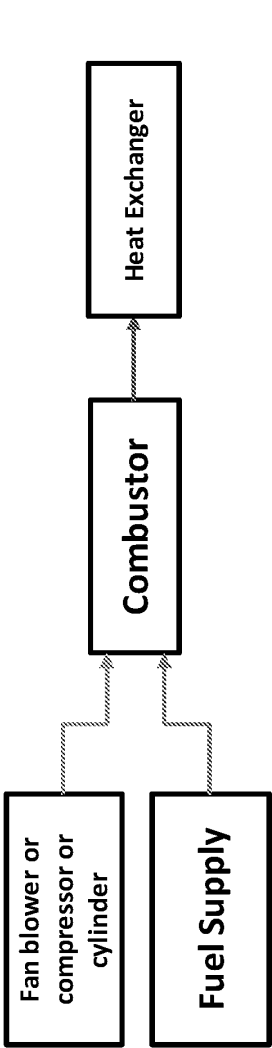


FIG. 37A

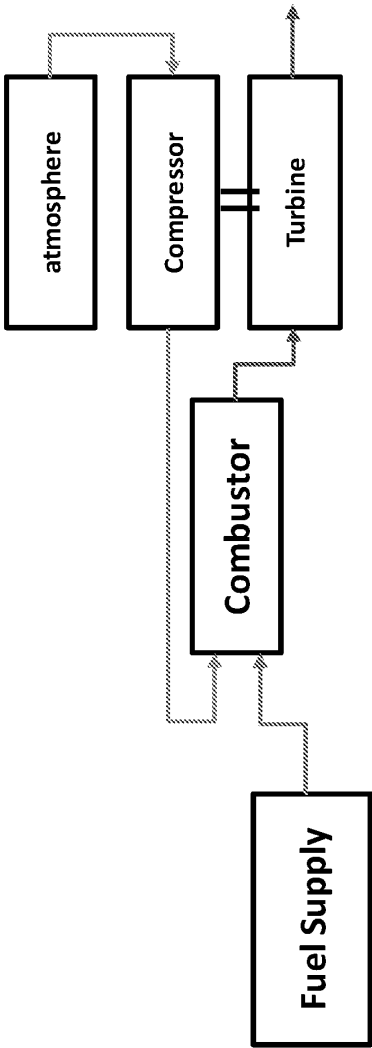


FIG. 37B

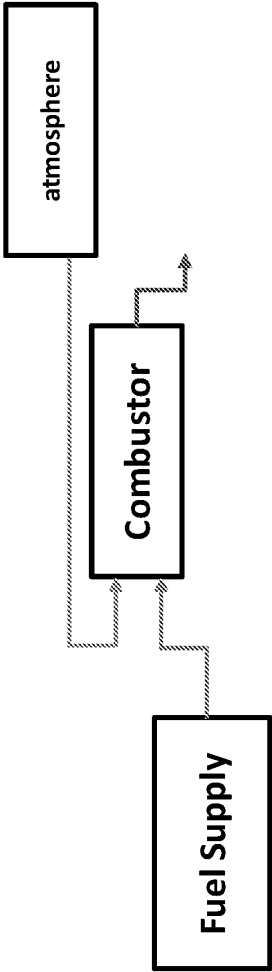


FIG.37C

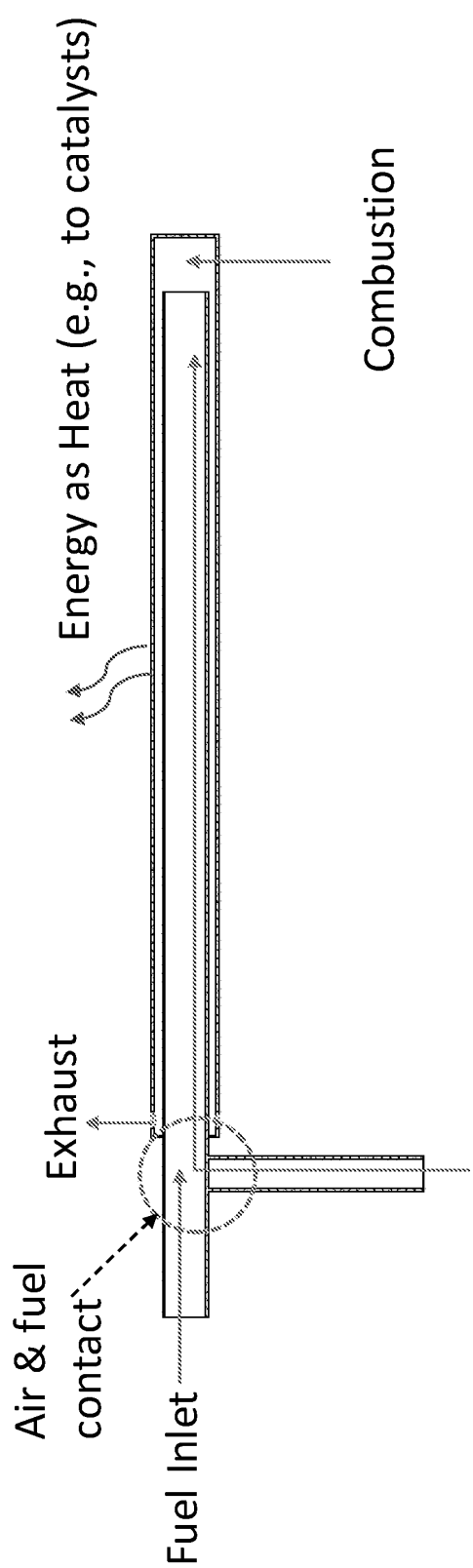


FIG. 38A

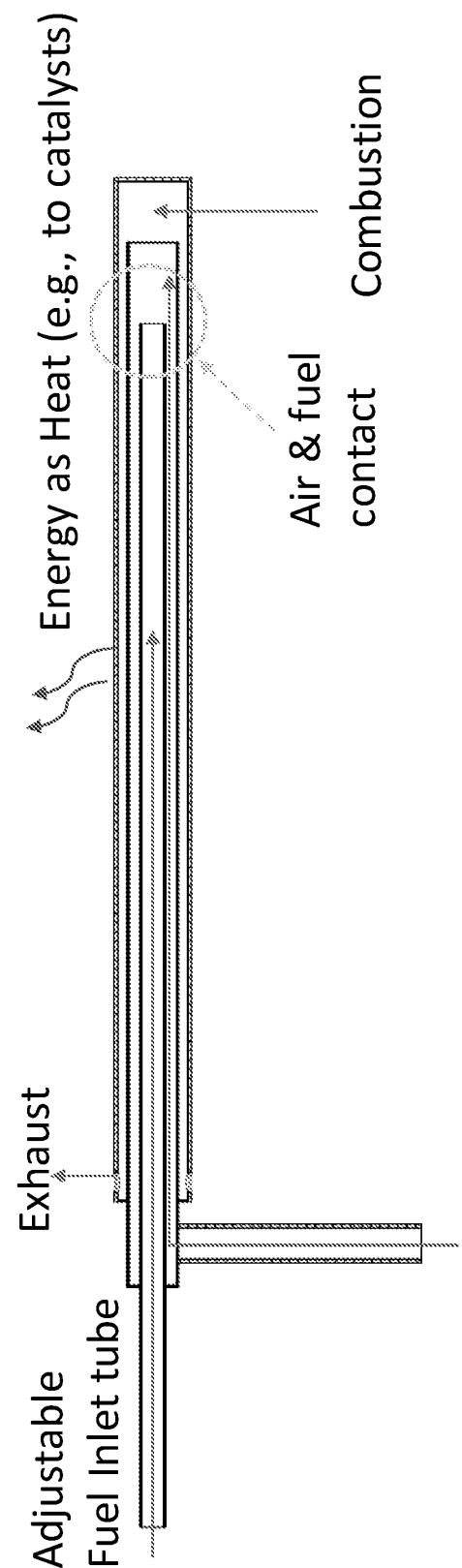


FIG. 38B

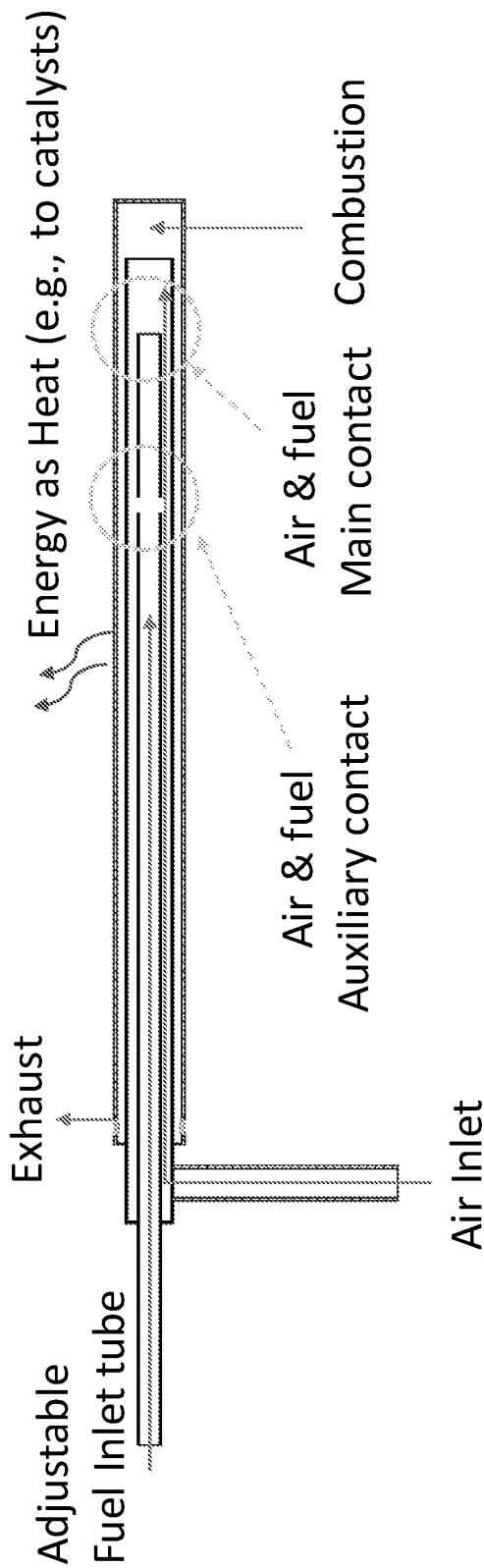


FIG. 39

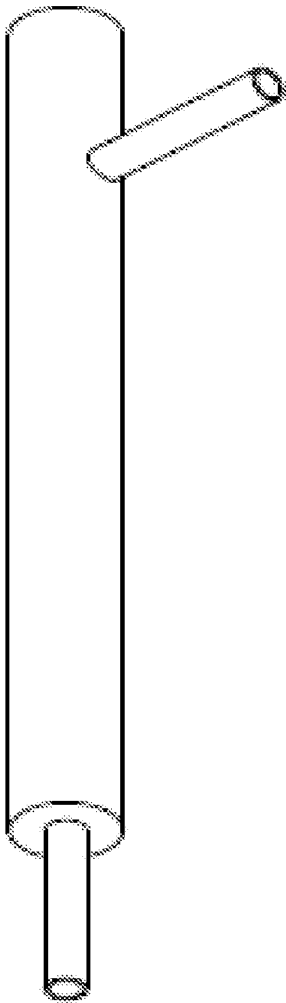


FIG. 40A

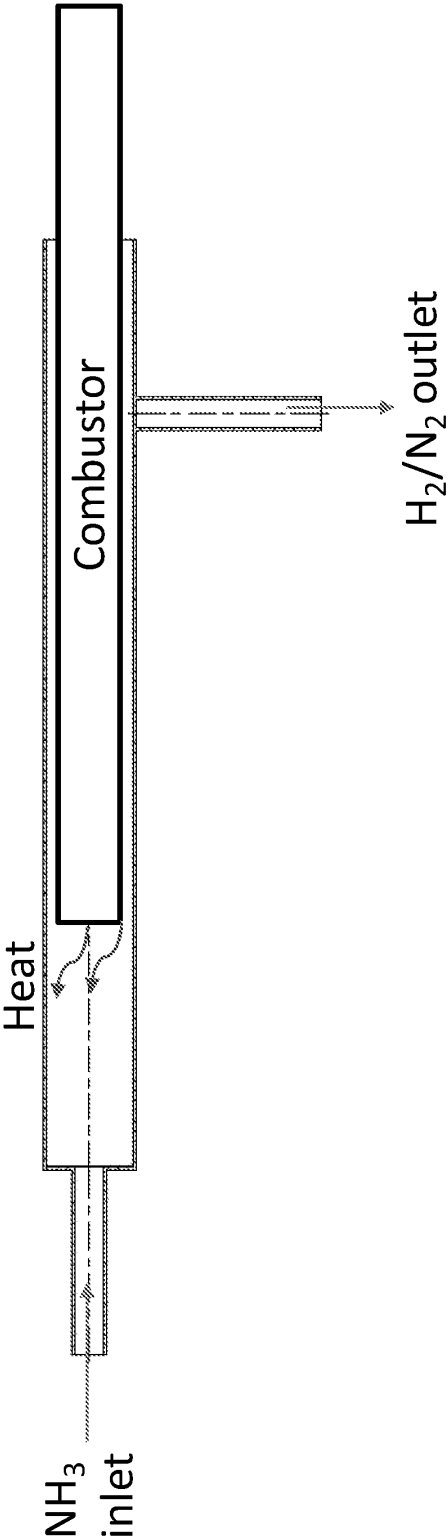


FIG. 40B

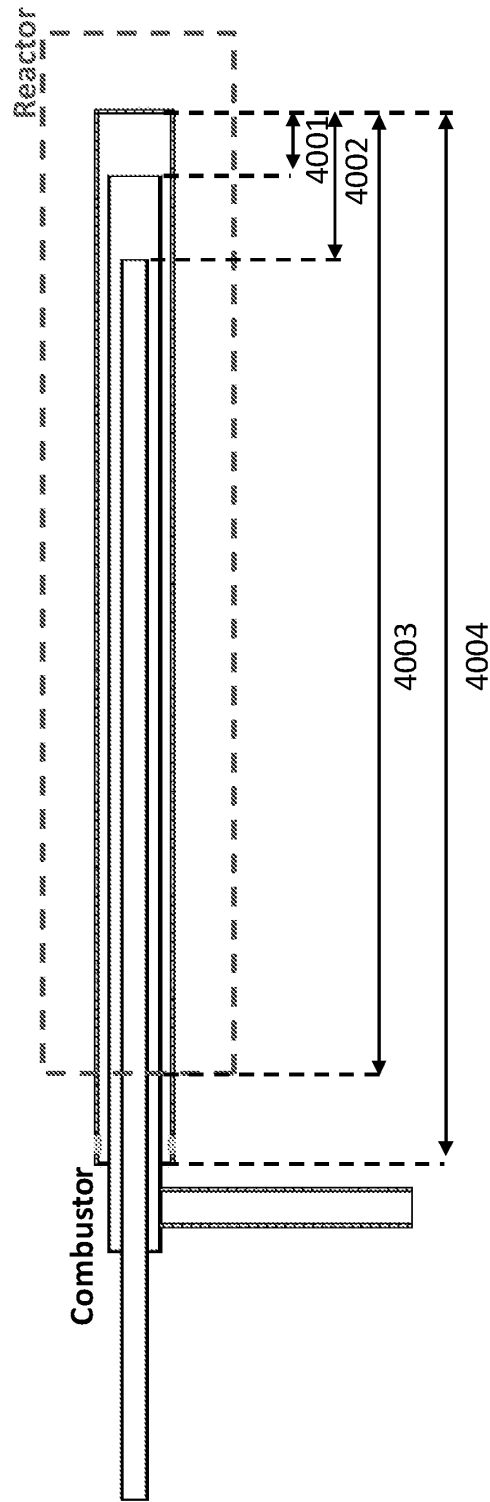


FIG. 40C

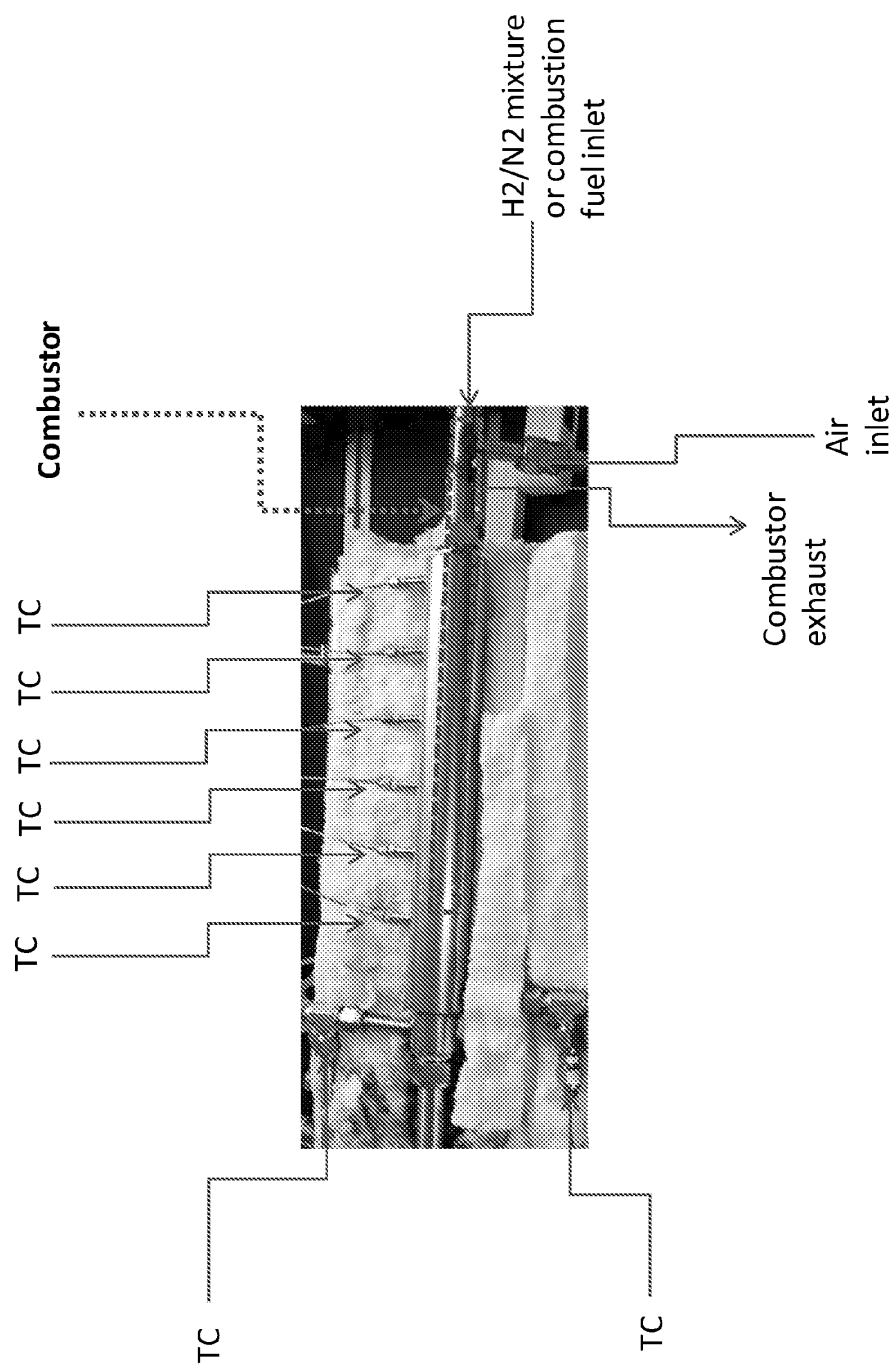


FIG. 40D

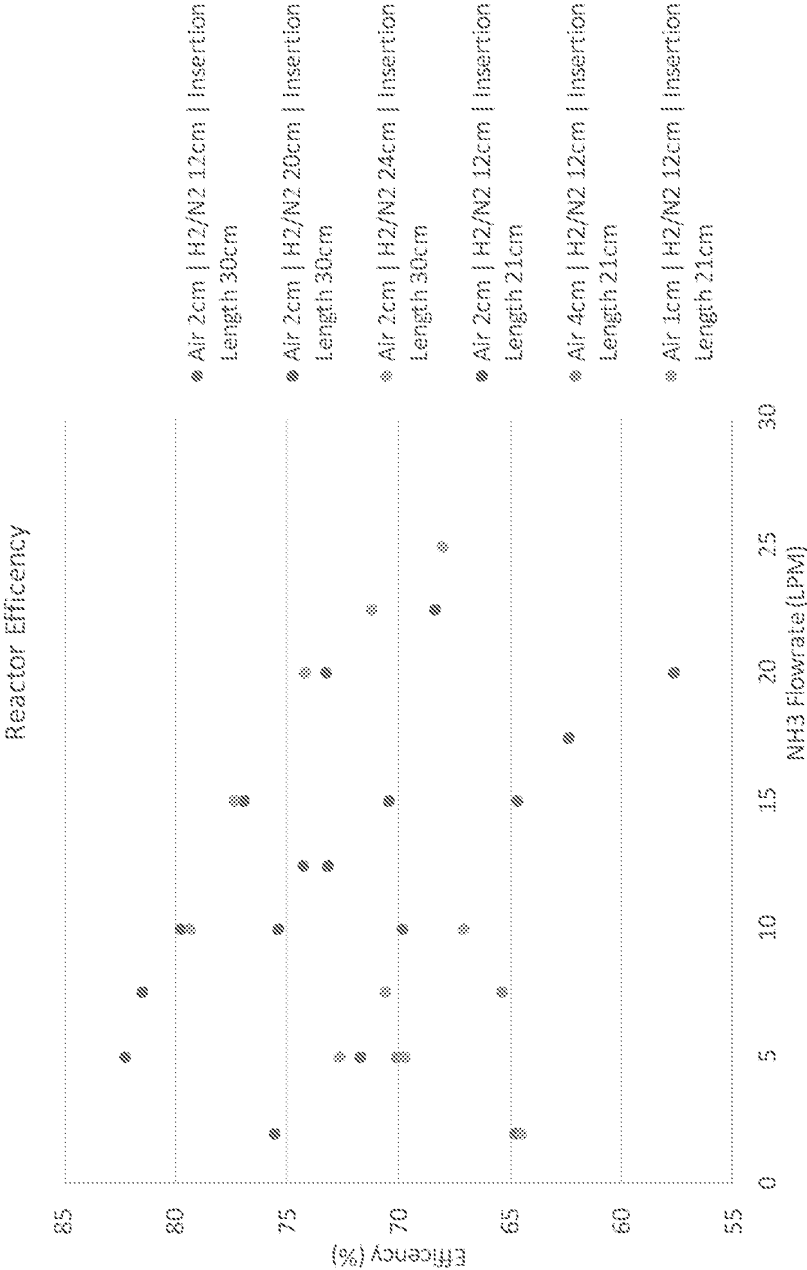


FIG. 41A

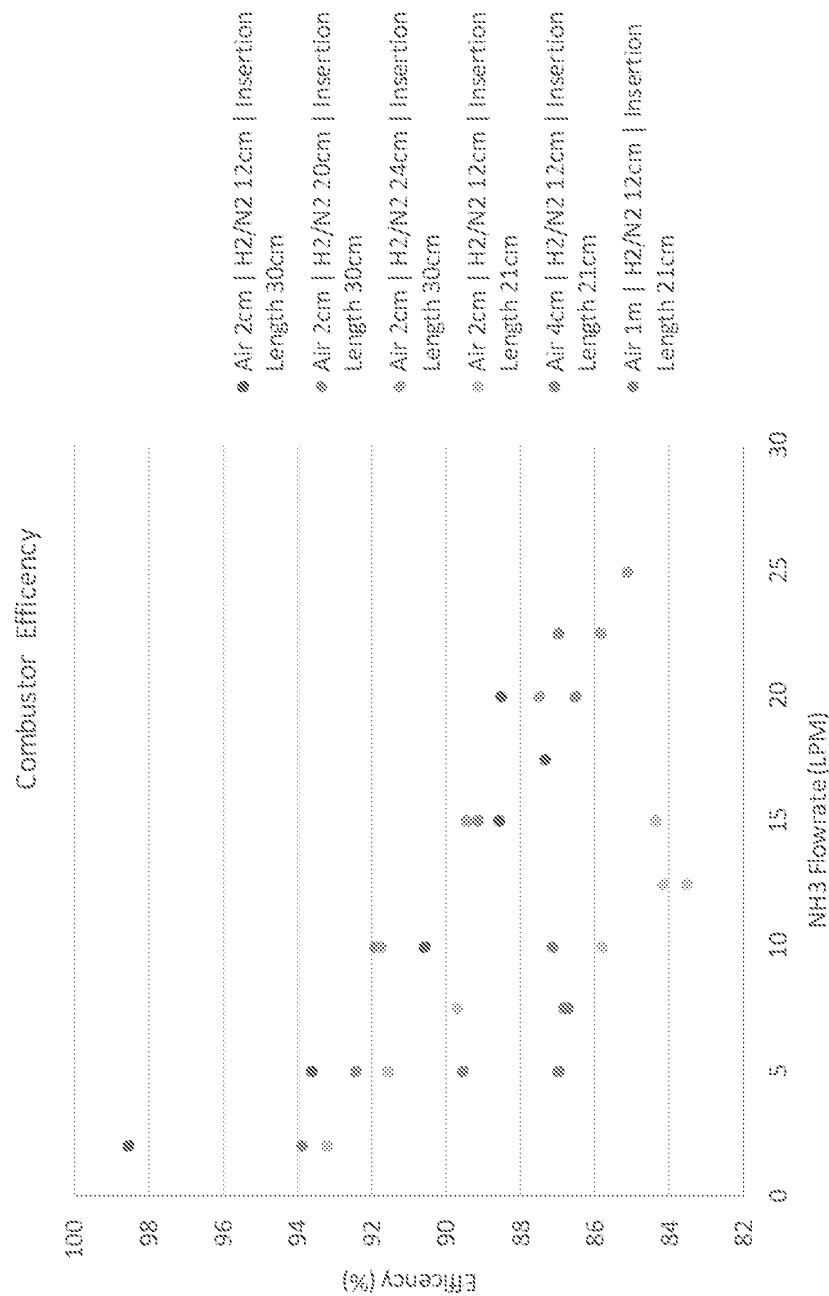


FIG. 41B

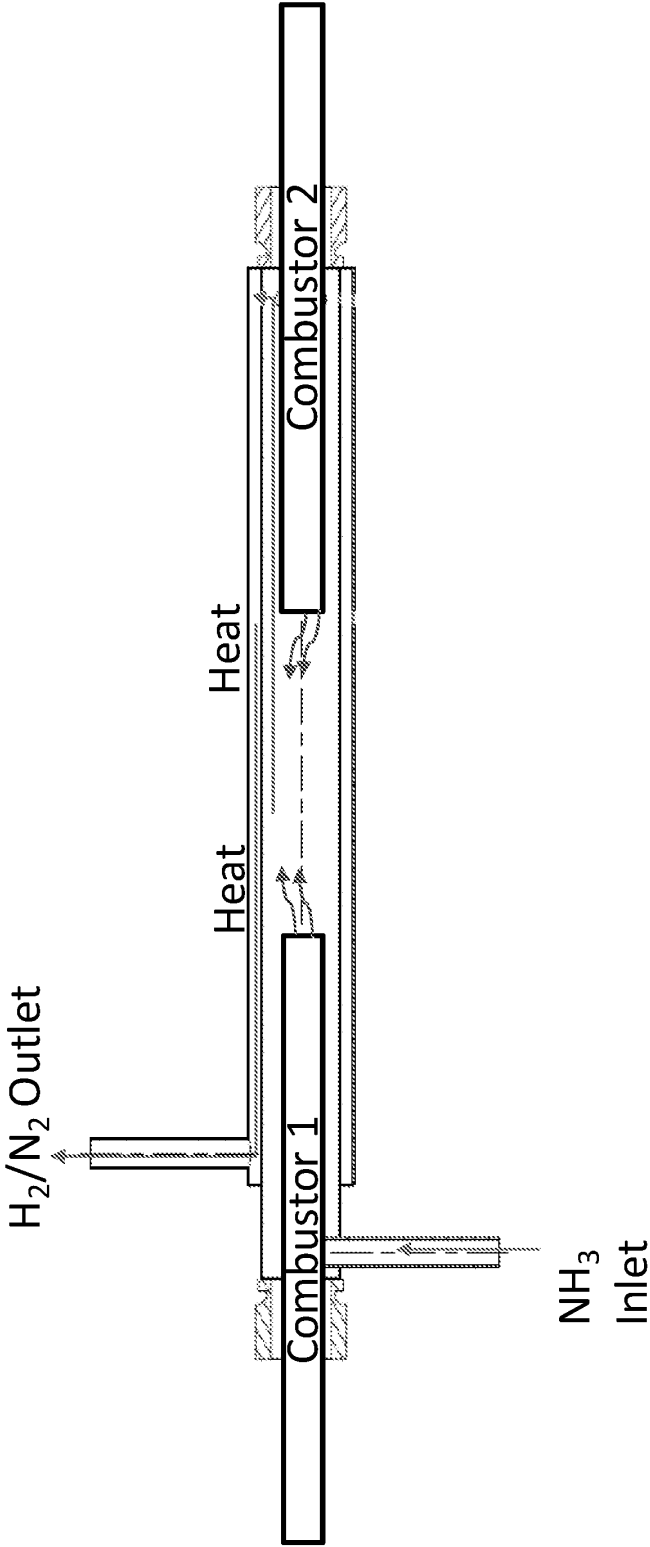


FIG. 42

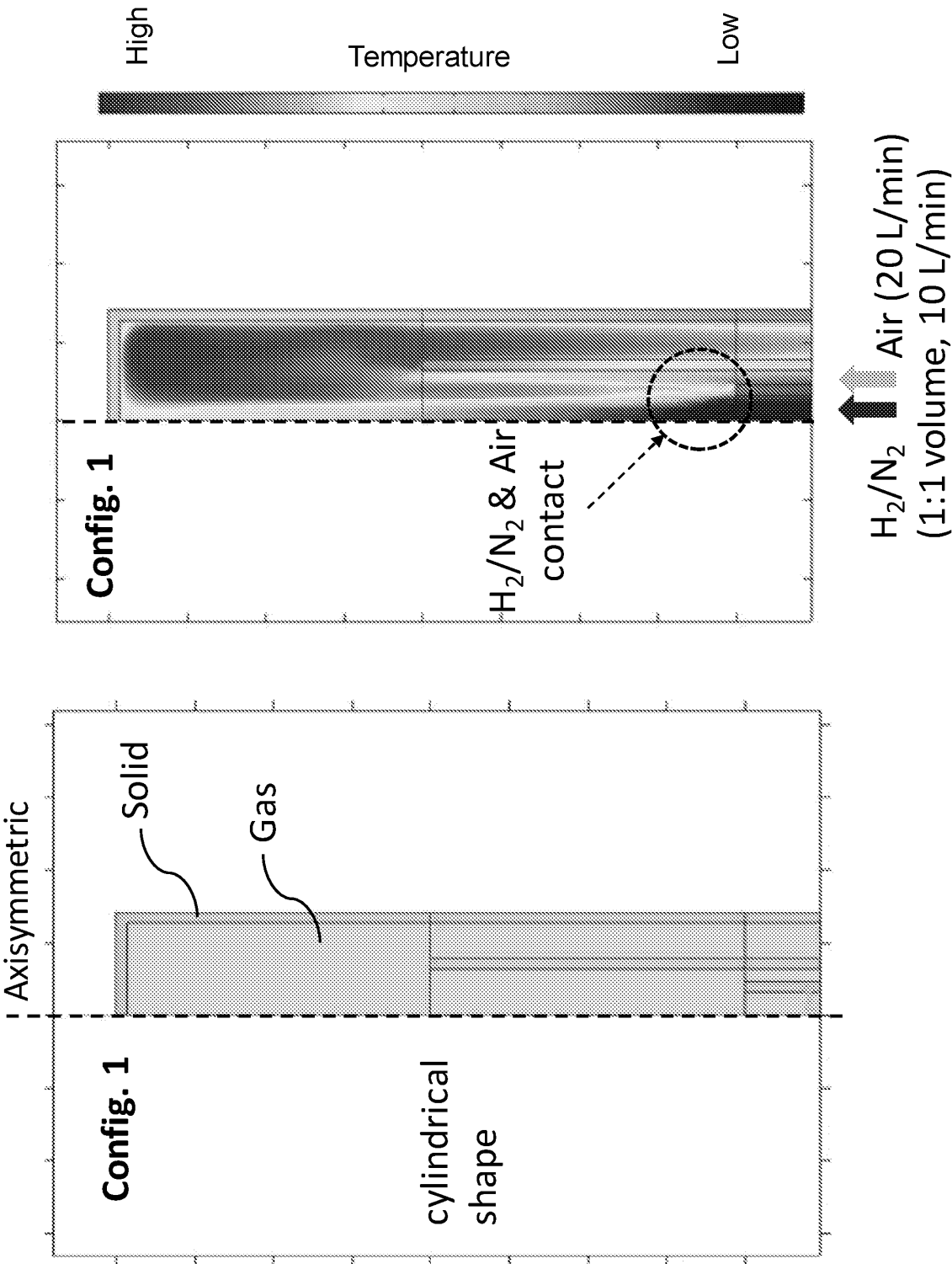


FIG. 43

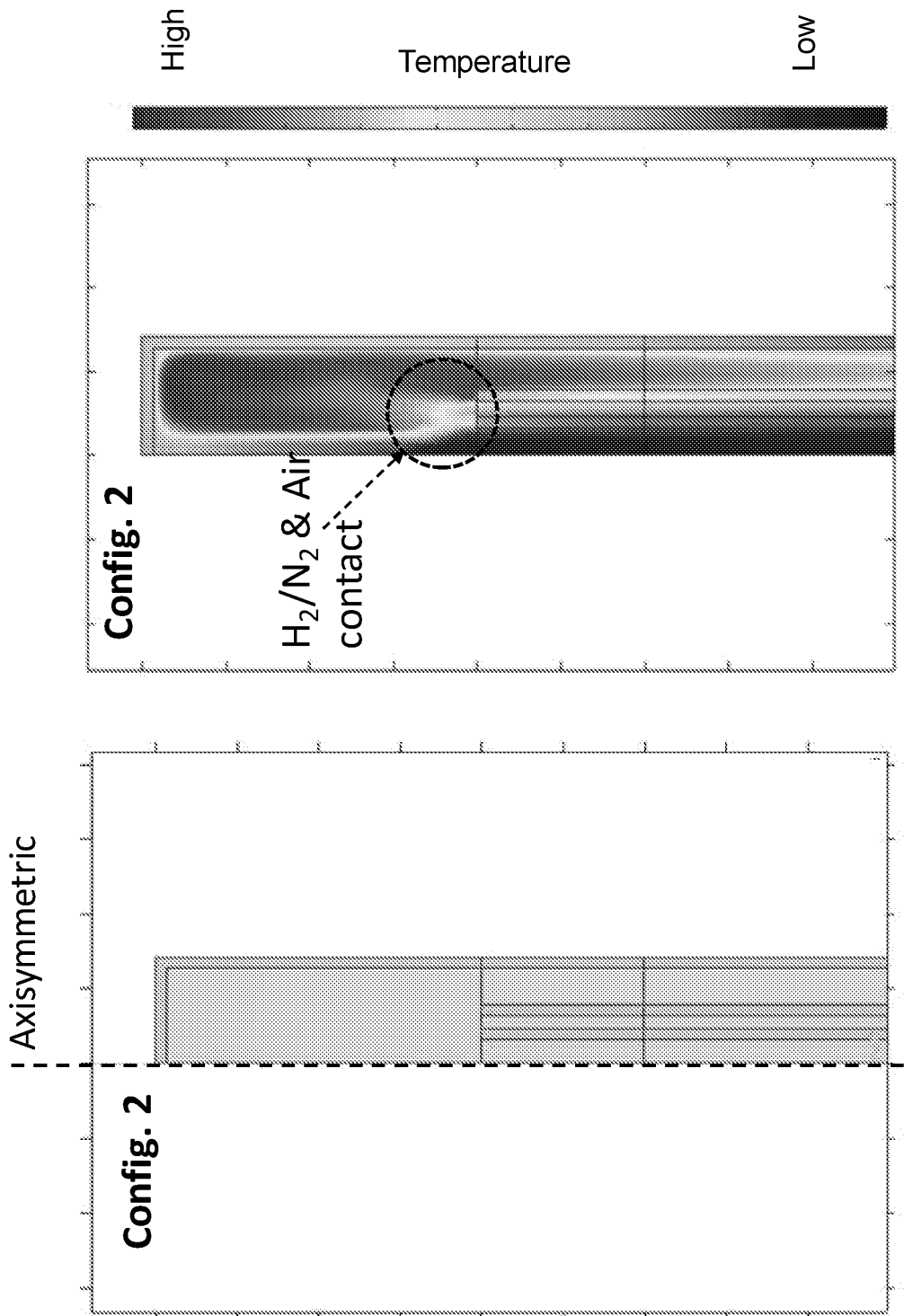


FIG. 44

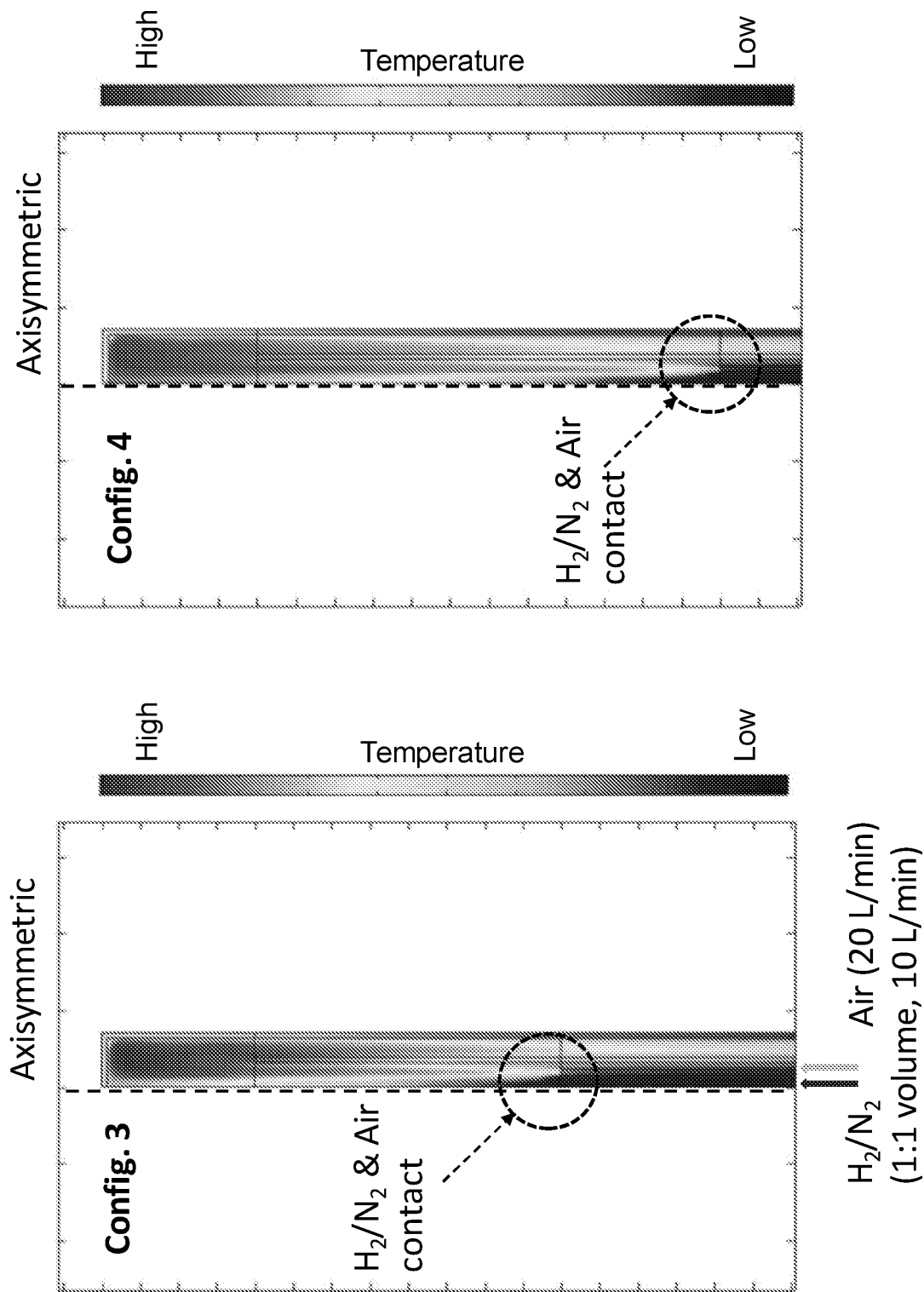


FIG. 45B

FIG. 45A

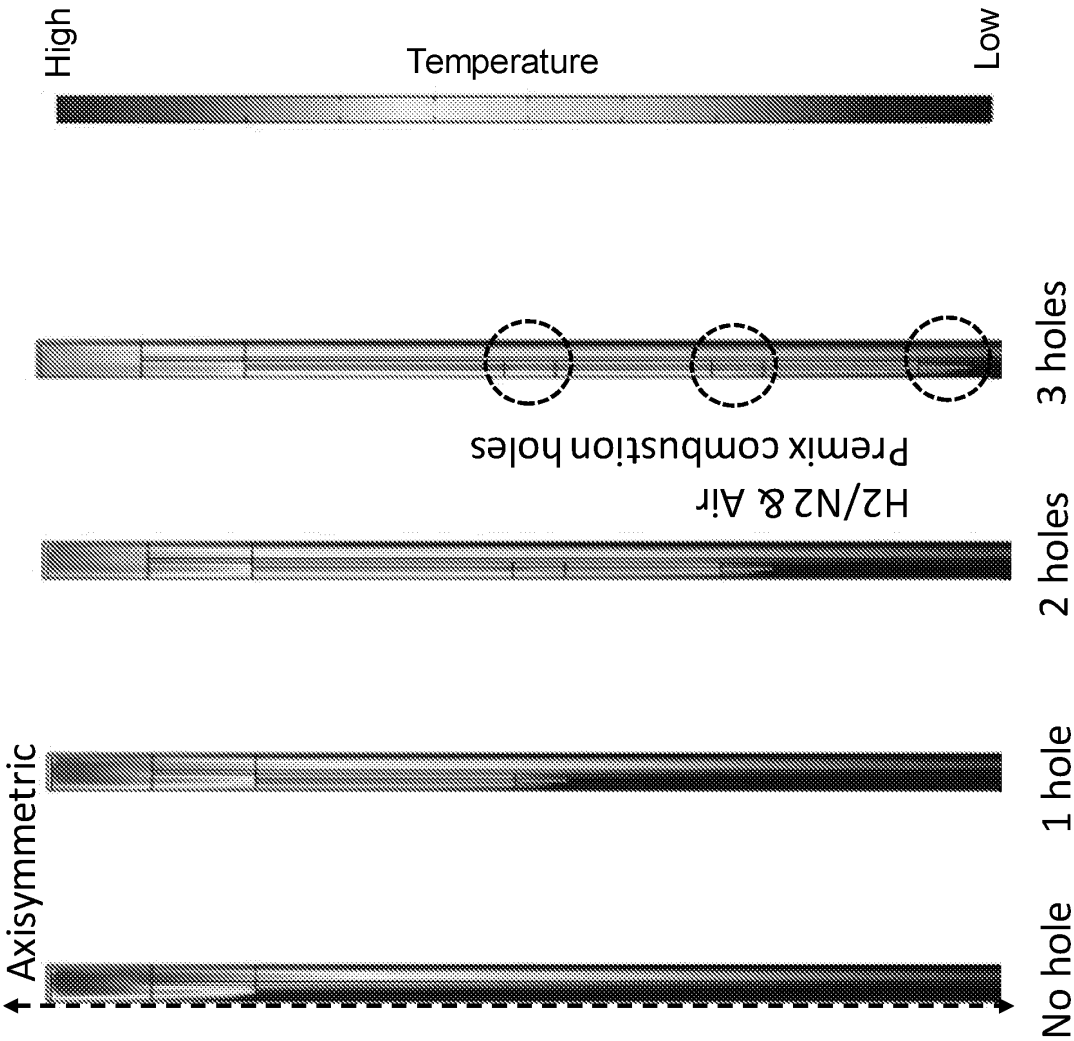


FIG. 46A

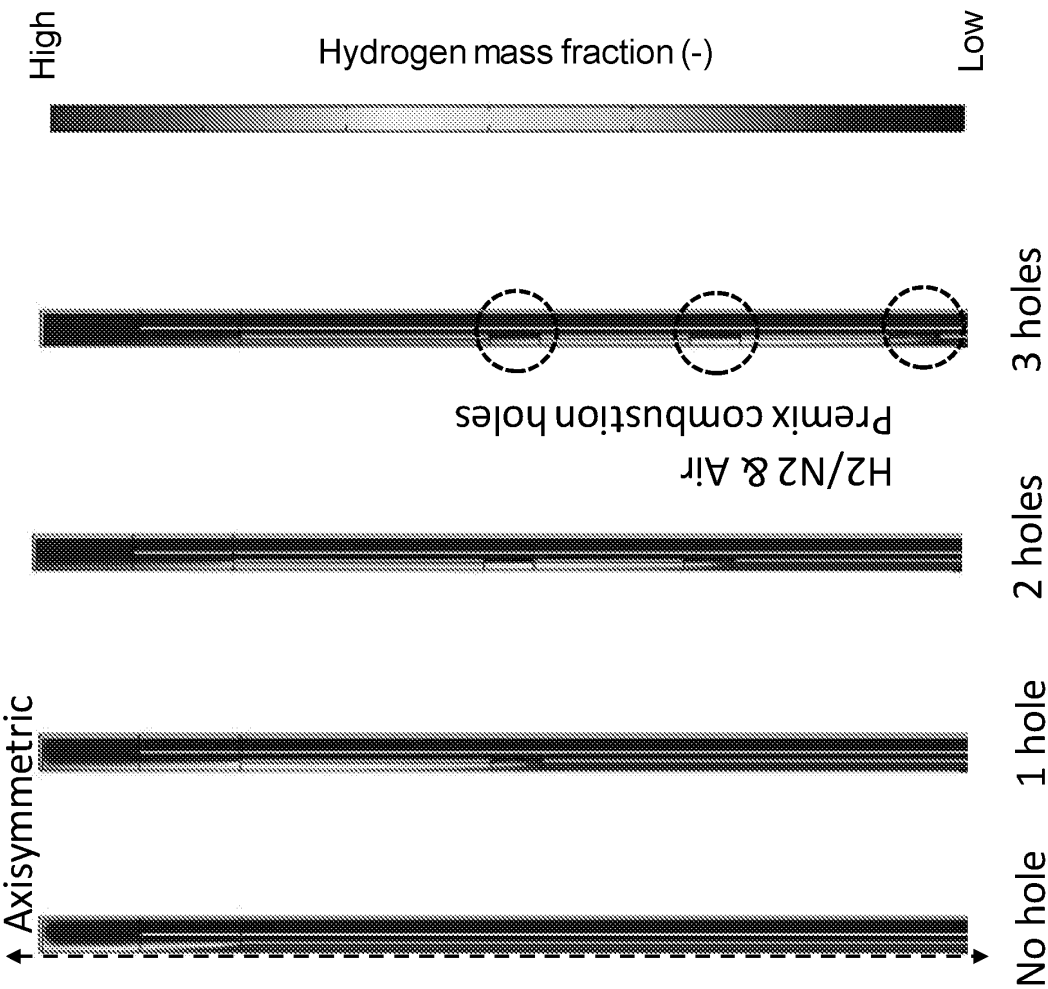


FIG. 46B

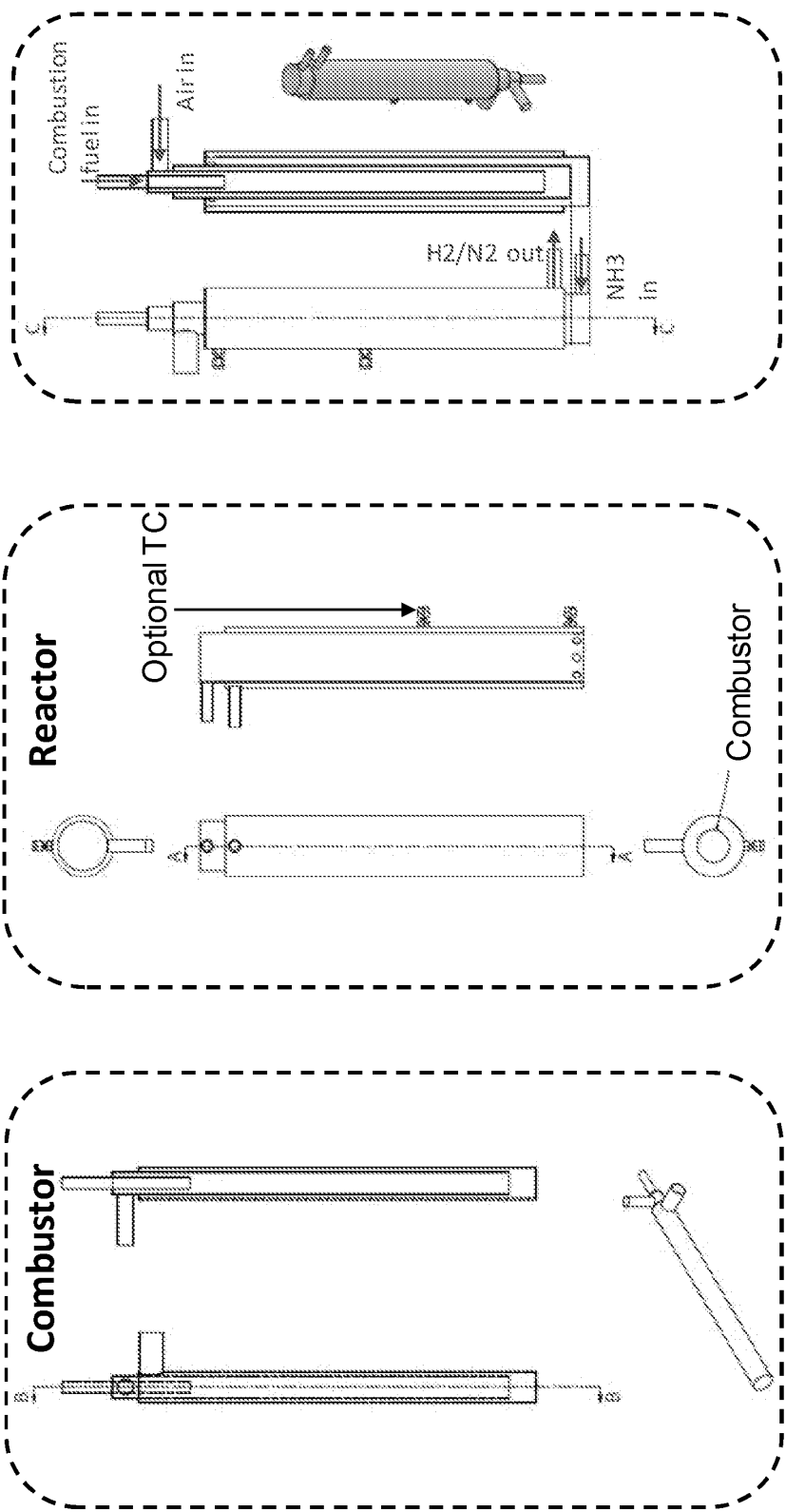


FIG. 47

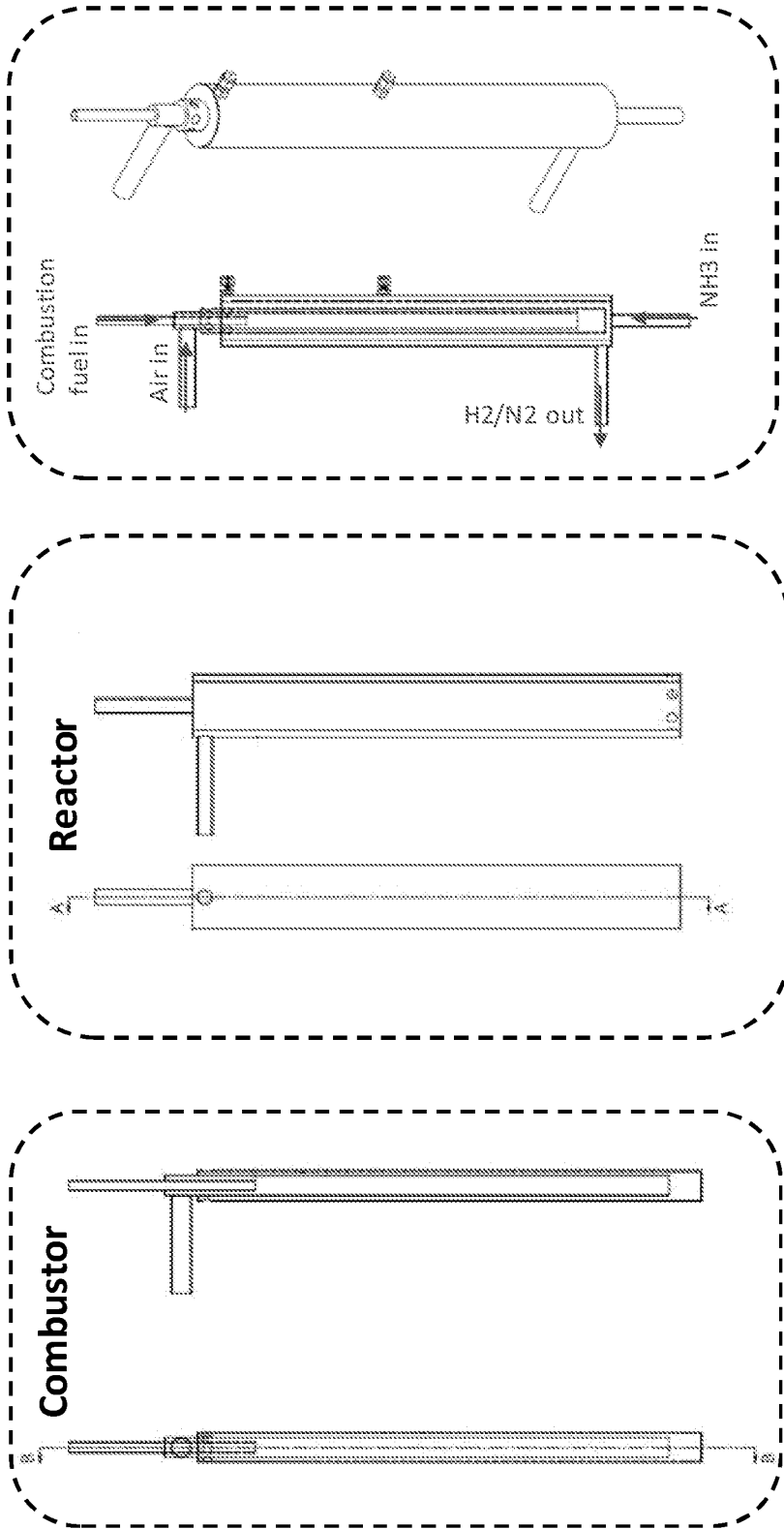


FIG. 48

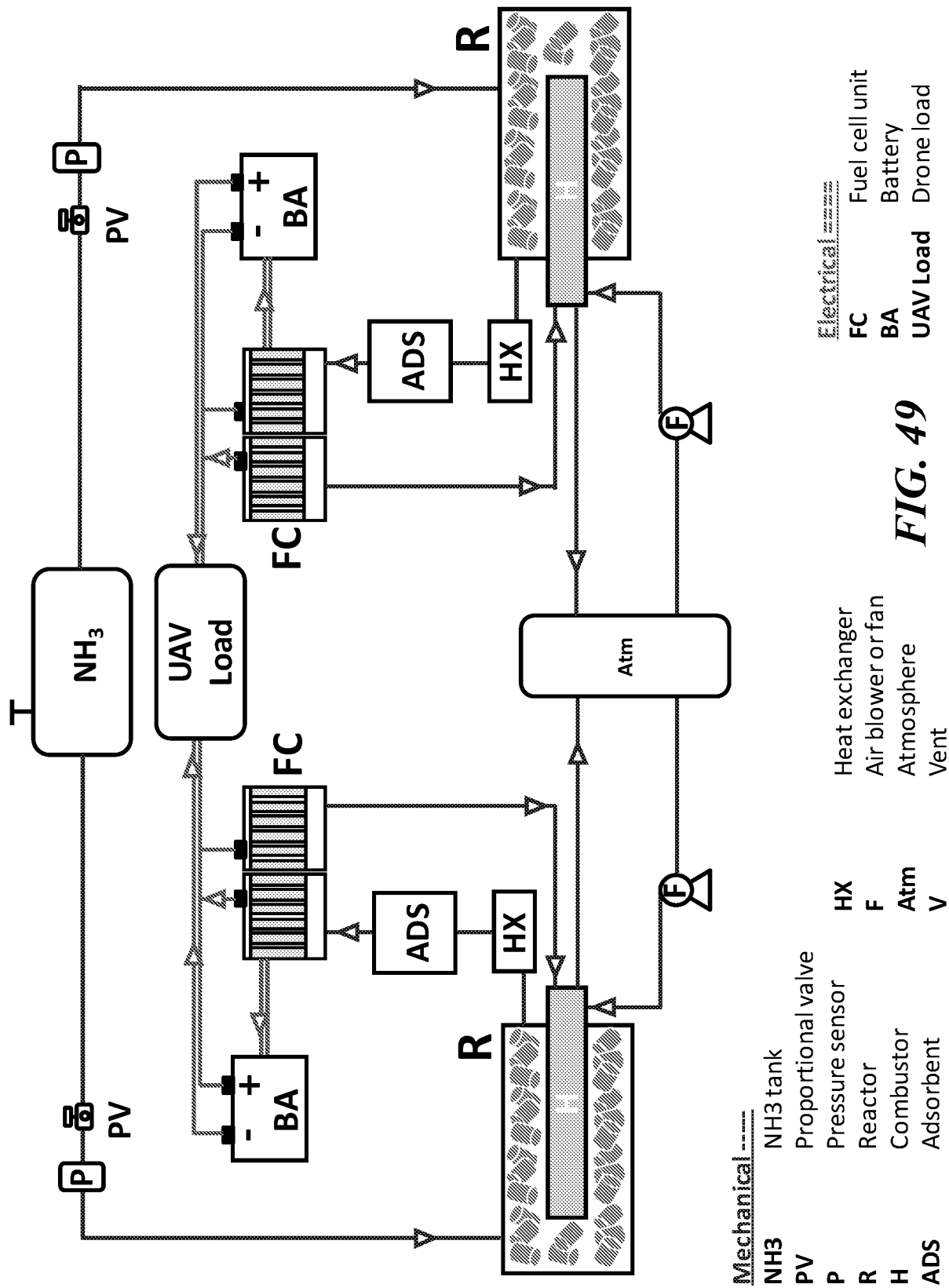


FIG. 49

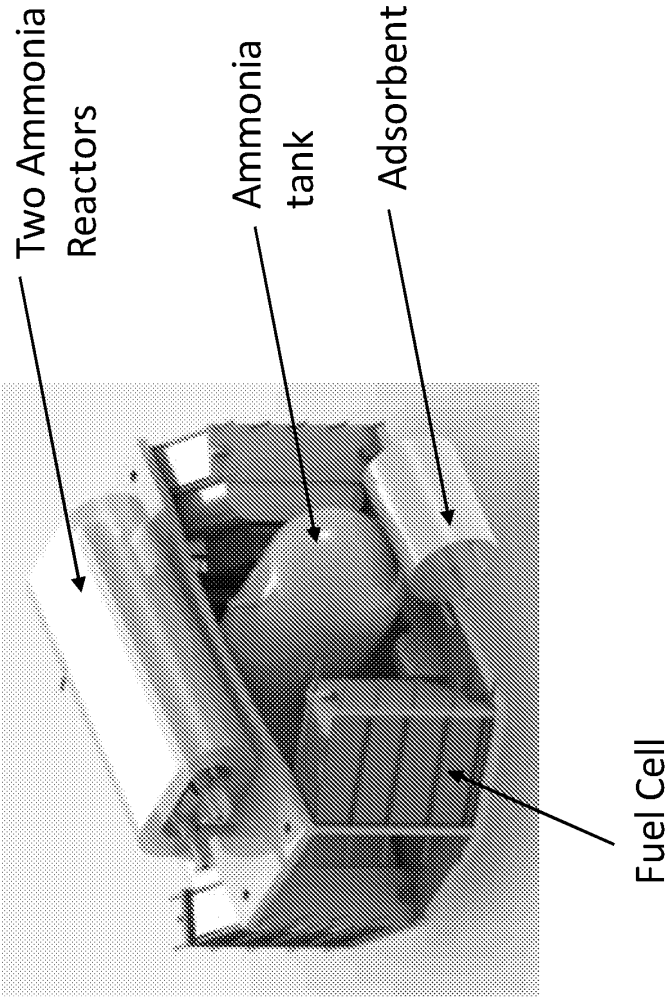


FIG. 50

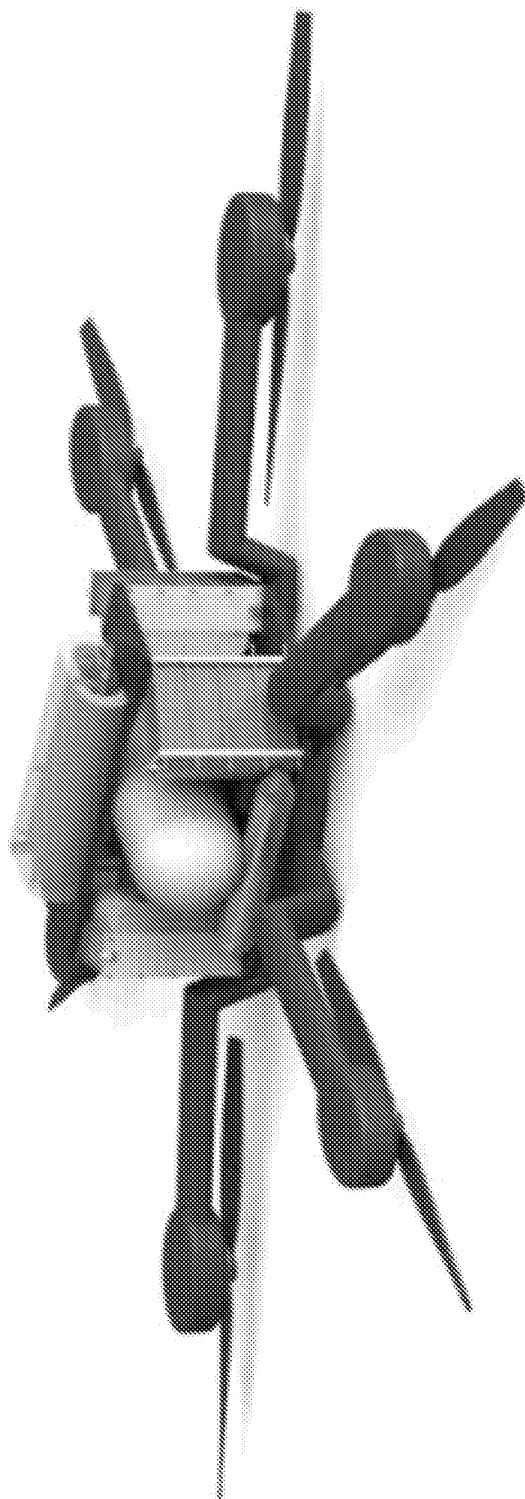


FIG. 51

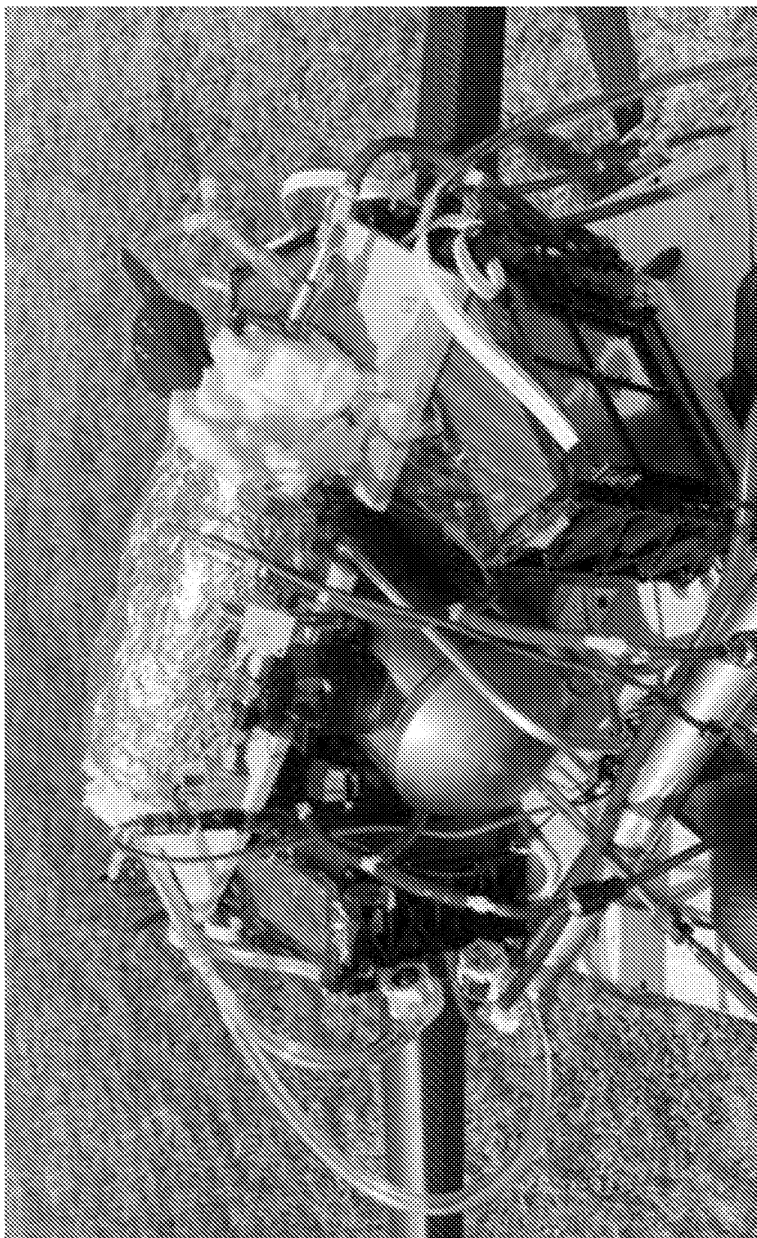


FIG. 52



FIG. 53

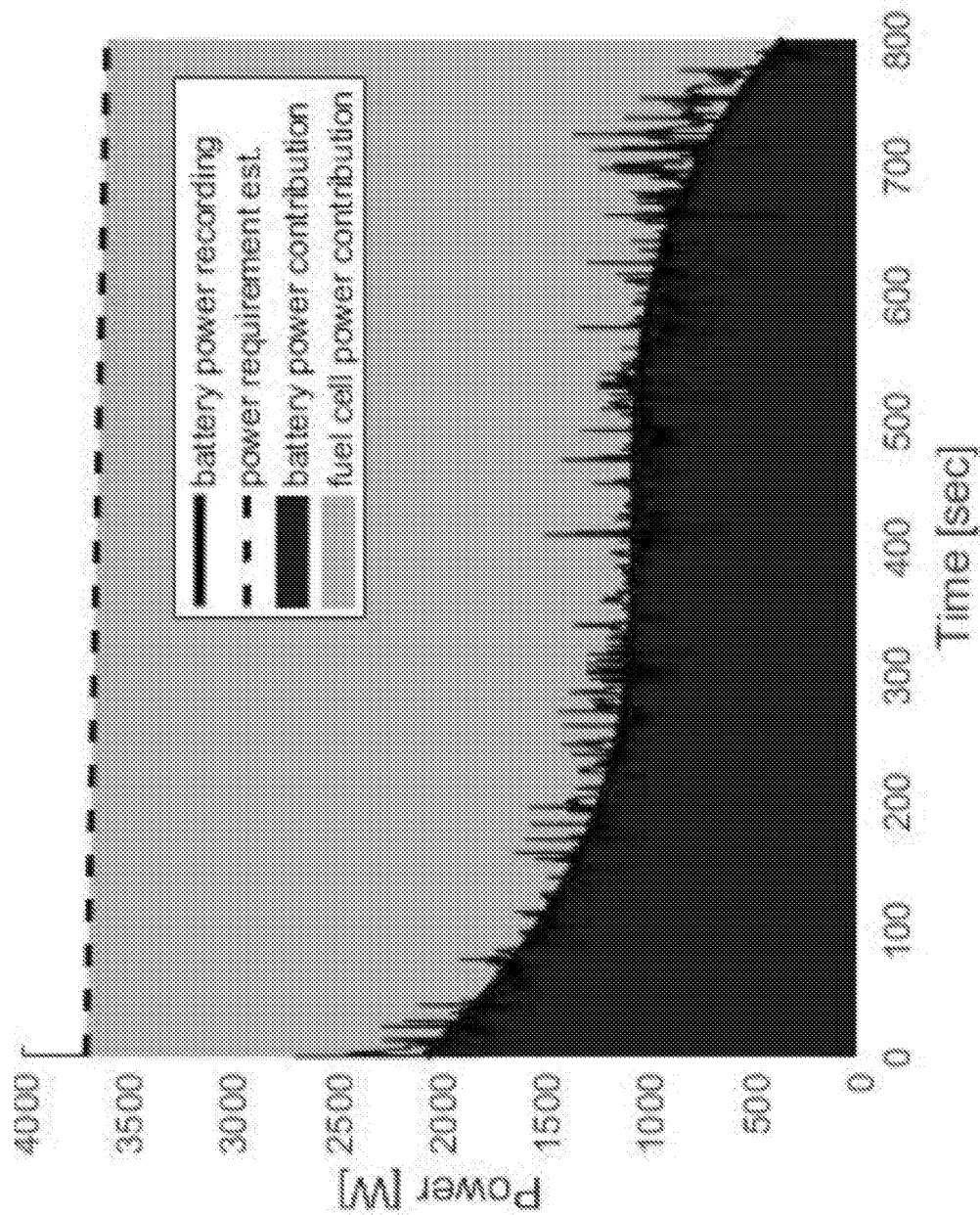


FIG. 54

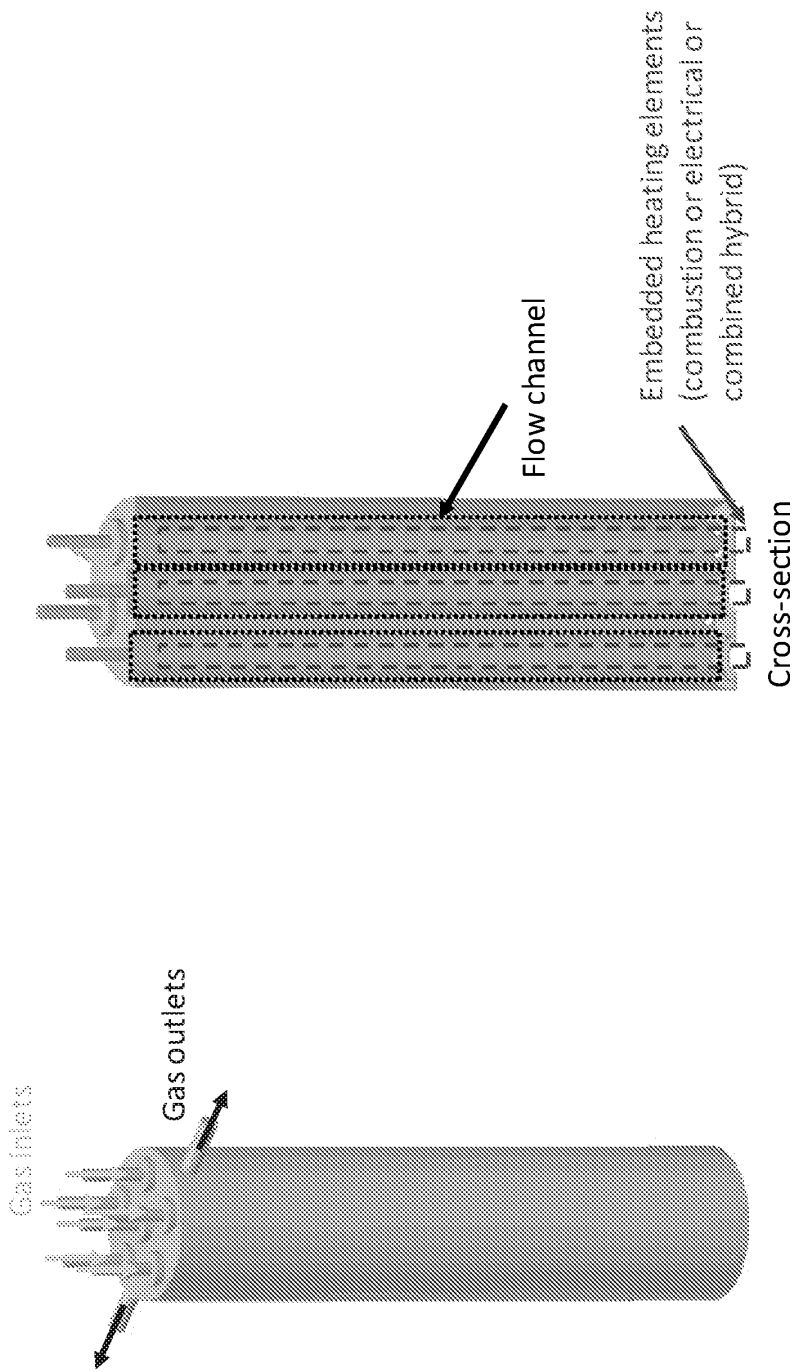


FIG. 55A

FIG. 55B

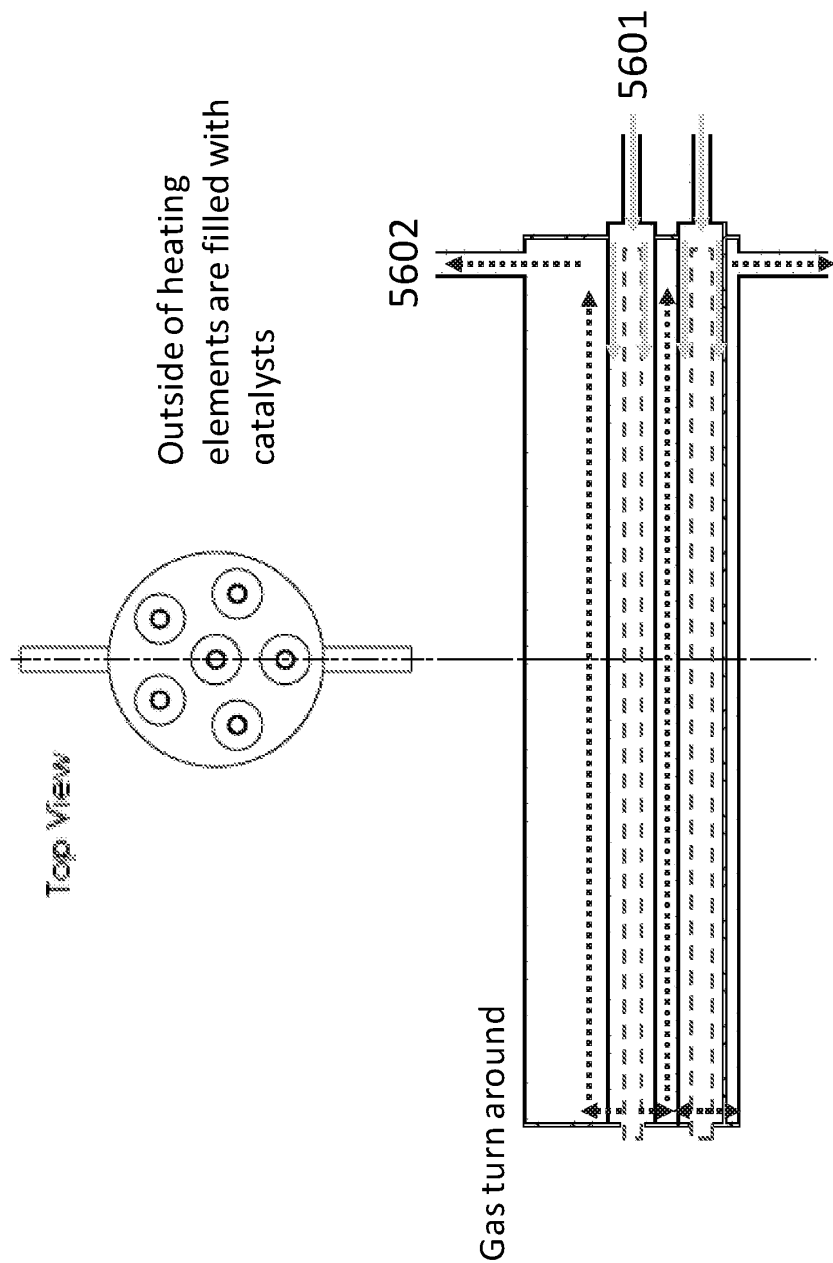


FIG. 56

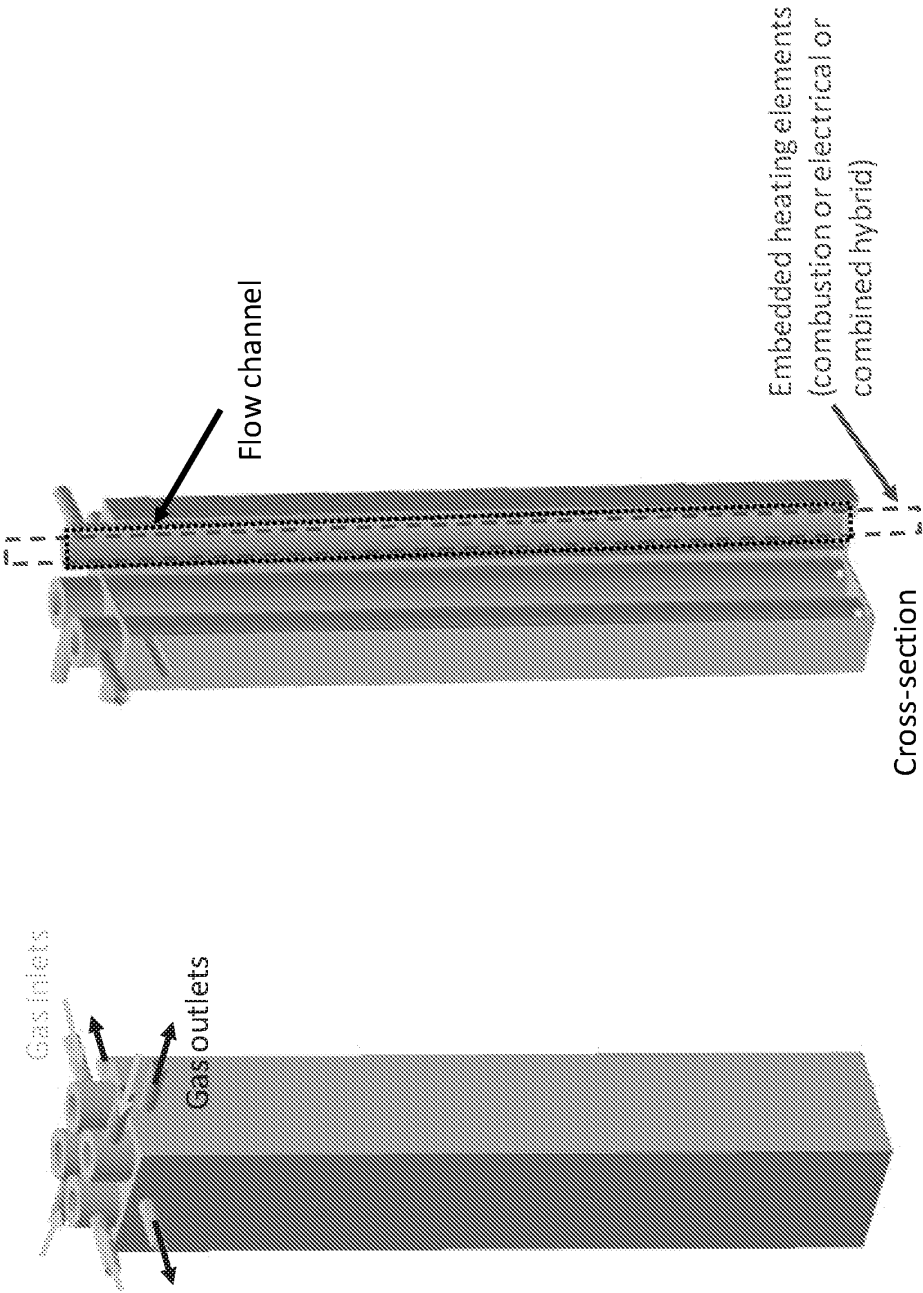


FIG. 57A

FIG. 57B

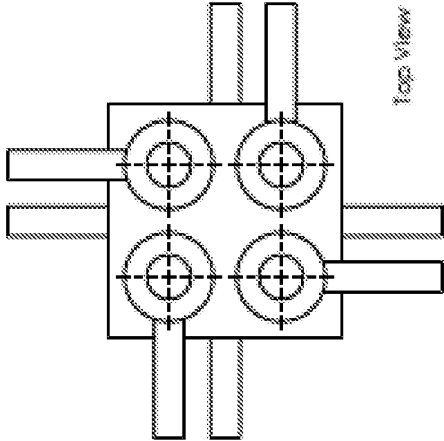


FIG. 58A

Gas turn around point

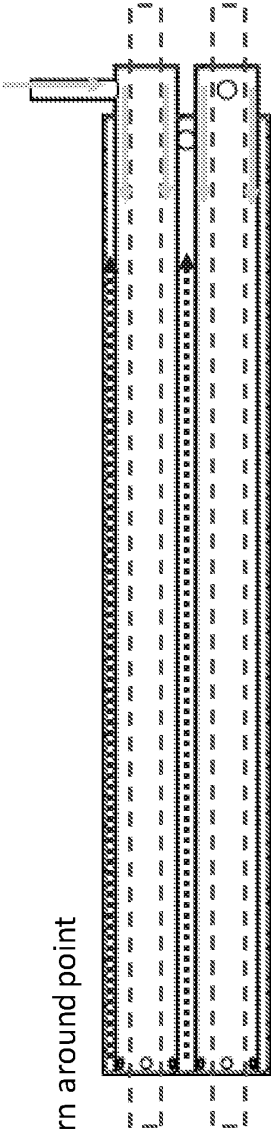


FIG. 58B

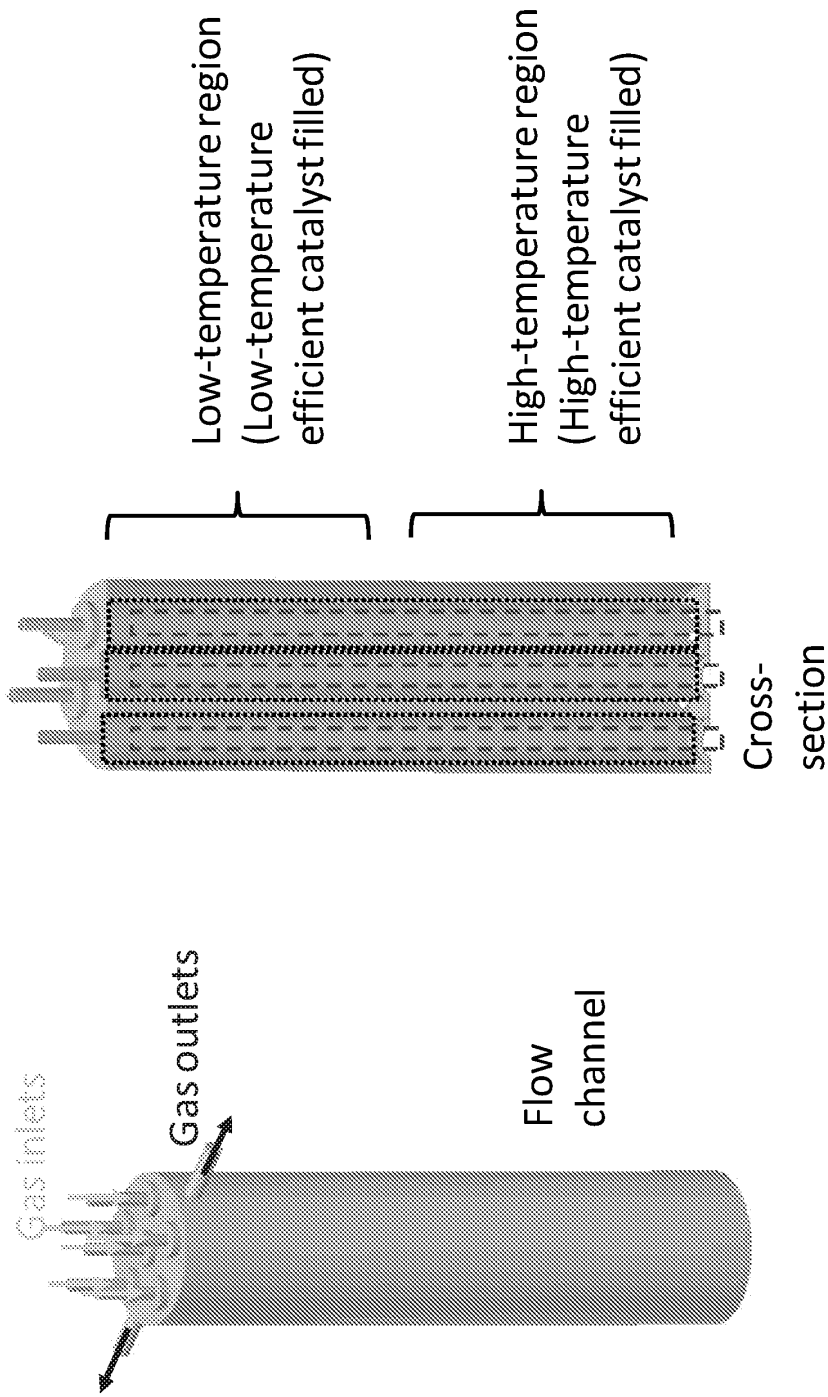


FIG. 59A

FIG. 59B

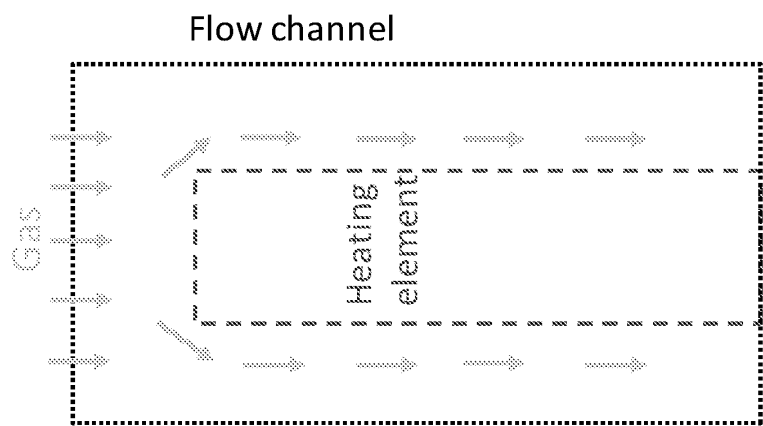


FIG. 60

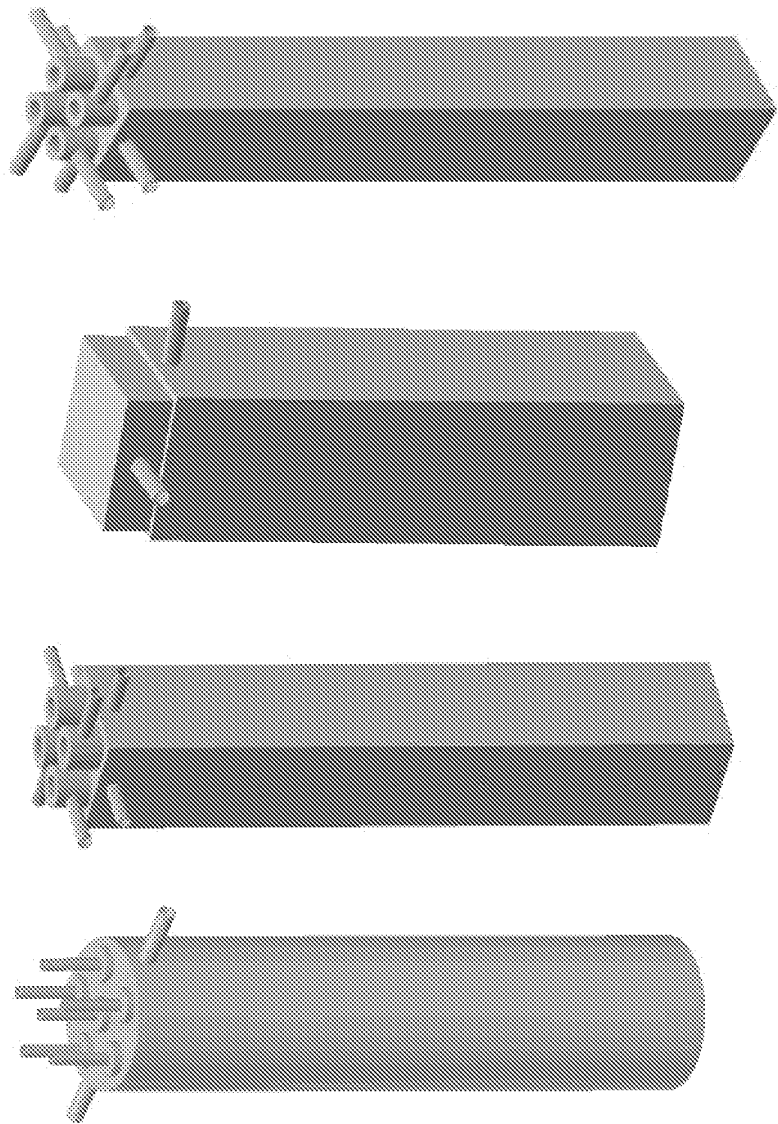
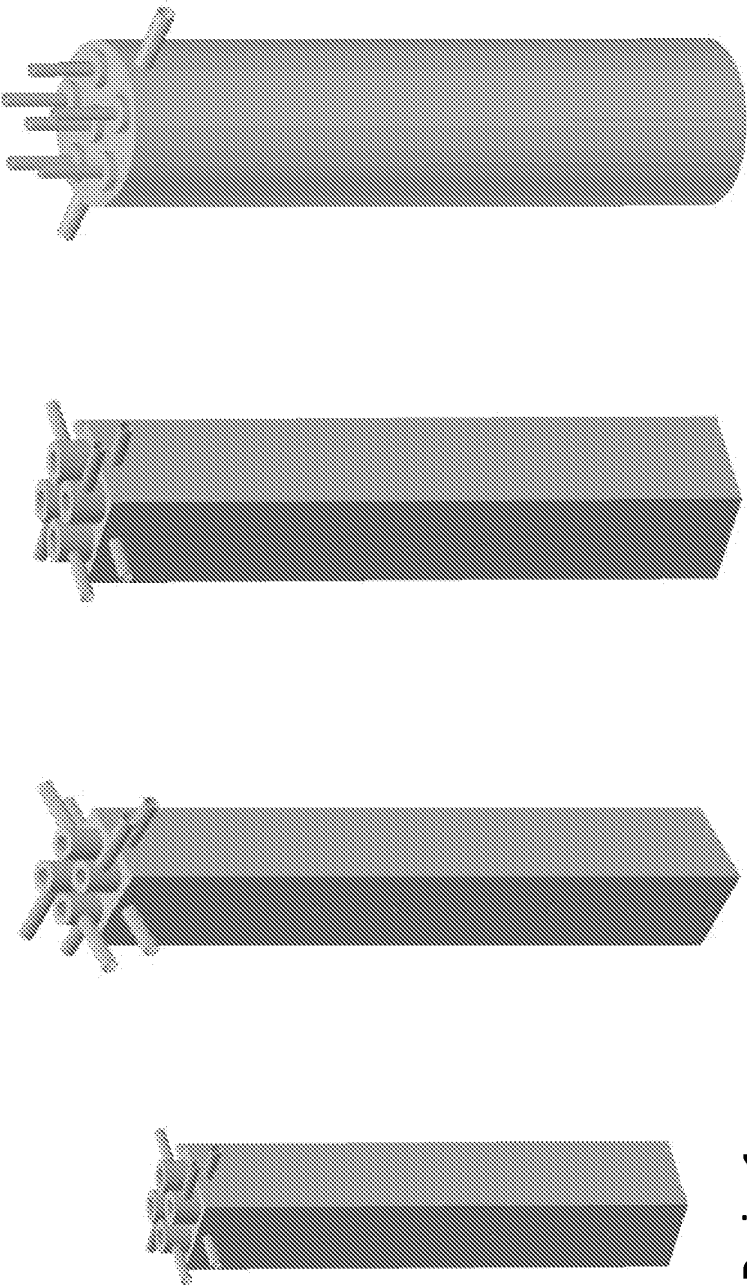


FIG. 61



Design 1

Design 2

Design 3

Design 4

FIG. 62A

FIG. 62B

FIG. 62C

FIG. 62D

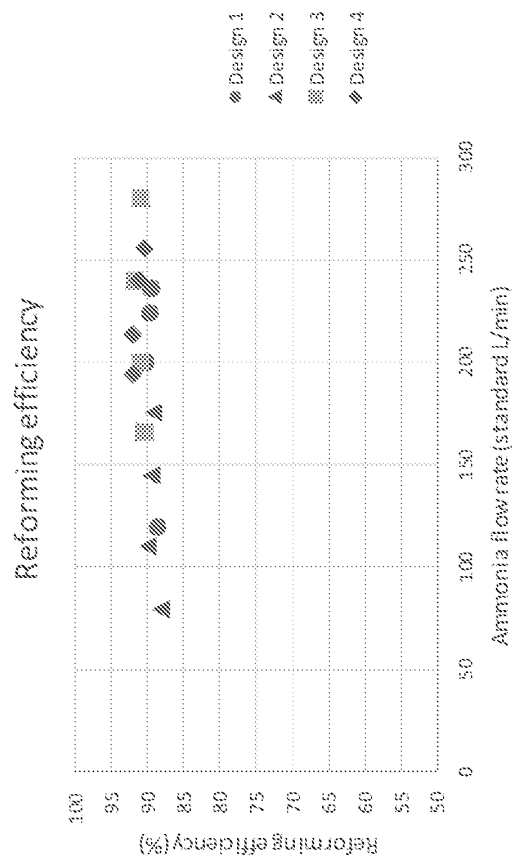


FIG. 63A

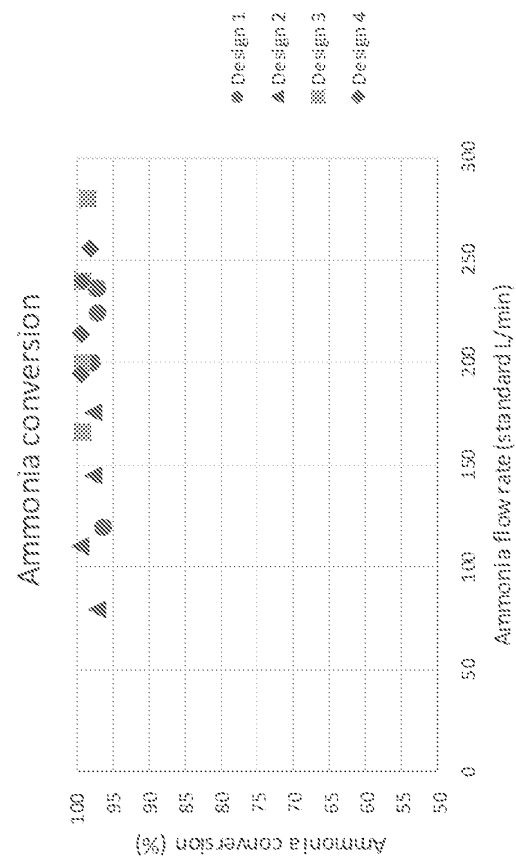


FIG. 63B

Startup

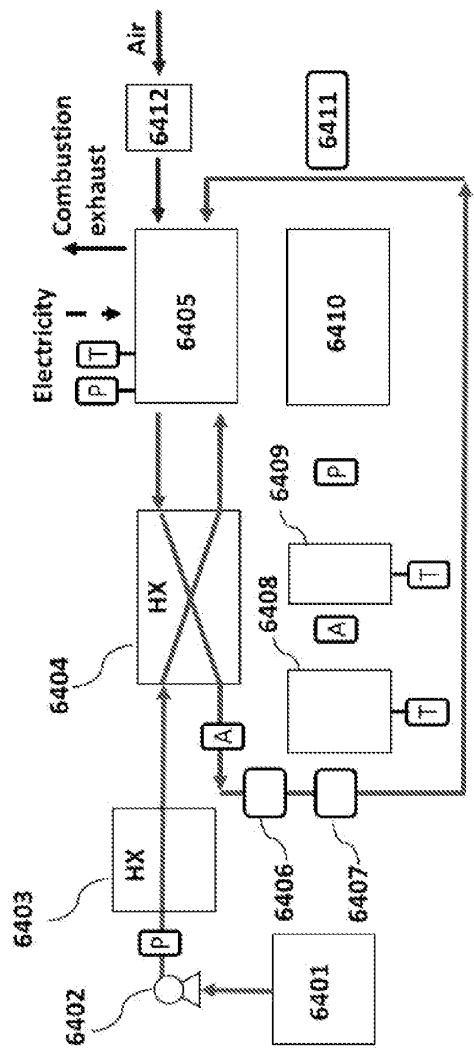


FIG. 64A

Post-startup

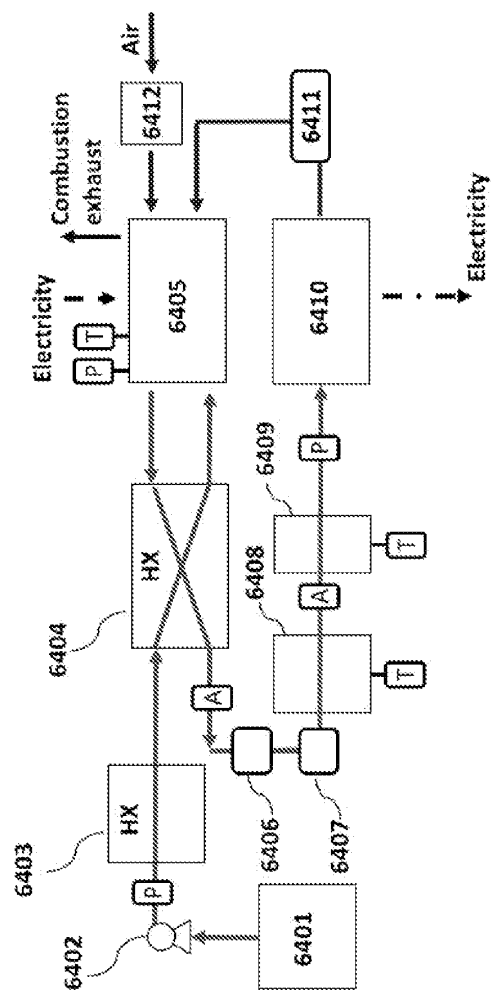


FIG. 64B

Startup

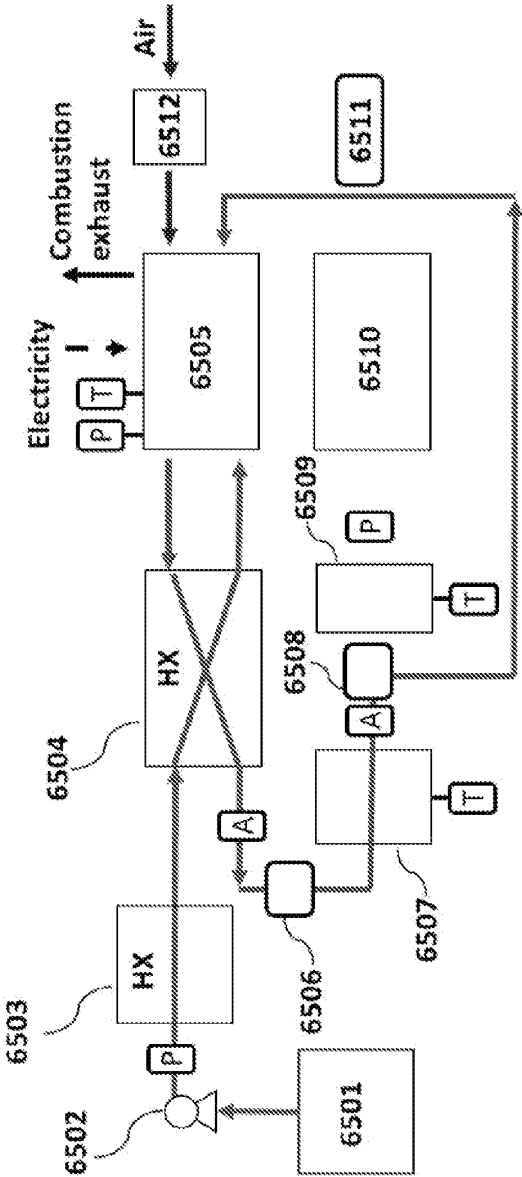
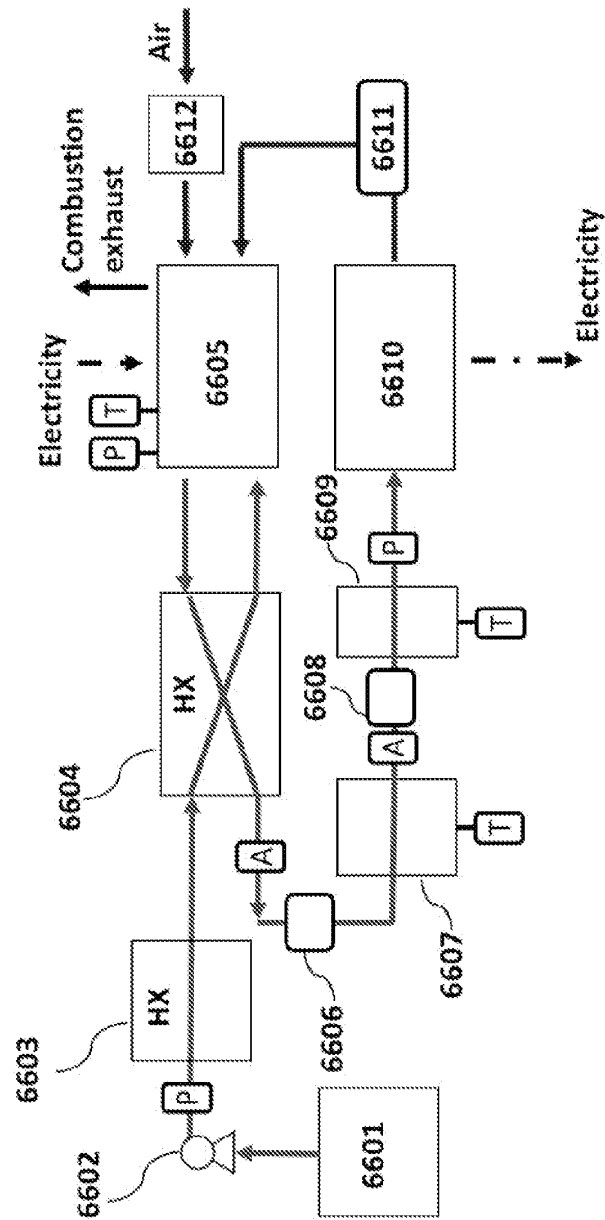


FIG. 65

Post-startup



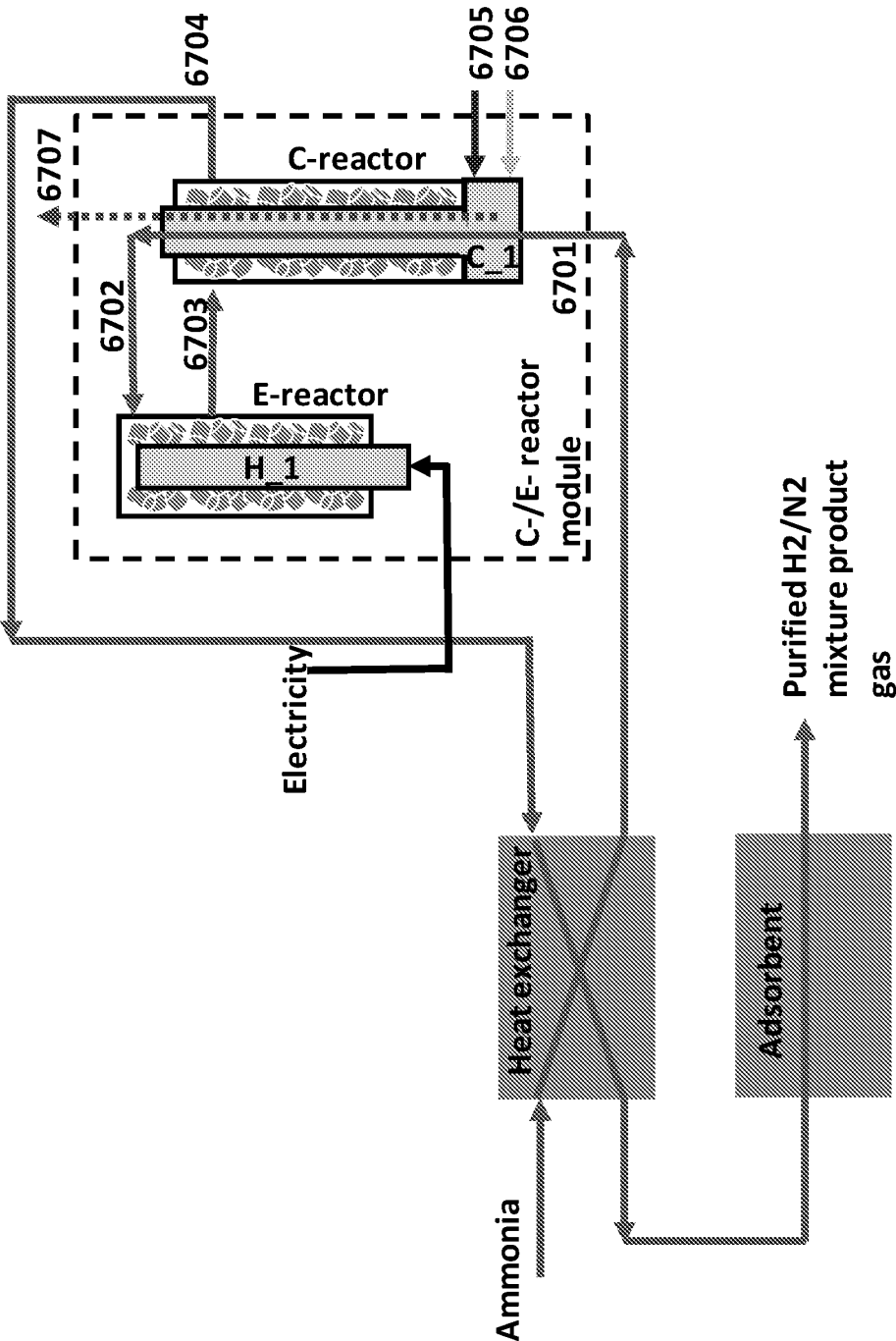


FIG. 67

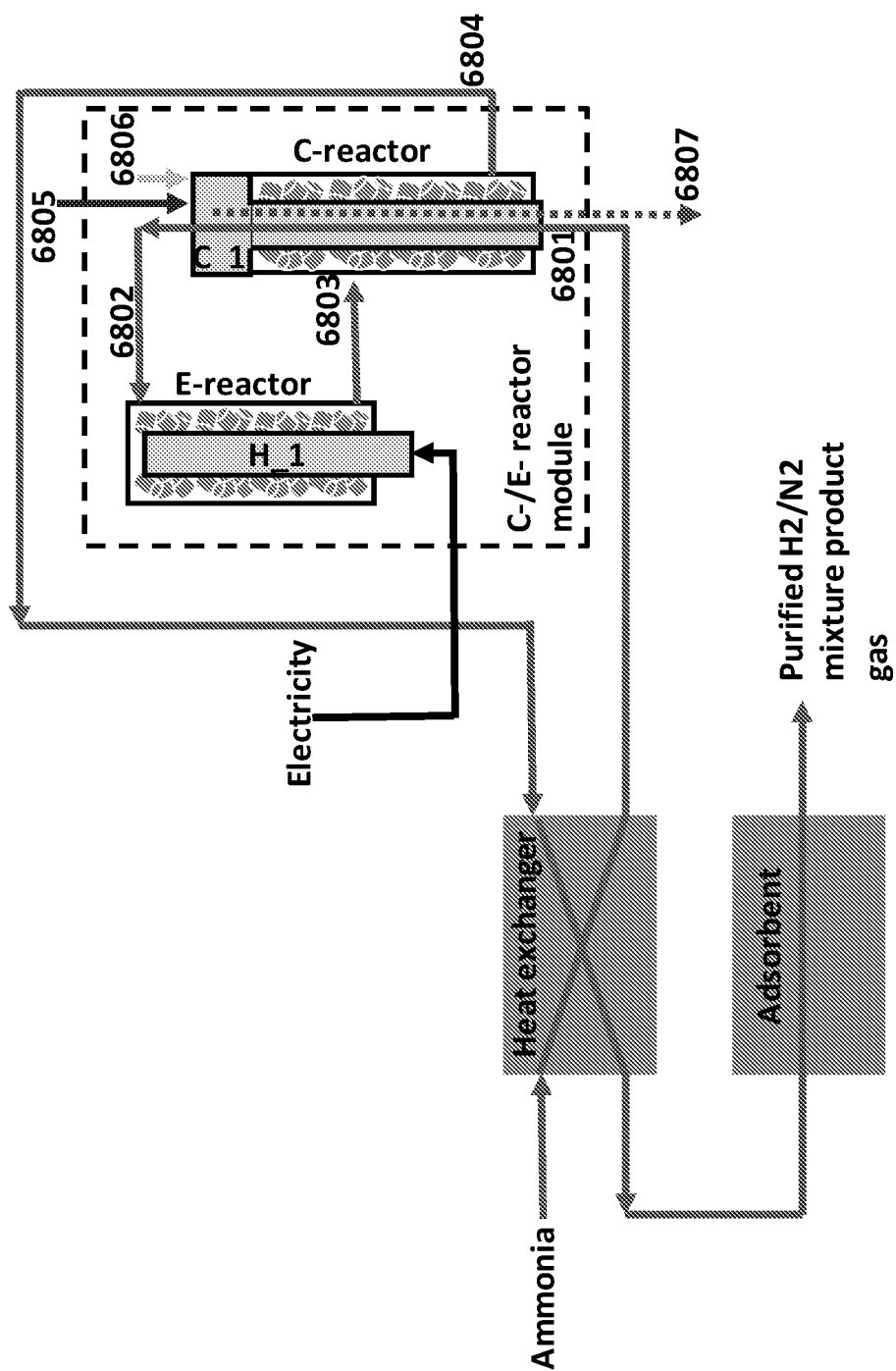


FIG. 68

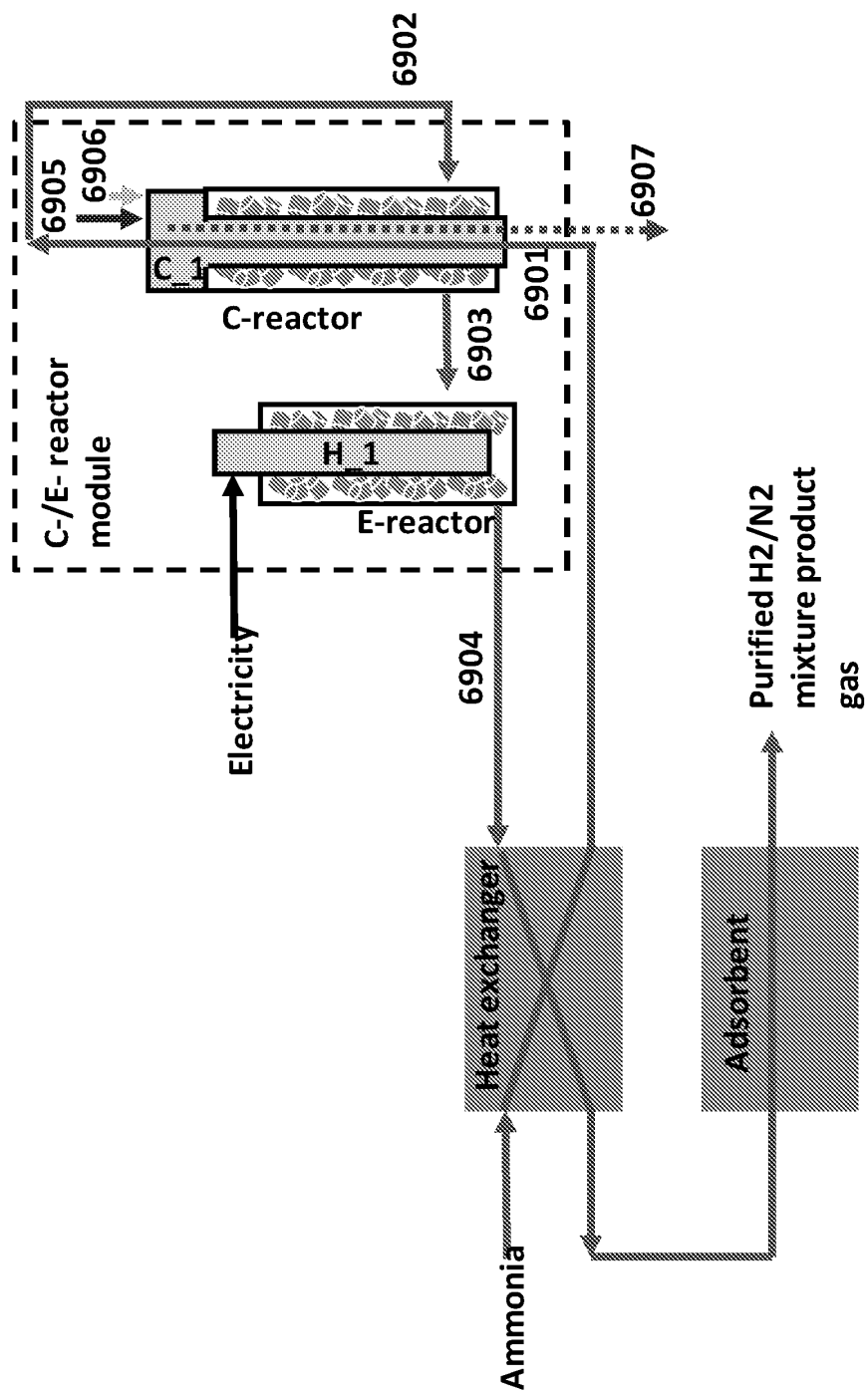


FIG. 69

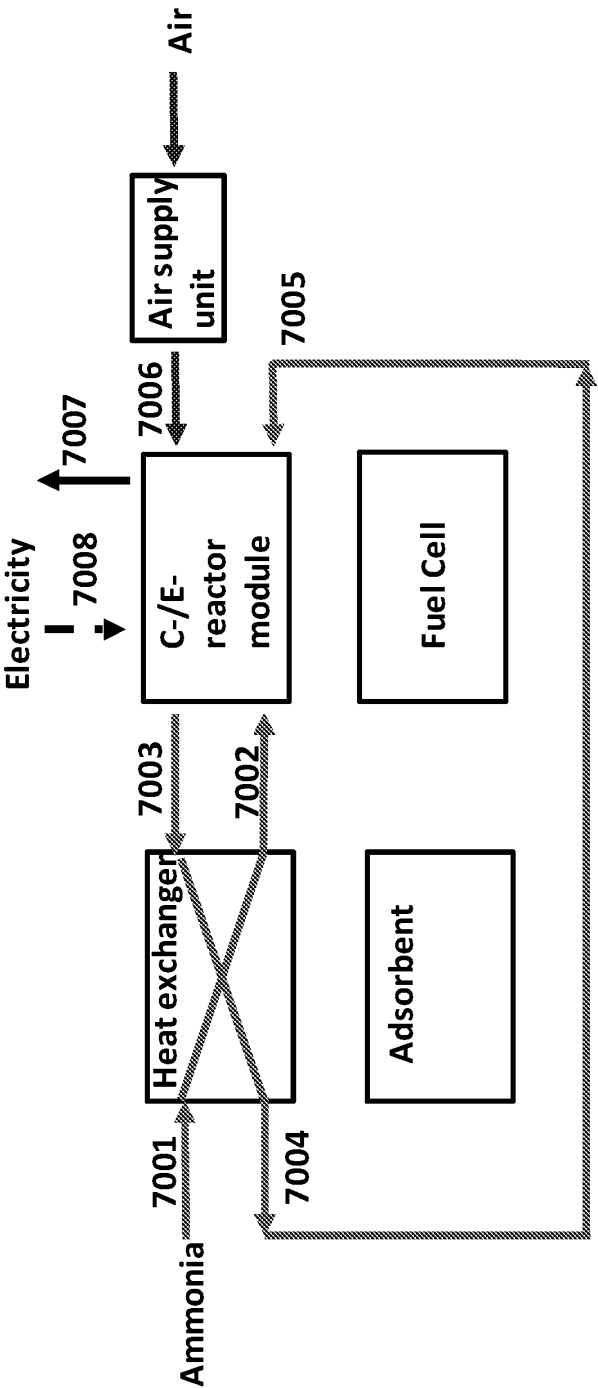


FIG. 70

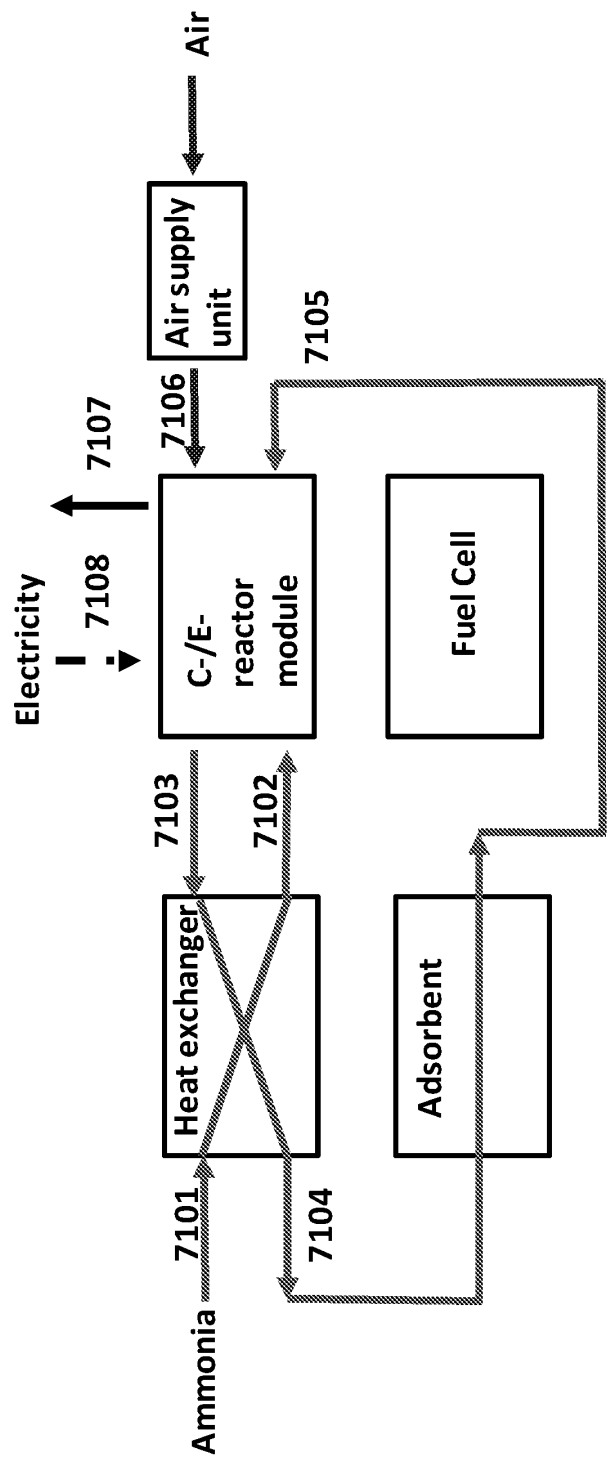


FIG. 71

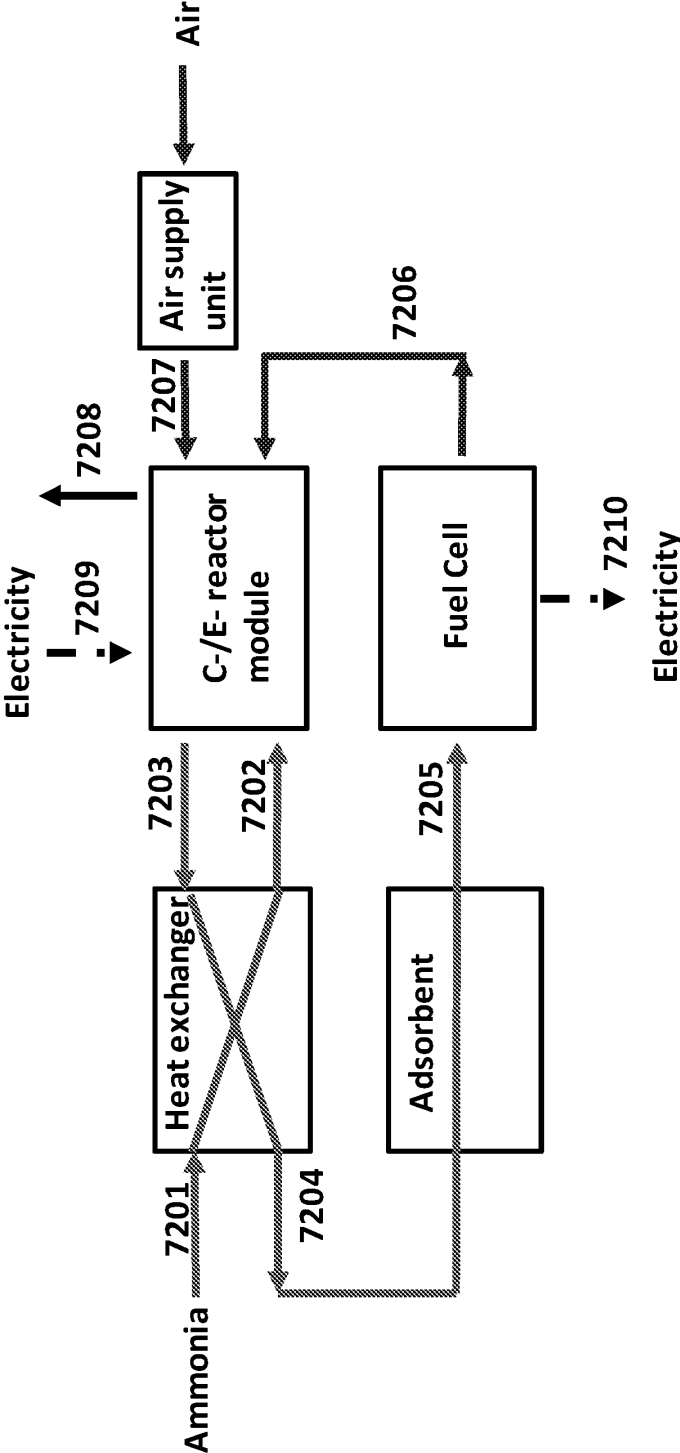


FIG. 72

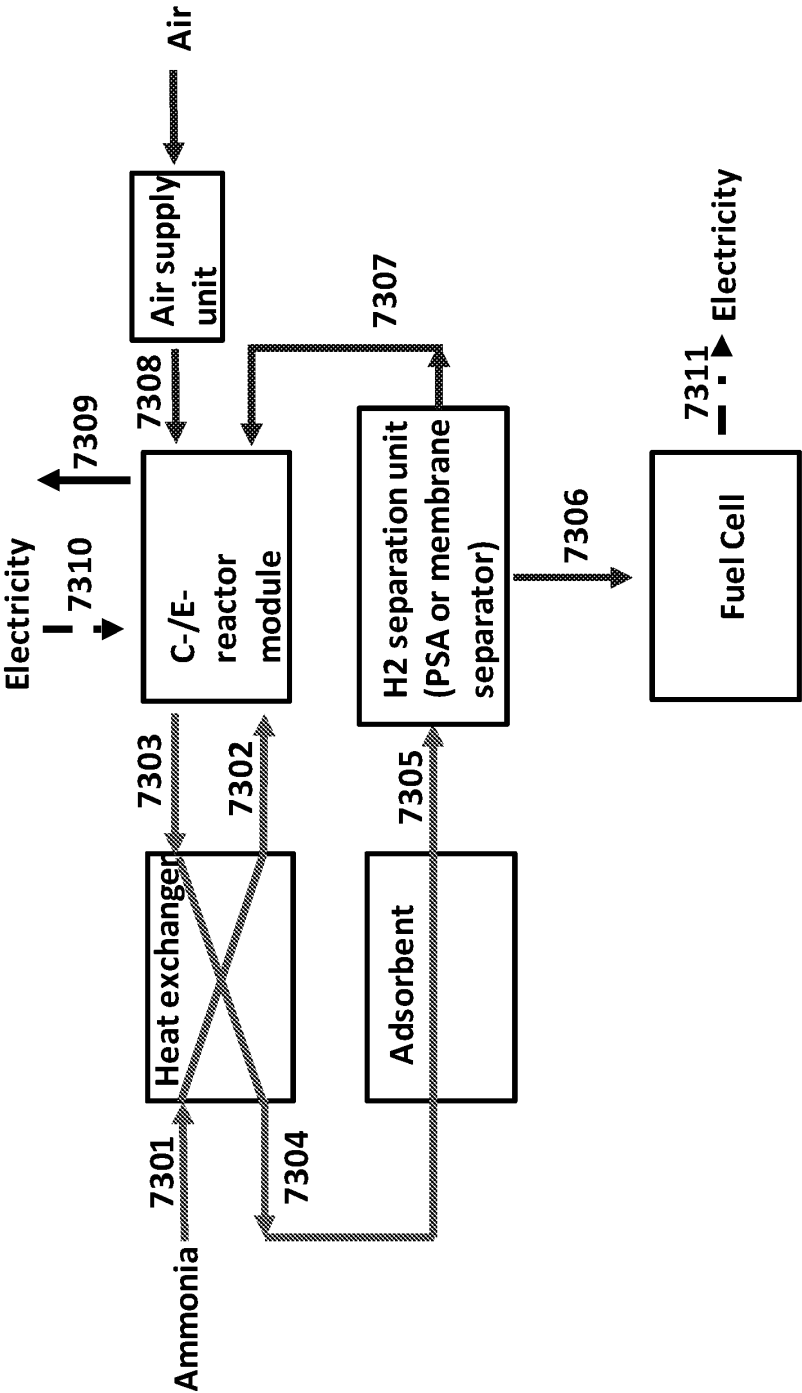


FIG. 73

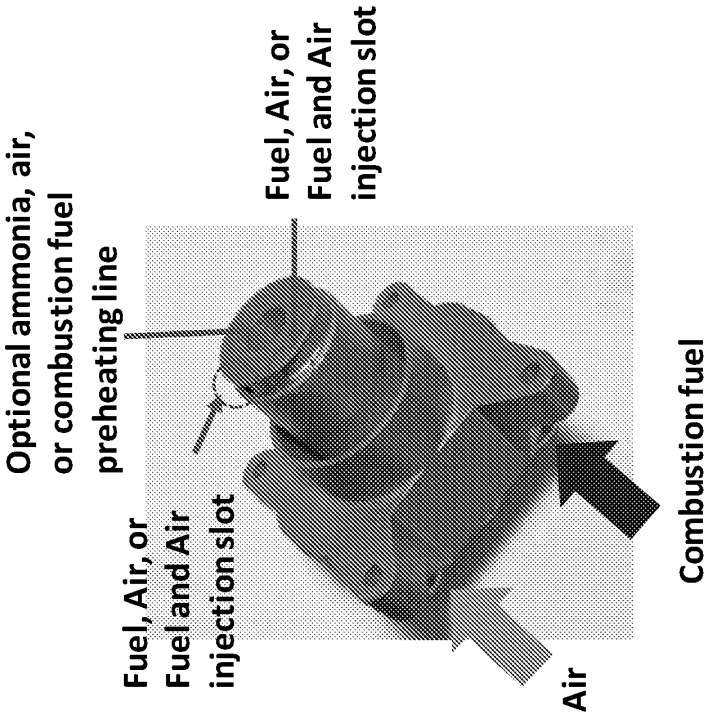


FIG. 74

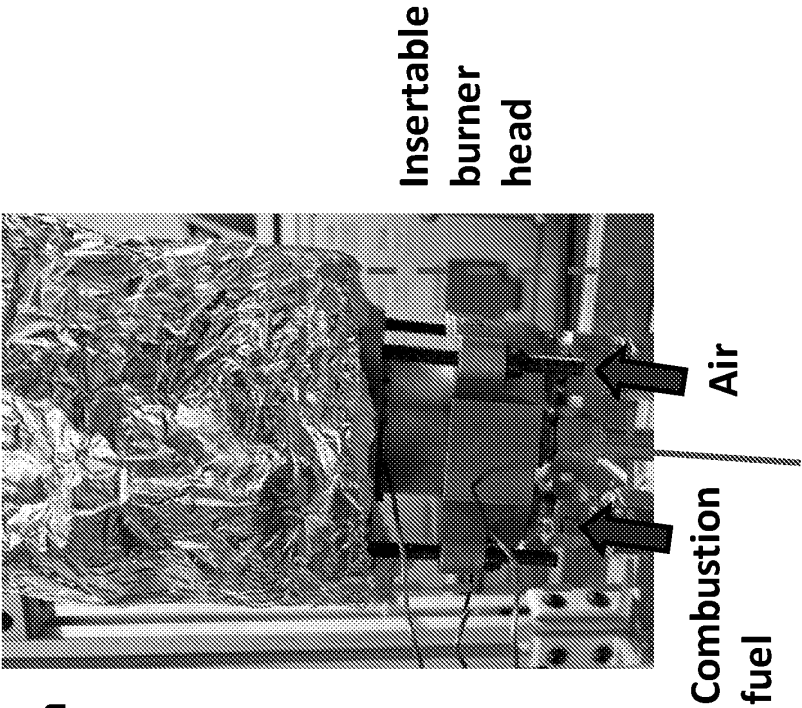


FIG. 75B

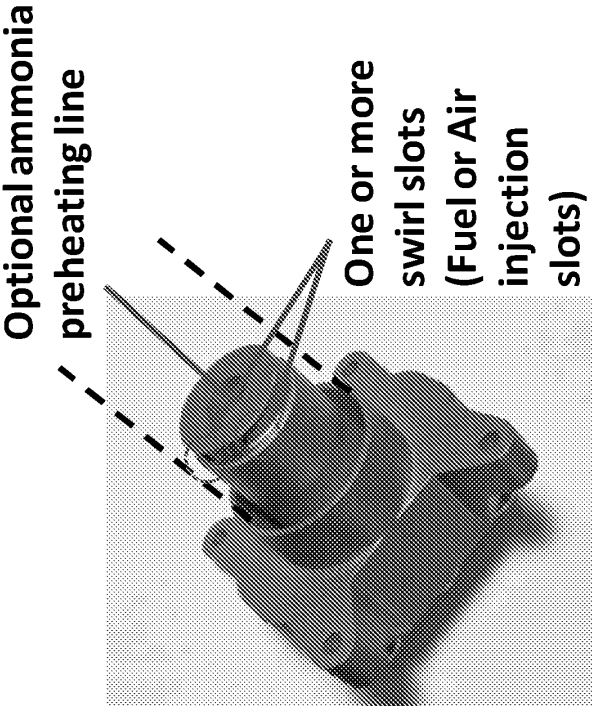


FIG. 75A

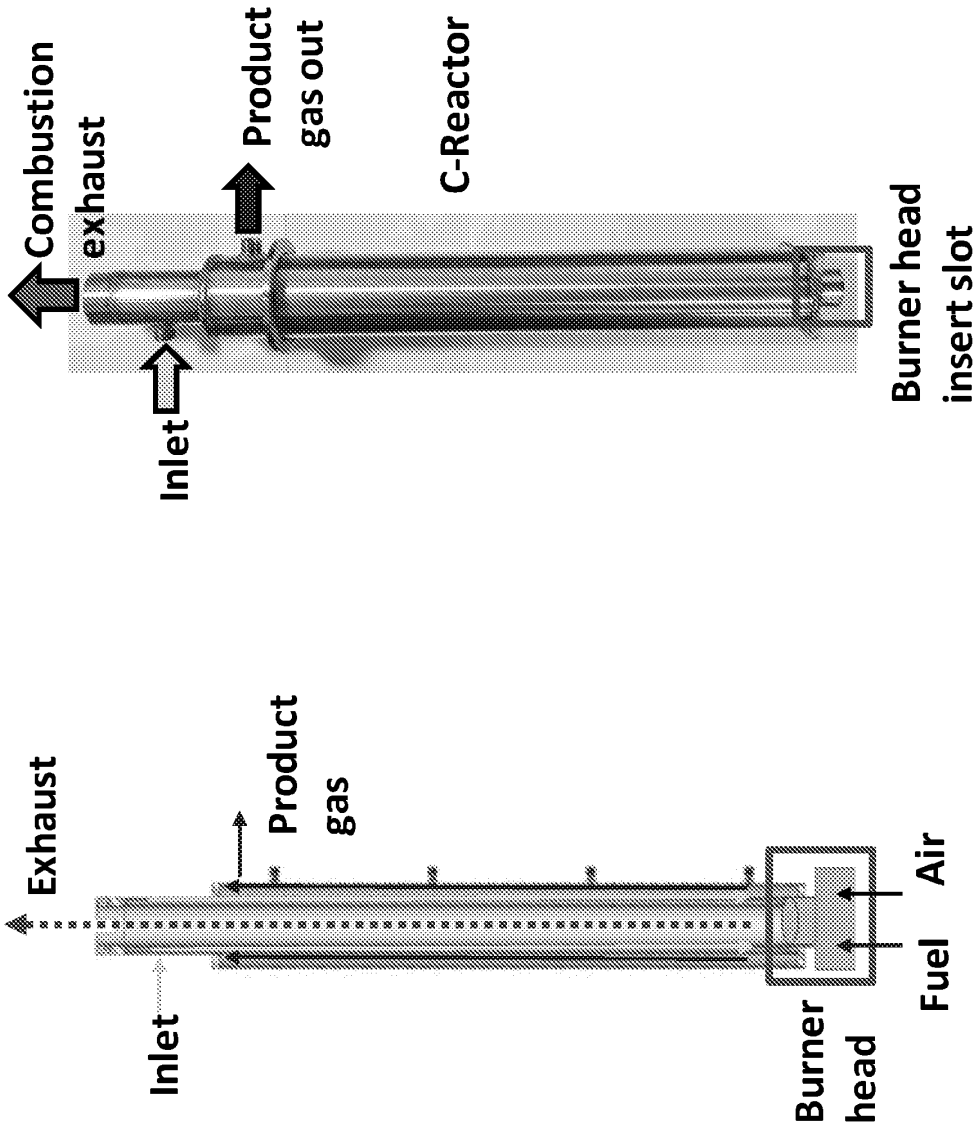


FIG. 76B

FIG. 76A

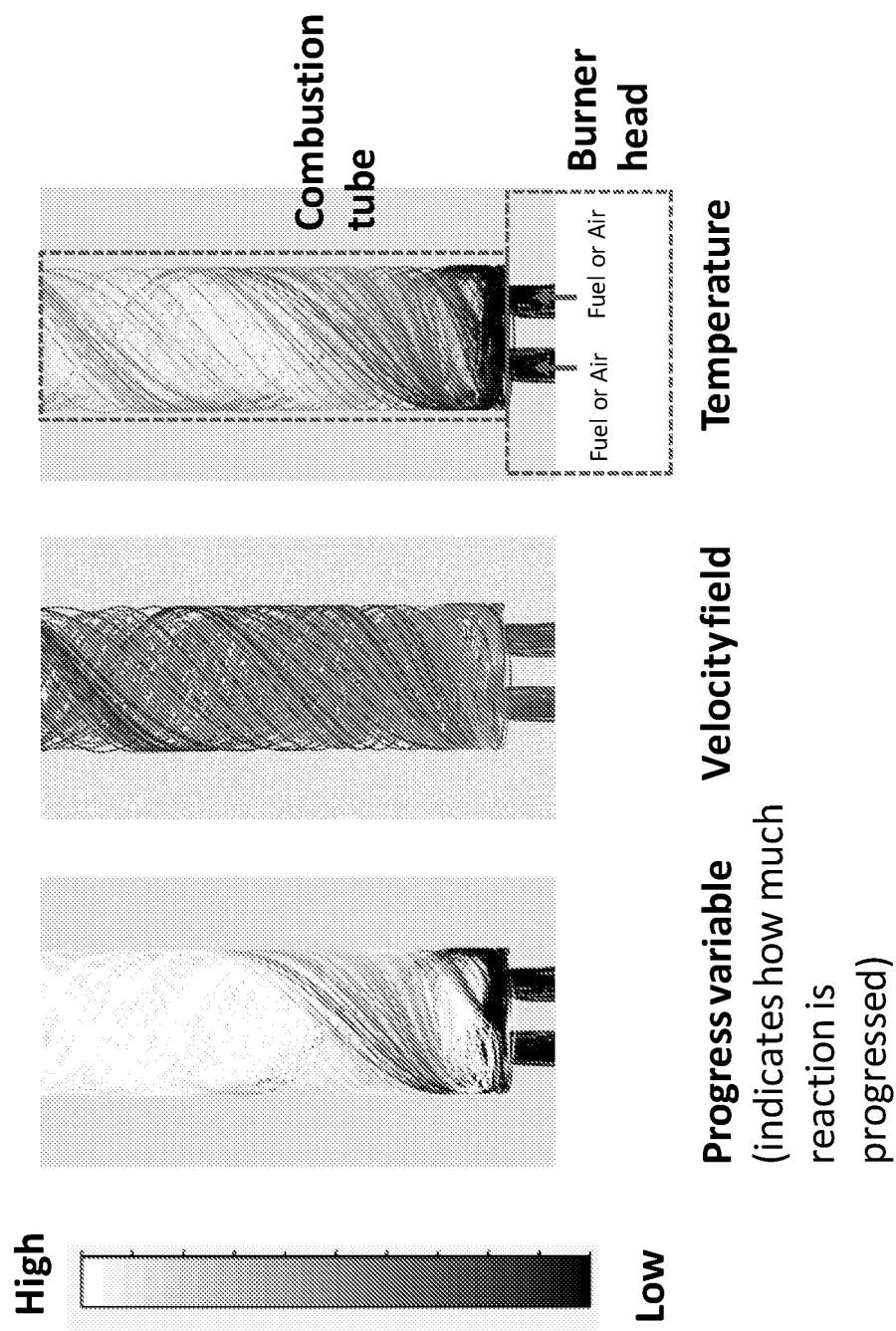


FIG. 77

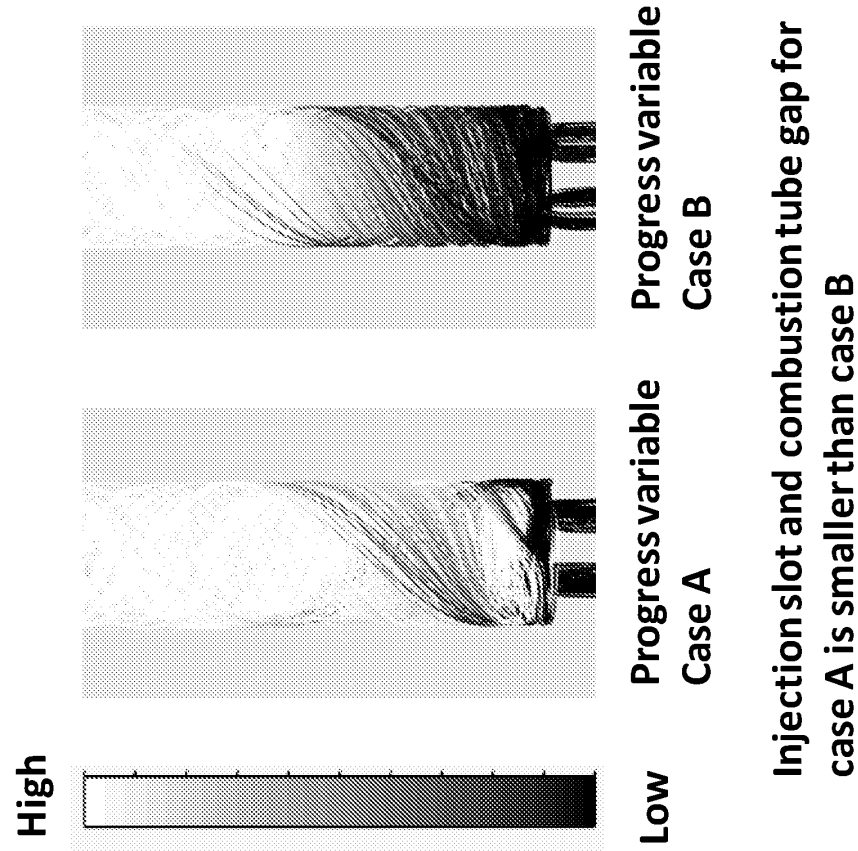
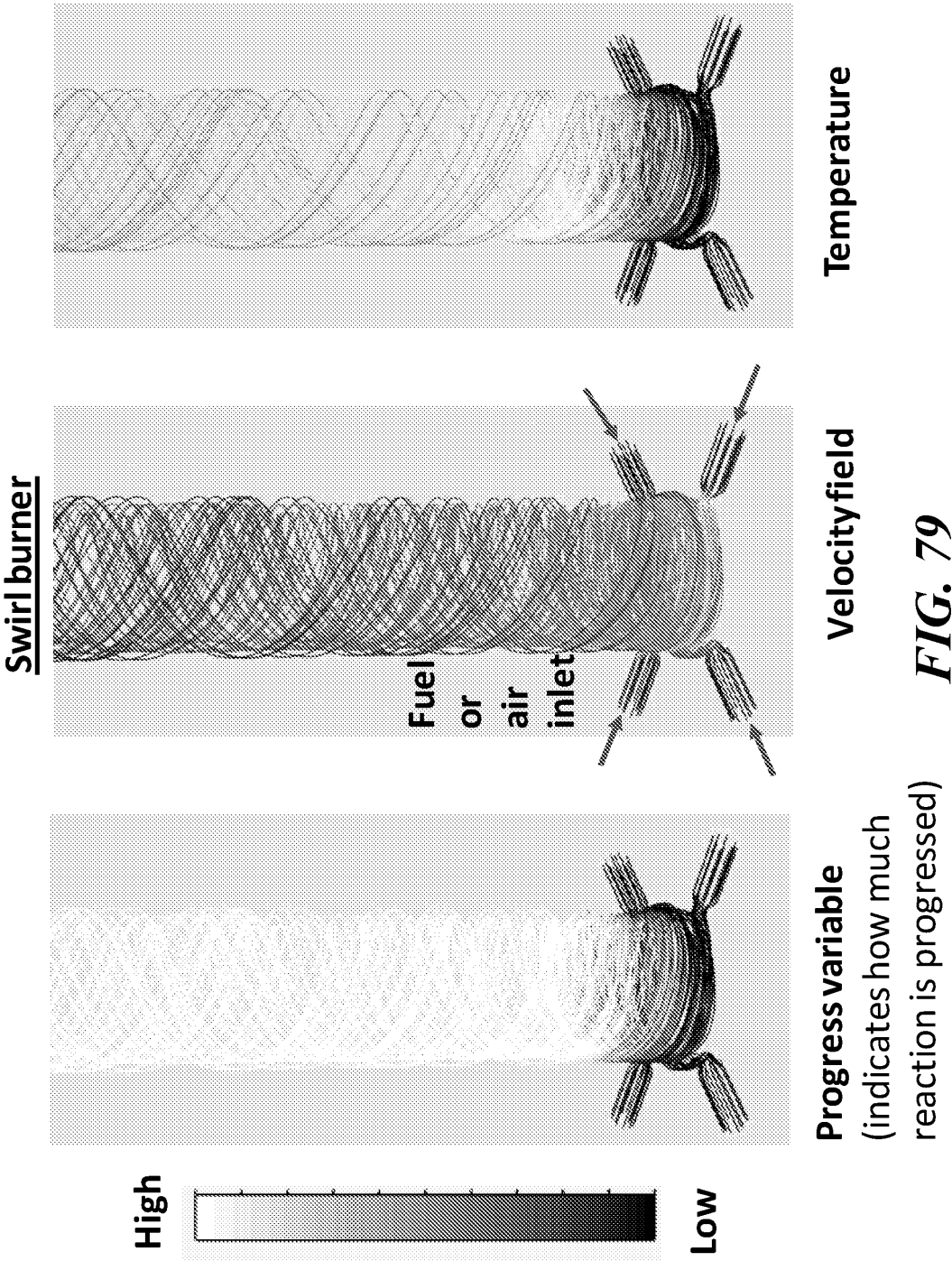


FIG. 78



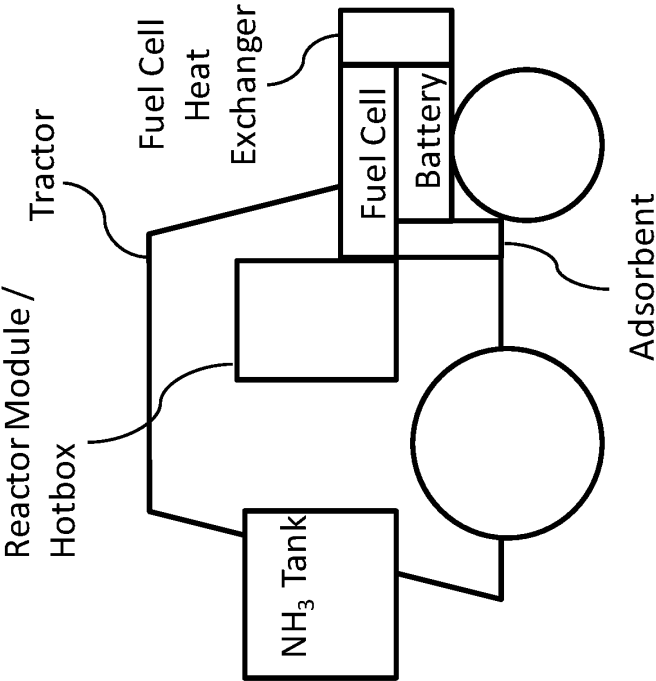


FIG. 80B

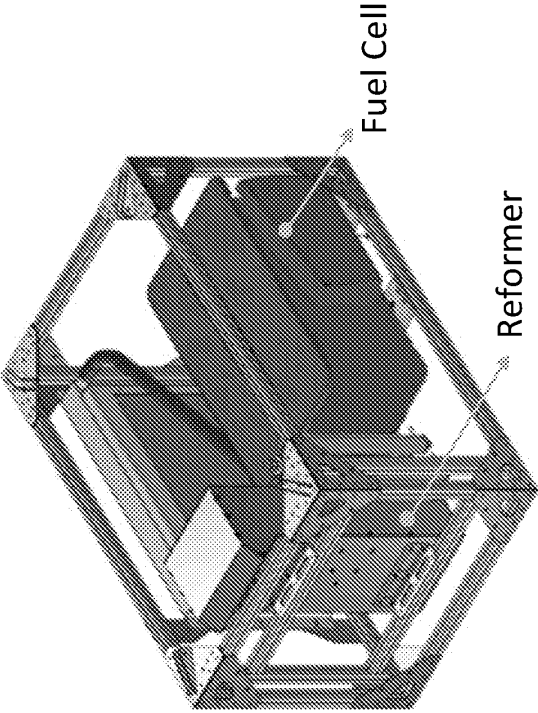


FIG. 80A

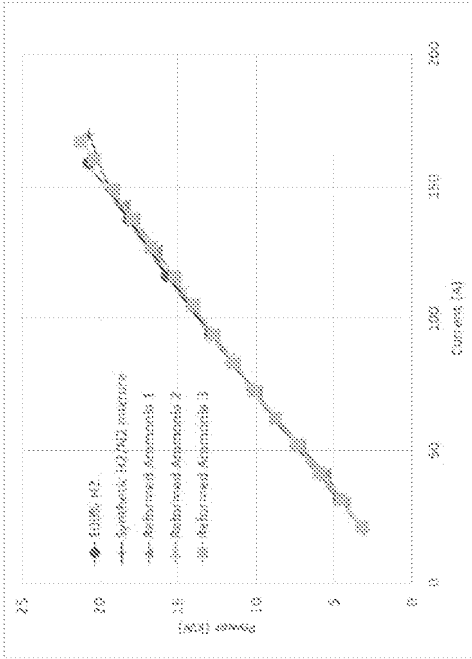


FIG. 81B

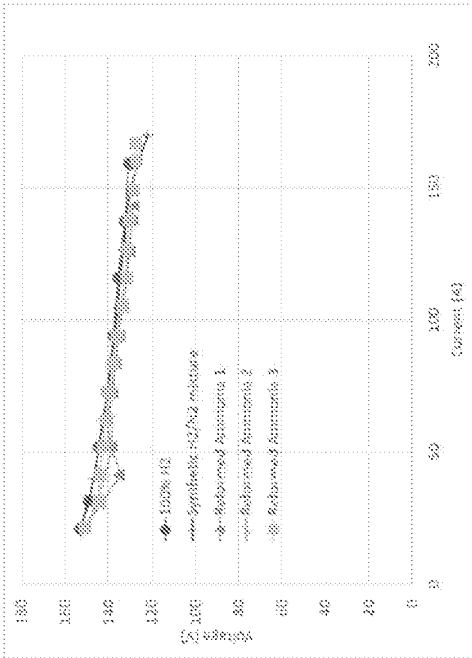


FIG. 81A

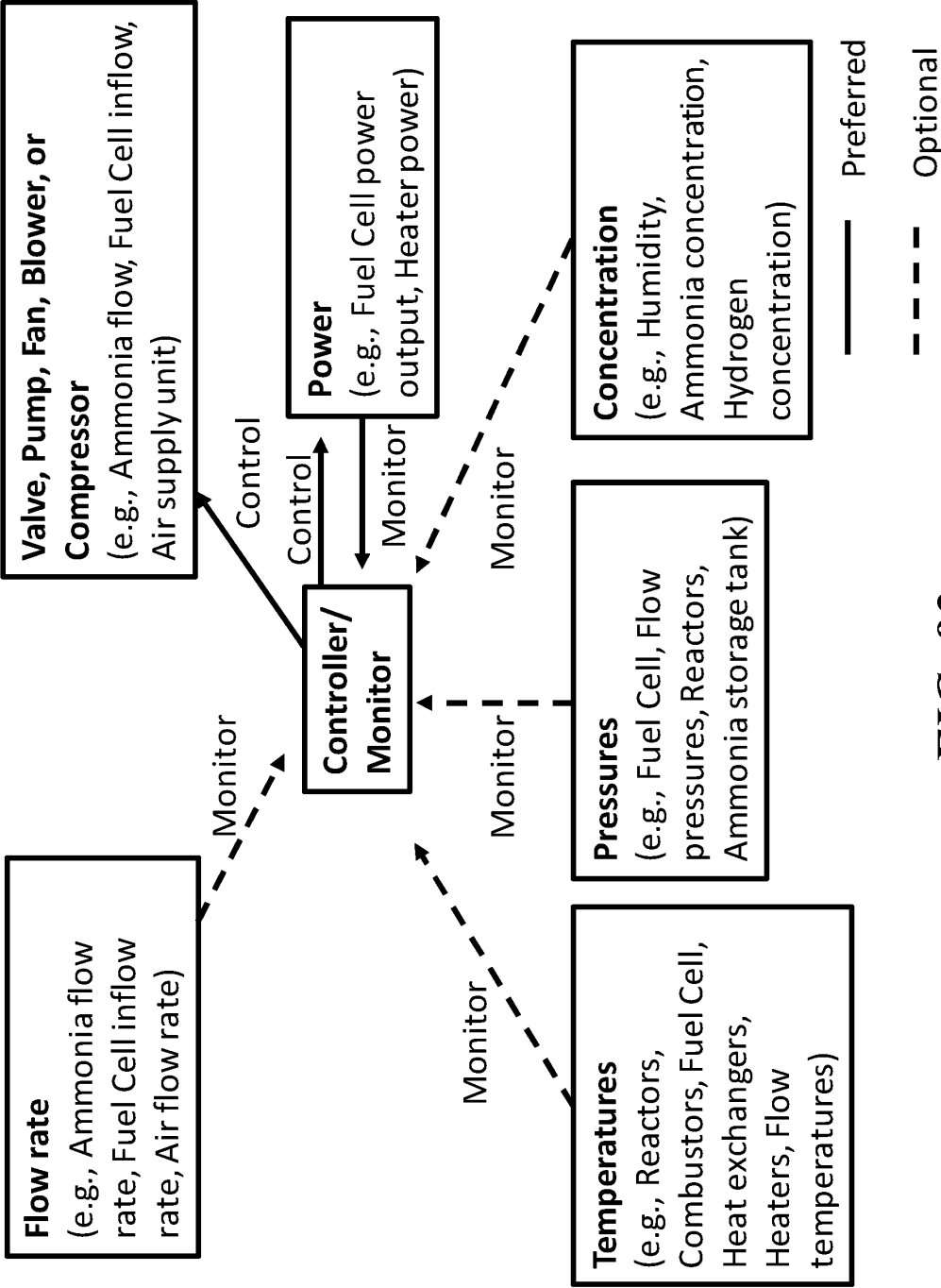


FIG. 82

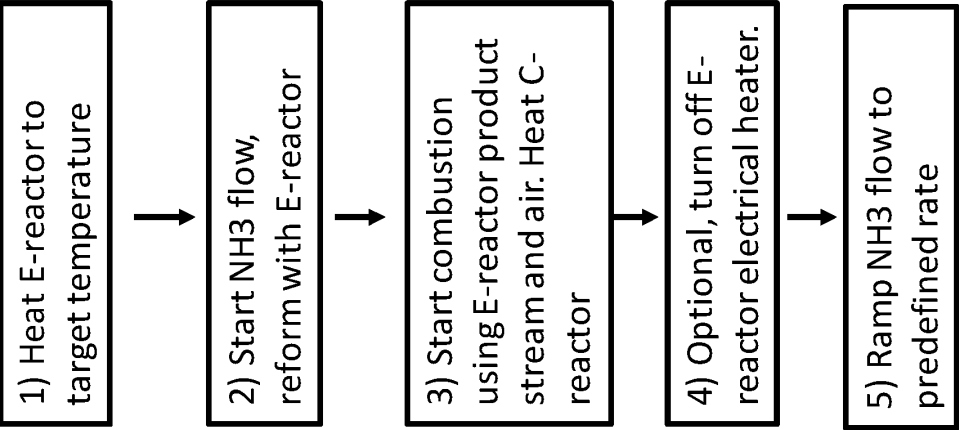


FIG. 83

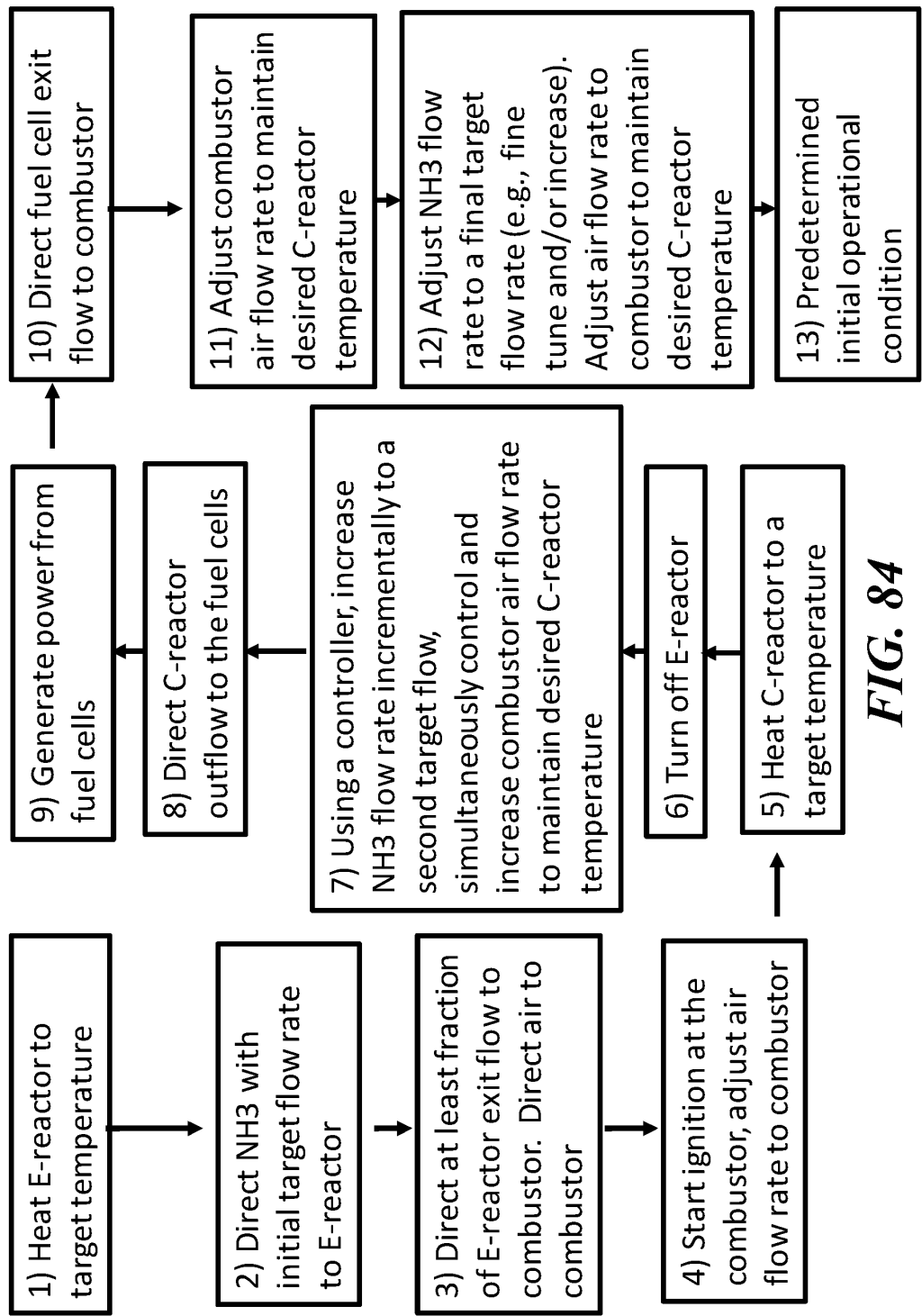


FIG. 84

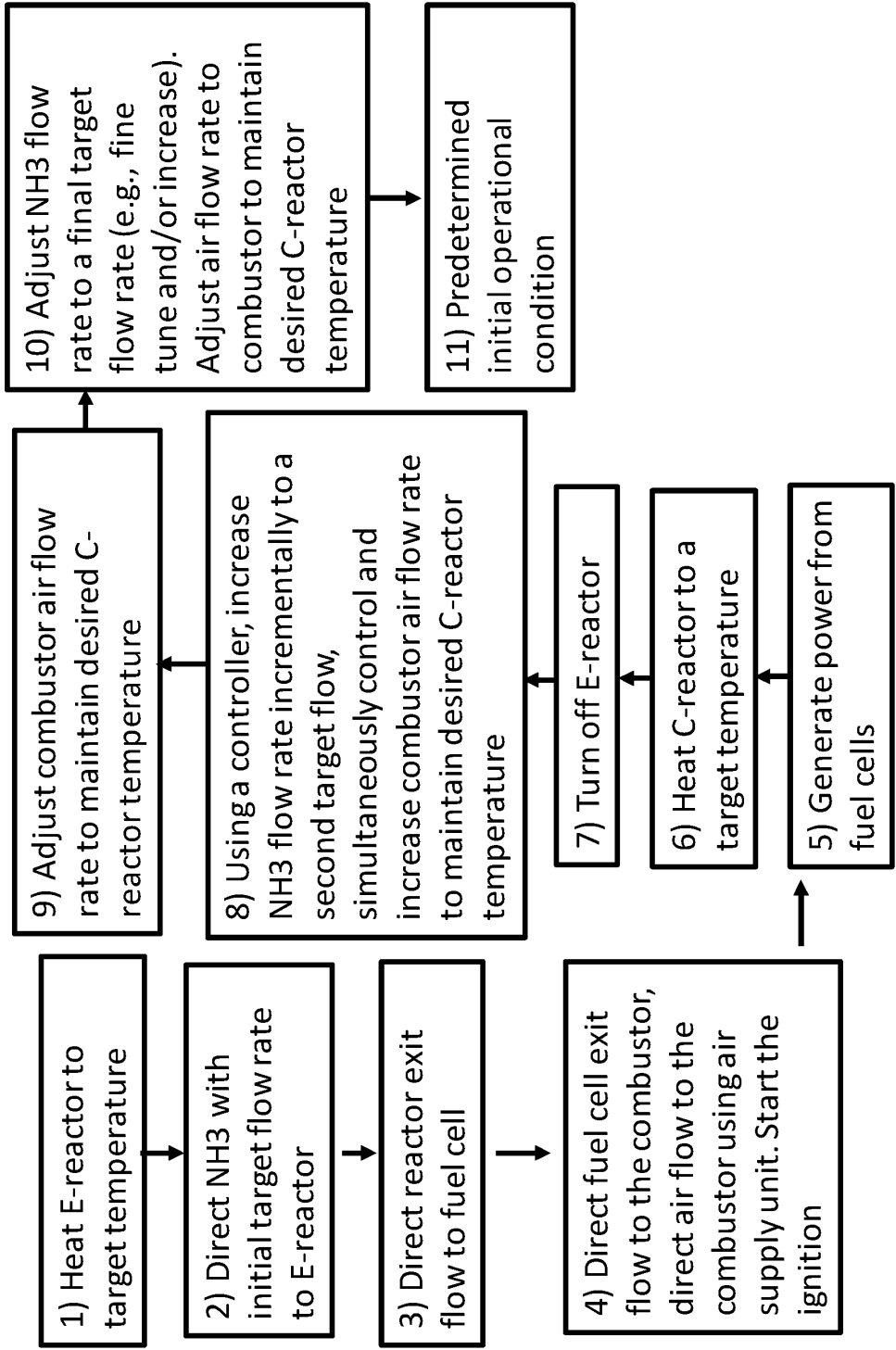


FIG. 85

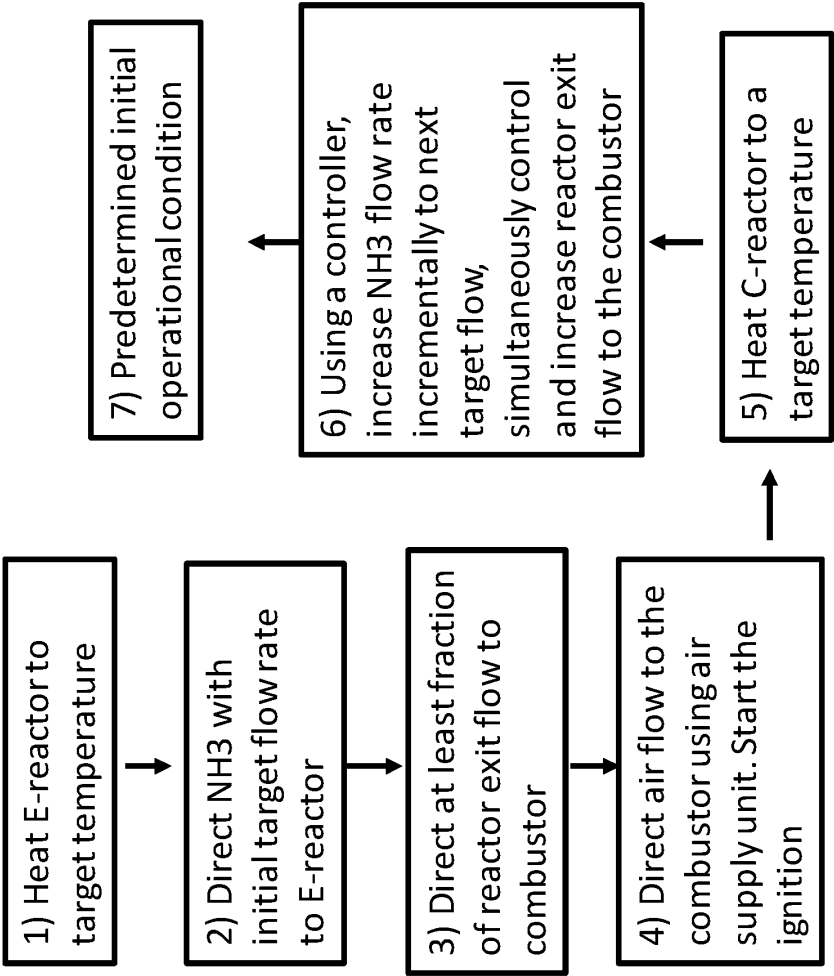


FIG. 86

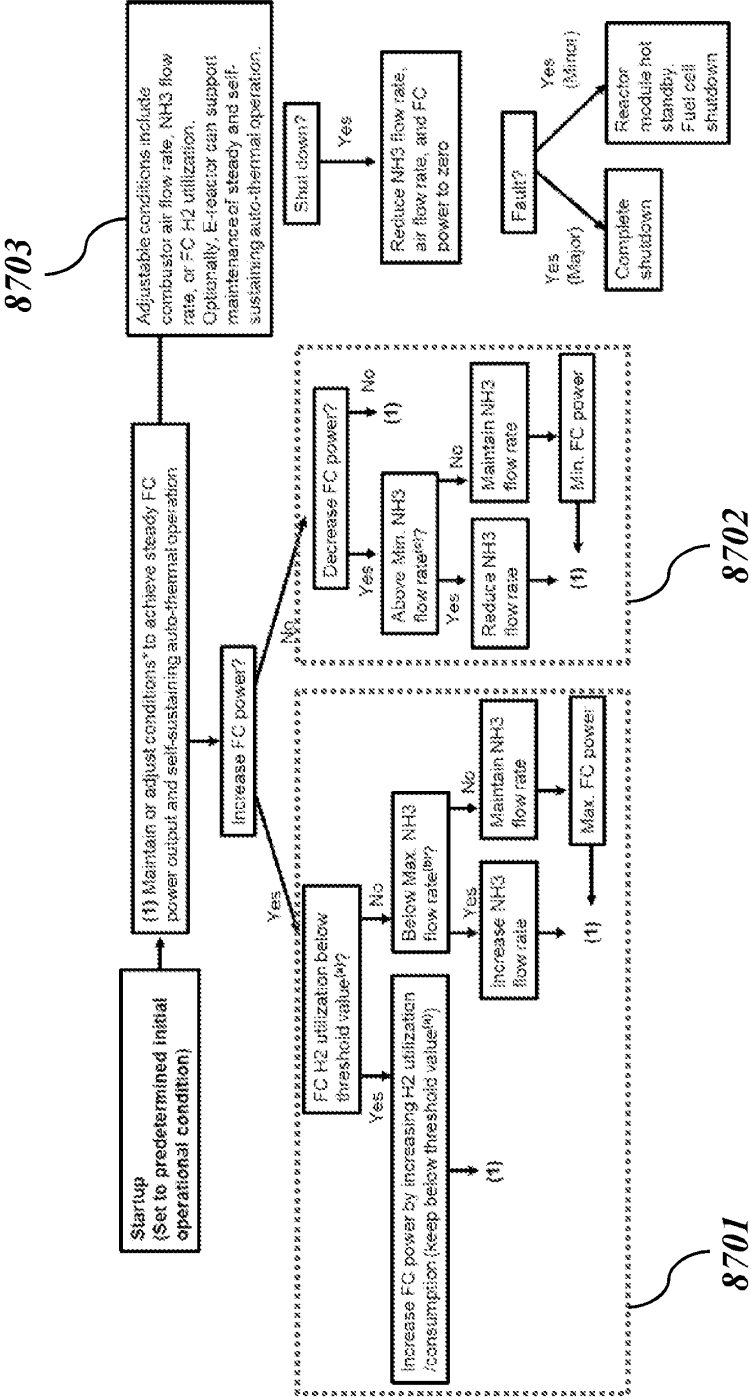


FIG. 87

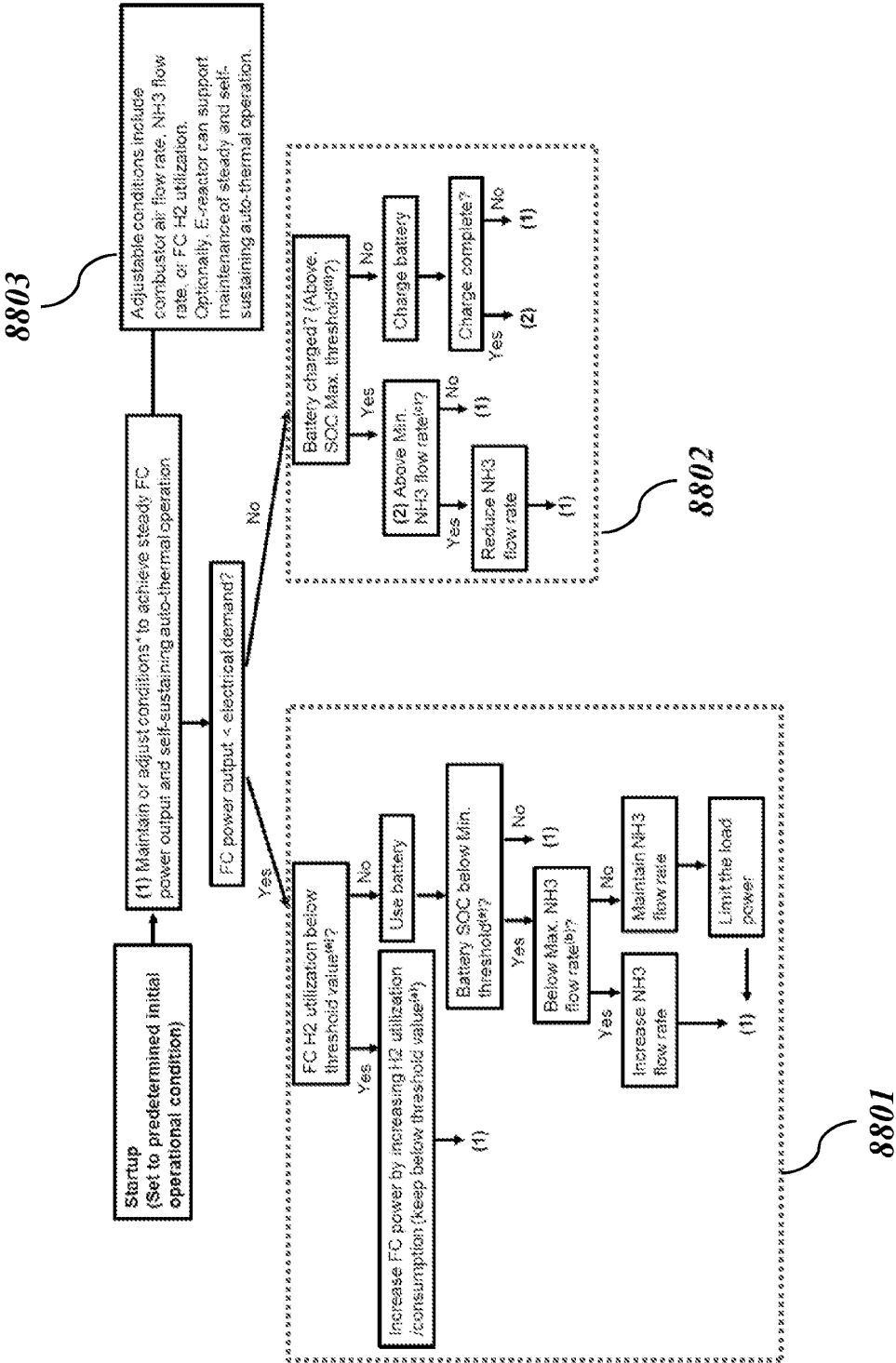


FIG. 88