

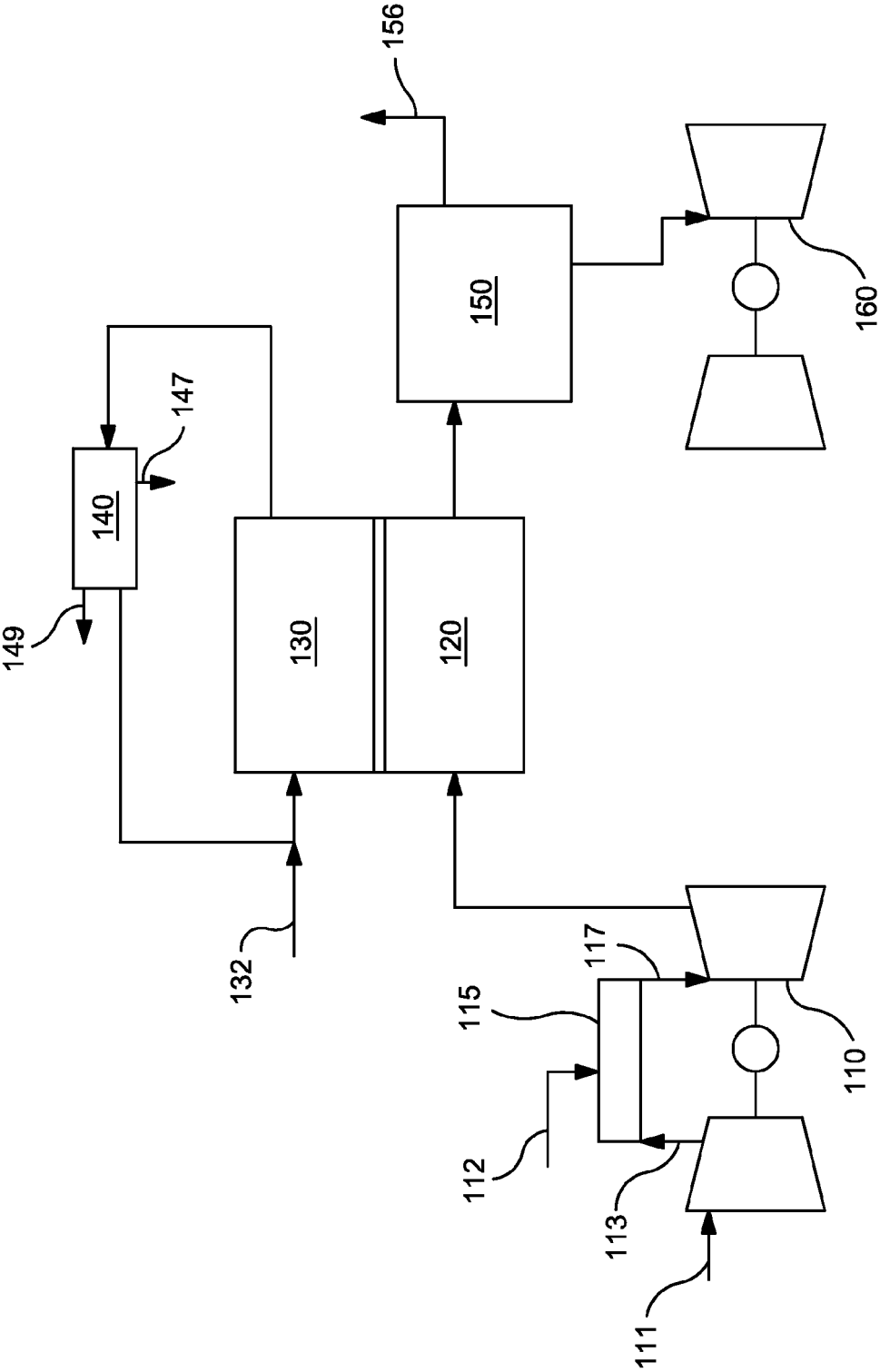


FIG. 1

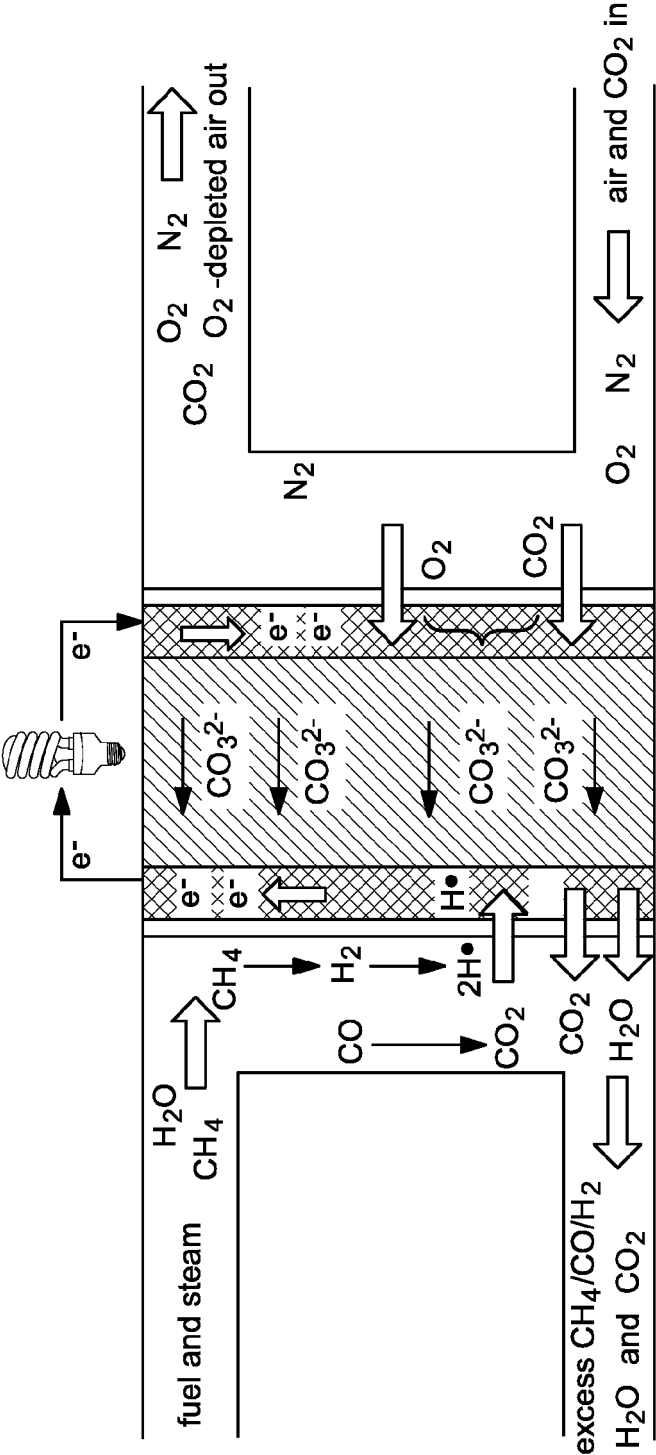


FIG. 2

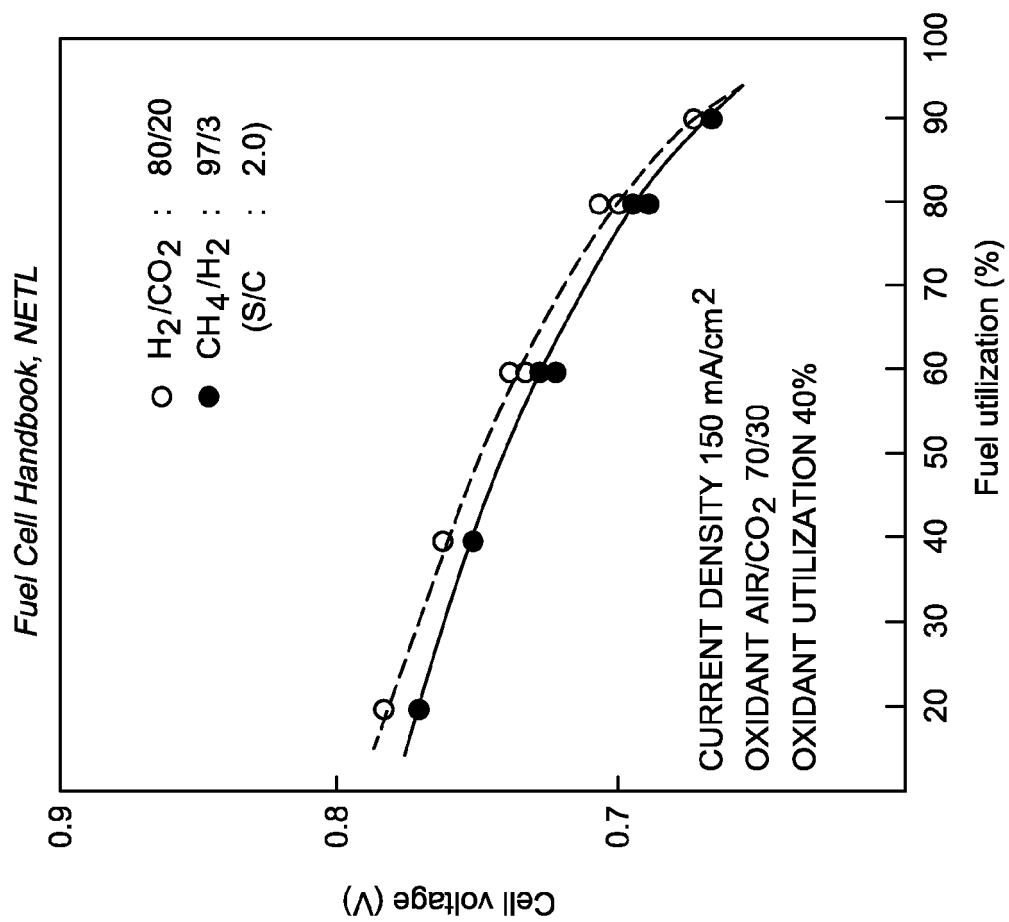


FIG. 3

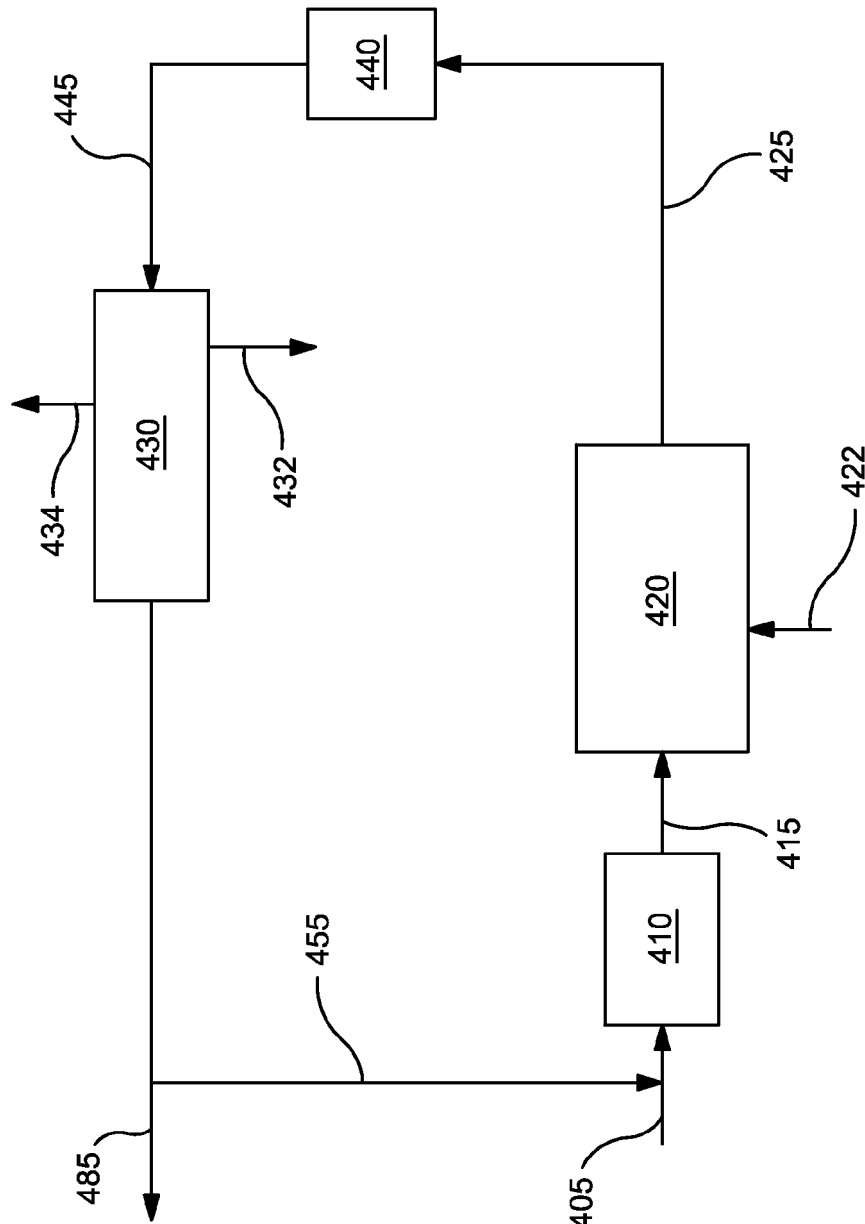


FIG. 4

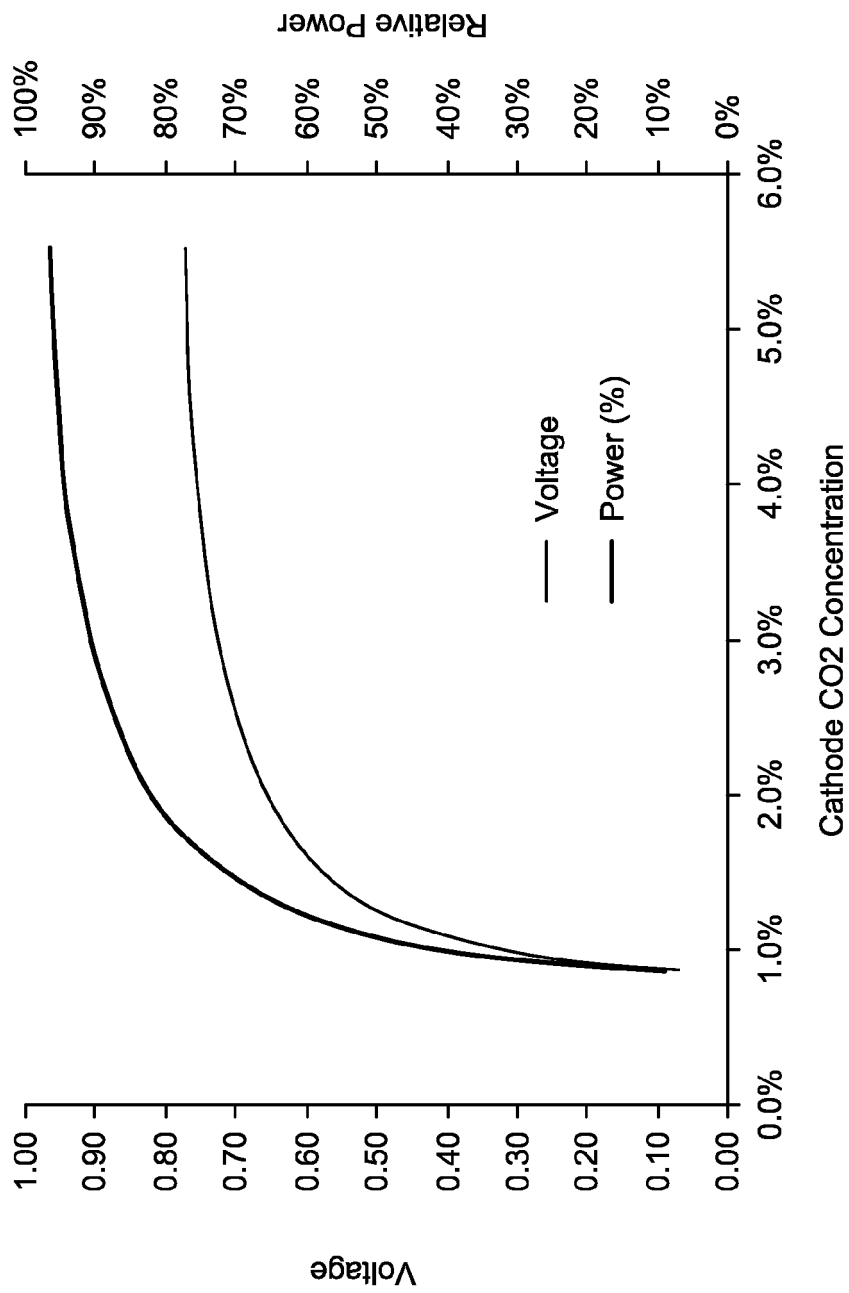


FIG. 5

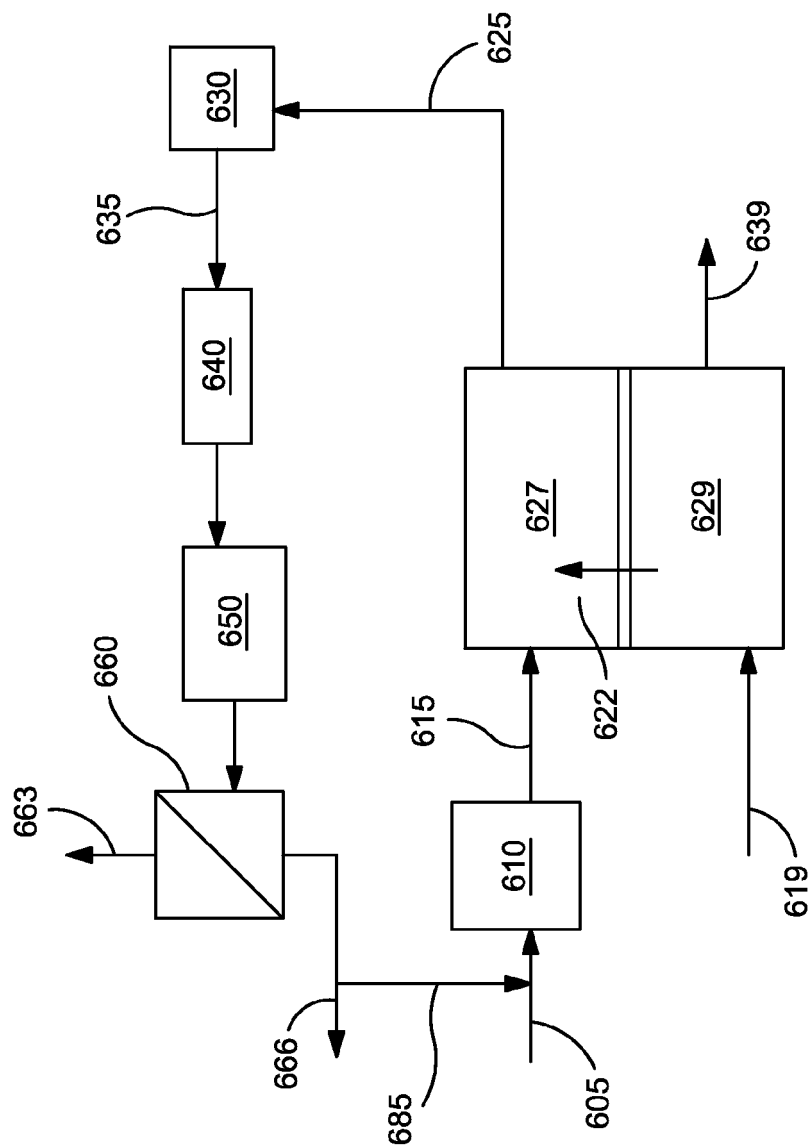


FIG. 6

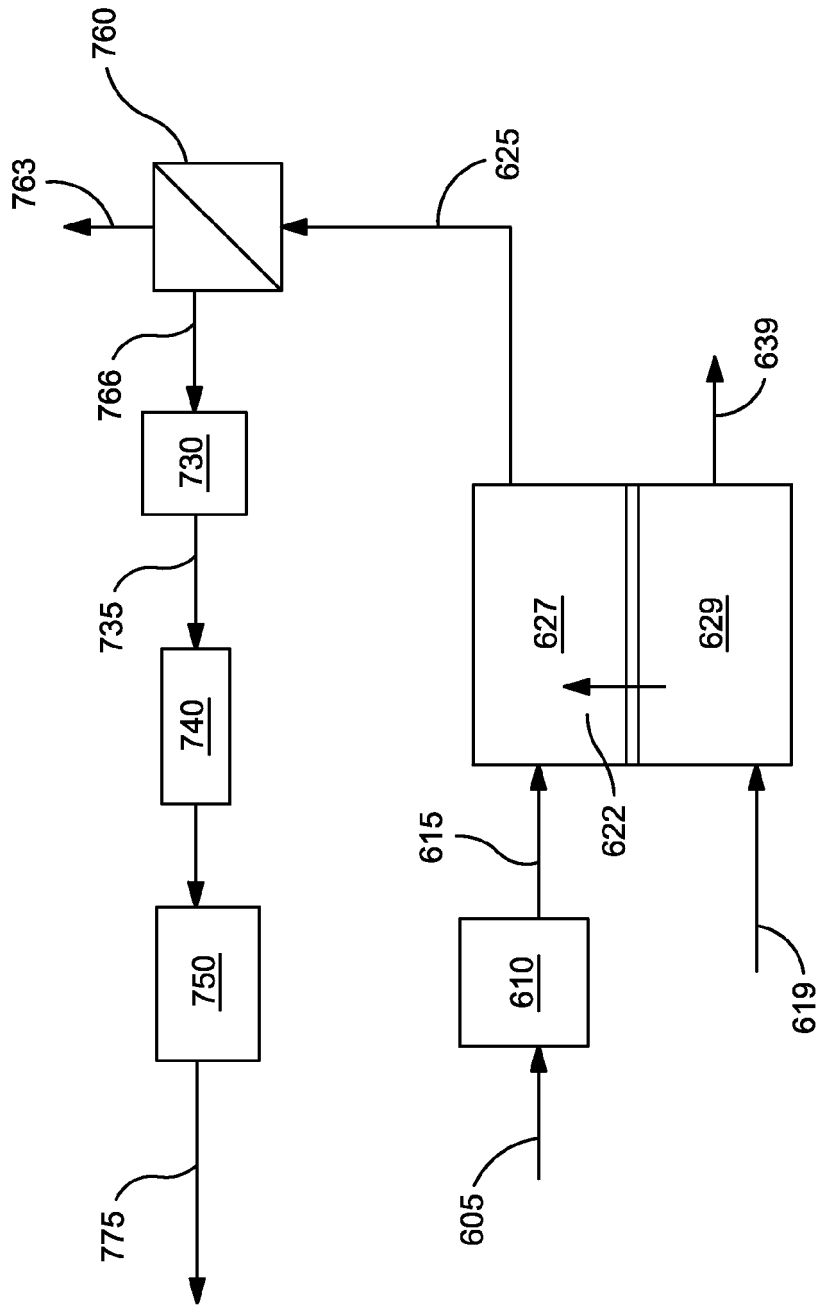
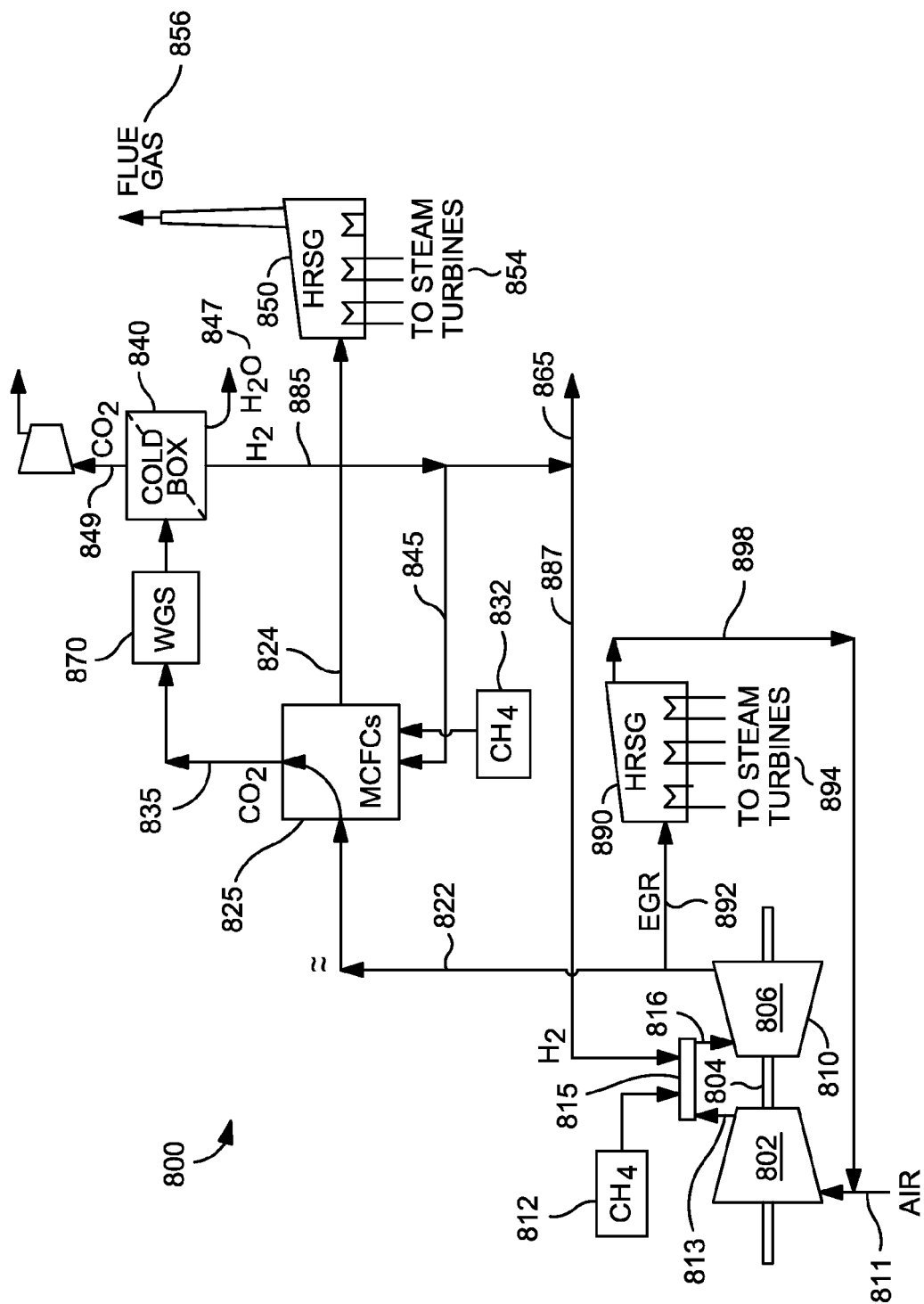


FIG. 7

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**FIG. 8**

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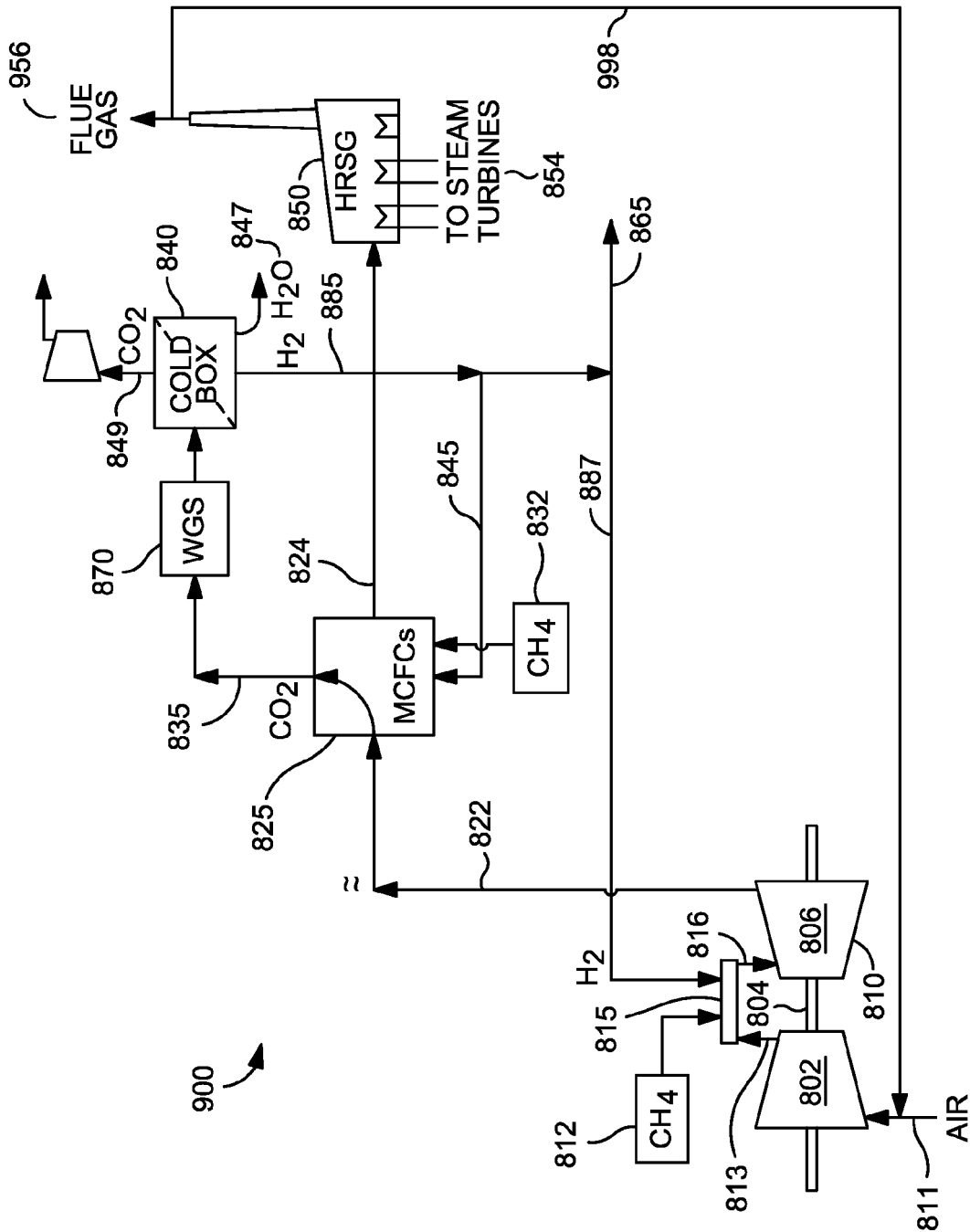


FIG. 9

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|                                                                               | 1a<br>(comparative) | 2a    | 2b    | 2c   | 2d    | 2e    |
|-------------------------------------------------------------------------------|---------------------|-------|-------|------|-------|-------|
| MCFC CO <sub>2</sub> Exhaust Conc. (%)                                        | 1.45                | 1.45  | 1.45  | 1.45 | 1.45  | 1.45  |
| MCFC O <sub>2</sub> Exhaust Conc. (%)                                         | 3.0                 | 4.7   | 4.7   | 4.7  | 4.7   | 4.7   |
| MCFC voltage (V)                                                              | 0.7                 | 0.7   | 0.7   | 0.7  | 0.7   | 0.7   |
| MCFC Current Density (A/m <sup>2</sup> )                                      | 1075                | 1160  | 1230  | 1255 | 1650  | 1550  |
| MCFC Area (k-m <sup>2</sup> )                                                 | 208                 | 161   | 152   | 149  | 113   | 120   |
| CO <sub>2</sub> Capture (%)                                                   | 85.2                | 83.7  | 83.8  | 83.8 | 83.9  | 83.9  |
| CO <sub>2</sub> Capture (Mtons / year)                                        | 2.05                | 1.84  | 1.84  | 1.84 | 1.84  | 1.85  |
| Area / Tons captured (k-m <sup>2</sup> *year / Mtons)                         | 101.4               | 87.5  | 82.4  | 80.8 | 61.3  | 65    |
| CO <sub>2</sub> emissions (from cathode exhaust, lbs CO <sub>2</sub> / MW/hr) | 111                 | 123   | 123   | 122  | 123   | 124   |
| Ratio H <sub>2</sub> :C (molar) in anode feed                                 | 0                   | 0.55  | 1.22  | 1.22 | 3.85  | 3.85  |
| N <sub>2</sub> in anode feed %                                                | 1                   | 9     | 8.9   | 14.8 | 14.5  | 18.9  |
| Anode steam penalty (MW)                                                      | -10.9               | -7    | -7    | -0.4 | -7    | -0.4  |
| Cryogenic separation penalty (MW)                                             | -18.9               | -16.6 | -13.5 | -8   | -17.7 | -12.2 |
| % turbine fuel that is H <sub>2</sub> or CO                                   | 0                   | 0     | 0     | 0    | 0     | 0     |
| Total net power (MW)                                                          | 724                 | 661   | 664   | 676  | 660   | 672   |
| Electrical efficiency (%)                                                     | 58.9                | 58.9  | 59.1  | 60.2 | 58.9  | 59.8  |
|                                                                               |                     |       |       |      |       |       |
|                                                                               |                     |       |       |      |       |       |
|                                                                               |                     |       |       |      |       |       |
|                                                                               |                     |       |       |      |       |       |
|                                                                               |                     |       |       |      |       |       |

FIG. 10

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|                                                                                            | 1b<br>(comparative) | 3a    | 3b    | 3d    | 4d    | 4e   |
|--------------------------------------------------------------------------------------------|---------------------|-------|-------|-------|-------|------|
| MCFC CO <sub>2</sub> Exhaust Conc. (%)                                                     | 1.45                | 1.45  | 1.45  | 1.45  | 1.45  | 1.45 |
| MCFC O <sub>2</sub> Exhaust Conc. (%)                                                      | 3.6                 | 3.8   | 4.8   | 5.2   | 5.0   | 5.0  |
| MCFC voltage (V)                                                                           | 0.7                 | 0.7   | 0.7   | 0.7   | 0.7   | 0.7  |
| MCFC Current Density (A/m <sup>2</sup> )                                                   | 1015                | 1085  | 1020  | 1120  | 1350  | 1470 |
| MCFC Area (k-m <sup>2</sup> )                                                              | 190                 | 186   | 173   | 132   | 122   | 112  |
| CO <sub>2</sub> Capture (%)                                                                | 83.7                | 84.6  | 83.5  | 82.8  | 83.3  | 83.3 |
| CO <sub>2</sub> Capture (Mtons / year)                                                     | 1.95                | 1.85  | 1.80  | 1.70  | 1.77  | 1.77 |
| Area / Tons captured (k-m <sup>2</sup> *year / Mtons)                                      | 97.6                | 100.3 | 96.1  | 77.4  | 68.9  | 63.4 |
| CO <sub>2</sub> emissions (from cathode exhaust, lbs CO <sub>2</sub> / MWh <sub>hr</sub> ) | 117                 | 114   | 124   | 128   | 126   | 126  |
| Ratio H <sub>2</sub> :C (molar) in anode feed                                              | 0                   | 0     | 0     | 0     | 1.29  | 1.29 |
| N <sub>2</sub> in anode feed %                                                             | 1                   | 1     | 1     | 1     | 1.4   | 2.4  |
| Anode steam penalty (MW)                                                                   | -9.4                | -9.9  | -8.6  | -10.9 | -9.2  | -0.5 |
| Cryogenic separation penalty (MW)                                                          | -12.1               | -17.1 | -11.1 | -10.1 | -11.3 | -4.2 |
| % turbine fuel that is H <sub>2</sub> or CO                                                | 0                   | 8.8   | 7.1   | 19.0  | 10.6  | 10.6 |
| Total net power (MW)                                                                       | 702                 | 668   | 658   | 638   | 650   | 665  |
| Electrical efficiency (%)                                                                  | 59.1                | 59.7  | 59.8  | 60.7  | 59.9  | 61.4 |
|                                                                                            |                     |       |       |       |       |      |
|                                                                                            |                     |       |       |       |       |      |
|                                                                                            |                     |       |       |       |       |      |
|                                                                                            |                     |       |       |       |       |      |
|                                                                                            |                     |       |       |       |       |      |

FIG. 11

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|                                                                                           | 4d    | 4e   | 4f   | 5d    | 5e   | 5f   |
|-------------------------------------------------------------------------------------------|-------|------|------|-------|------|------|
| MCFC CO <sub>2</sub> Exhaust Conc. (%)                                                    | 1.45  | 1.45 | 1.45 | 1.45  | 1.45 | 1.45 |
| MCFC O <sub>2</sub> Exhaust Conc. (%)                                                     | 5.0   | 5.0  | 5.3  | 2.0   | 2.0  | 2.5  |
| MCFC voltage (V)                                                                          | 0.7   | 0.7  | 0.7  | 0.7   | 0.7  | 0.7  |
| MCFC Current Density (A/m <sup>2</sup> )                                                  | 1350  | 1470 | 1685 | 1340  | 1470 | 1710 |
| MCFC Area (k-m <sup>2</sup> )                                                             | 122   | 112  | 86   | 128   | 117  | 88   |
| CO <sub>2</sub> Capture (%)                                                               | 83.3  | 83.3 | 82.7 | 86.2  | 86.2 | 85.7 |
| CO <sub>2</sub> Capture (Mtons / year)                                                    | 1.77  | 1.77 | 1.70 | 1.84  | 1.84 | 1.77 |
| Area / Tons captured (k-m <sup>2</sup> *year / Mtons)                                     | 68.9  | 63.4 | 50.6 | 69.5  | 63.6 | 49.8 |
| CO <sub>2</sub> emissions (from cathode exhaust, lbs CO <sub>2</sub> / MW <sub>hr</sub> ) | 126   | 126  | 126  | 103   | 102  | 104  |
| Ratio H <sub>2</sub> :C (molar) in anode feed                                             | 1.29  | 1.29 | 1.99 | 1.29  | 1.29 | 1.99 |
| N <sub>2</sub> in anode feed %                                                            | 1.4   | 2.4  | 1.9  | 1.4   | 2.4  | 1.9  |
| Anode steam penalty (MW)                                                                  | -9.2  | -0.5 | -0.5 | -9.5  | -0.5 | -0.6 |
| Cryogenic separation penalty (MW)                                                         | -11.3 | -4.2 | -2.6 | -11.8 | -4.3 | -2.7 |
| % turbine fuel that is H <sub>2</sub> or CO                                               | 10.6  | 10.6 | 19.2 | 11.0  | 11.0 | 20.0 |
| Total net power (MW)                                                                      | 650   | 665  | 654  | 653   | 669  | 657  |
| Electrical efficiency (%)                                                                 | 59.9  | 61.4 | 62.4 | 59.9  | 61.4 | 62.4 |
|                                                                                           |       |      |      |       |      |      |
|                                                                                           |       |      |      |       |      |      |
|                                                                                           |       |      |      |       |      |      |
|                                                                                           |       |      |      |       |      |      |
|                                                                                           |       |      |      |       |      |      |

FIG. 12

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| Case                                                                        | BASE CASES |       |       |       | CONCEPT 1: ANODE RECYCLE ... |       |       |       |       |       |       |       |
|-----------------------------------------------------------------------------|------------|-------|-------|-------|------------------------------|-------|-------|-------|-------|-------|-------|-------|
|                                                                             | 0          | 1a    | 1b    | 1a'   | 2a                           | 2a    | 2a    | 2b    | 2b    | 2b    | 2b    | 2b    |
| Fuel Utilization (%)                                                        | 75%        | 75%   | 75%   | 75%   | 75%                          | 75%   | 75%   | 75%   | 75%   | 75%   | 75%   | 75%   |
| Steam to Carbon Ratio                                                       | 3.6        | 3.6   | 3.6   | 3.6   | 2.0                          | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   |
| Exhaust Gas Recycle (%)                                                     | 0%         | 35%   | 35%   | 35%   | 35%                          | 0%    | 0%    | 35%   | 0%    | 0%    | 0%    | 0%    |
| Water Gas Shift Reactors                                                    | No         | No    | Yes   | No    | No                           | No    | No    | Yes   | Yes   | Yes   | Yes   | Yes   |
| Internal Reforming (%)                                                      | 99%        | 99%   | 99%   | 99%   | 20%                          | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   |
| MCFC CO <sub>2</sub> Cathode Inlet Conc. (%)                                | 4.80%      | 7.36% | 6.87% | 5.31% | 6.11%                        | 4.05% | 4.05% | 6.13% | 4.07% | 4.07% | 4.07% | 4.07% |
| MCFC CO <sub>2</sub> Cathode Exhaust Conc. (%)                              | 1.5%       | 1.5%  | 1.5%  | 1.5%  | 1.5%                         | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  |
| MCFC O <sub>2</sub> Cathode Exhaust Conc. (%)                               | 10.0%      | 4.2%  | 4.5%  | 4.8%  | 5.9%                         | 10.9% | 10.9% | 5.8%  | 10.9% | 10.9% | 10.9% | 10.9% |
| MCFC Voltage (V)                                                            | 0.70       | 0.70  | 0.70  | 0.70  | 0.70                         | 0.70  | 0.65  | 0.70  | 0.70  | 0.70  | 0.65  | 0.65  |
| MCFC Current Density (A/m <sup>2</sup> )                                    | 1015       | 1007  | 1000  | 915   | 961                          | 847   | 1089  | 999   | 878   | 1120  | 1120  | 1120  |
| MCFC Area (k-m <sup>2</sup> )                                               | 184        | 215   | 197   | 236   | 174                          | 169   | 131   | 168   | 164   | 129   | 129   | 129   |
| CO <sub>2</sub> Capture (%)                                                 | 72.5%      | 83.2% | 82.6% | 82.6% | 71.0%                        | 60.7% | 60.5% | 81.2% | 70.2% | 70.1% | 70.1% | 70.1% |
| CO <sub>2</sub> Capture (Mtons/year)                                        | 1.62       | 1.88  | 1.84  | 1.88  | 1.64                         | 1.41  | 1.40  | 1.67  | 1.43  | 1.43  | 1.43  | 1.43  |
| Area/Tons captured (k-m <sup>2</sup> *year/Mtons)                           | 113.9      | 114.2 | 107.6 | 126.0 | 106.0                        | 119.9 | 93.6  | 101.1 | 114.9 | 90.1  | 90.1  | 90.1  |
| CO <sub>2</sub> emissions (from cathode exhaust, lbs CO <sub>2</sub> /MWhr) | 212.0      | 145.7 | 147.5 | 134.8 | 141.9                        | 217.9 | 218.8 | 143.4 | 217.5 | 218.7 | 218.7 | 218.7 |
| Ratio H <sub>2</sub> :Reformable C (molar) in anode feed                    | 0.00       | 0.00  | 0.00  | 0.00  | 0.80                         | 0.81  | 0.80  | 1.30  | 1.30  | 1.30  | 1.30  | 1.30  |
| N <sub>2</sub> in anode feed (%)                                            | 0%         | 0%    | 0%    | 0%    | 0%                           | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    |
| Anode steam penalty (MW)                                                    | 10.4       | 12.0  | 11.0  | 12.0  | 4.0                          | 3.4   | 3.4   | 3.9   | 3.4   | 3.4   | 3.4   | 3.4   |
| % turbine fuel that is H <sub>2</sub> or CO (LHV basis)                     | 0.0%       | 0.0%  | 0.0%  | 0.0%  | 0.0%                         | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  |
| Total net power (MW)                                                        | 679        | 611   | 609   | 688   | 630                          | 654   | 652   | 624   | 651   | 648   | 648   | 648   |
| Electrical efficiency (%)                                                   | 57.6%      | 51.2% | 52.1% | 57.3% | 58.6%                        | 61.3% | 61.1% | 57.9% | 60.8% | 60.5% | 60.5% | 60.5% |

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1304 1306 1308 1309 1310 1312 1314 1316 1318 1320

FIG. 13

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| ... CONCEPT 1: ANODE RECYCLE |       |       |       |       |       |       |       |       |       |       |       |       |       | EGR   |       |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 2c                           | 2c    | 2c    | 2d    | 2d    | 2d    | 2d    | 2e    | 2e    | 2e    | 2e    | 2e    | 2e    | 2g    | 2g    |       |
| 75%                          | 75%   | 75%   | 50%   | 50%   | 50%   | 50%   | 50%   | 50%   | 50%   | 50%   | 50%   | 50%   | 30%   | 30%   | 50%   |
| 0.0                          | 0.0   | 0.0   | 2.0   | 2.0   | 2.0   | 2.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 2.0   | 2.0   | 2.0   |
| 35%                          | 35%   | 0%    | 35%   | 35%   | 0%    | 0%    | 35%   | 35%   | 0%    | 0%    | 0%    | 0%    | 35%   | 35%   | 35%   |
| Yes                          | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| 0%                           | 0%    | 0%    | 20%   | 20%   | 20%   | 20%   | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 20%   | 20%   | 20%   |
| 6.13%                        | 6.13% | 4.07% | 6.13% | 6.13% | 4.07% | 4.07% | 6.13% | 6.13% | 4.07% | 4.07% | 4.07% | 6.53% | 6.47% | 6.47% | 4.48% |
| 1.5%                         | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  |
| 5.8%                         | 5.8%  | 10.9% | 5.8%  | 5.8%  | 10.9% | 10.9% | 5.8%  | 5.8%  | 10.9% | 10.9% | 10.9% | 4.8%  | 4.9%  | 4.9%  | 6.2%  |
| 0.70                         | 0.65  | 0.70  | 0.65  | 0.70  | 0.65  | 0.70  | 0.65  | 0.70  | 0.65  | 0.70  | 0.65  | 0.70  | 0.65  | 0.65  | 0.70  |
| 1045                         | 1329  | 919   | 1147  | 1093  | 1376  | 984   | 1218  | 1138  | 1414  | 1020  | 1246  | 1318  | 1603  | 938   | 938   |
| 161                          | 126   | 157   | 126   | 154   | 122   | 147   | 118   | 148   | 119   | 141   | 115   | 140   | 114   | 179   | 179   |
| 81.1%                        | 81.1% | 70.2% | 70.1% | 81.3% | 81.3% | 70.1% | 70.0% | 80.9% | 81.1% | 69.8% | 69.8% | 82.6% | 82.6% | 80.7% | 80.7% |
| 1.66                         | 1.66  | 1.43  | 1.67  | 1.67  | 1.67  | 1.43  | 1.43  | 1.66  | 1.66  | 1.42  | 1.42  | 1.82  | 1.80  | 1.66  | 1.66  |
| 96.6                         | 76.0  | 109.6 | 88.0  | 92.5  | 73.4  | 102.7 | 82.9  | 89.0  | 71.6  | 99.1  | 81.2  | 77.0  | 63.3  | 107.7 | 107.7 |
| 142.5                        | 143.5 | 223.7 | 225.5 | 146.0 | 146.5 | 230.6 | 231.7 | 147.0 | 146.6 | 213.2 | 232.3 | 144.0 | 145.0 | 149.4 | 149.4 |
| 1.28                         | 1.28  | 1.28  | 3.80  | 3.80  | 3.80  | 3.80  | 3.80  | 3.62  | 3.64  | 3.64  | 3.64  | 8.58  | 8.59  | 3.78  | 3.78  |
| 0%                           | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    |
| 0.0                          | 0.0   | 0.0   | 3.9   | 3.9   | 3.9   | 3.4   | 3.4   | 0.0   | 0.0   | 0.0   | 0.0   | 4.3   | 4.2   | 3.9   | 3.9   |
| 0.0%                         | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  |
| 630                          | 627   | 633   | 630   | 611   | 607   | 617   | 614   | 615   | 612   | 621   | 617   | 617   | 609   | 618   | 618   |
| 58.5%                        | 58.2% | 59.1% | 58.8% | 56.7% | 56.4% | 57.6% | 57.3% | 57.1% | 56.8% | 58.0% | 57.6% | 53.3% | 53.1% | 57.1% | 57.1% |
| 1322                         | 1324  | 1326  | 1328  | 1330  | 1332  | 1334  | 1336  | 1338  | 1340  | 1342  | 1344  | 1346  | 1348  | 1350  | 1350  |

**FIG. 13**  
CONTINUED

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| Case                                                                        | BASE CASES |       |       |  | CONCEPT 2: RECYCLE |       |       |       |       |       |       |       |
|-----------------------------------------------------------------------------|------------|-------|-------|--|--------------------|-------|-------|-------|-------|-------|-------|-------|
|                                                                             | 0          | 1a    | 1b    |  | 3a                 | 3a    | 3a    | 3a    | 3a    | 3a    | 3a    | 3a    |
| Fuel Utilization (%)                                                        | 75%        | 75%   | 75%   |  | 75%                | 75%   | 75%   | 75%   | 75%   | 75%   | 75%   | 75%   |
| Steam to Carbon Ratio                                                       | 3.6        | 3.6   | 3.6   |  | 2.0                | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   |
| Exhaust Gas Recycle (%)                                                     | 0%         | 35%   | 35%   |  | 35%                | 35%   | 35%   | 35%   | 35%   | 35%   | 35%   | 35%   |
| Water Gas Shift Reactors                                                    | No         | No    | Yes   |  | No                 | No    | No    | No    | No    | No    | No    | No    |
| Internal Reforming (%)                                                      | 99%        | 99%   | 99%   |  | 99%                | 99%   | 99%   | 99%   | 99%   | 99%   | 99%   | 99%   |
| MCFC CO <sub>2</sub> Cathode Inlet Conc. (%)                                | 4.80%      | 7.36% | 6.87% |  | 5.87%              | 5.87% | 5.87% | 5.87% | 5.87% | 5.87% | 5.87% | 5.87% |
| MCFC CO <sub>2</sub> Cathode Exhaust Conc. (%)                              | 1.5%       | 1.5%  | 1.5%  |  | 1.5%               | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  |
| MCFC O <sub>2</sub> Cathode Exhaust Conc. (%)                               | 10.0%      | 4.2%  | 4.5%  |  | 6.1%               | 6.1%  | 6.1%  | 6.1%  | 6.1%  | 6.1%  | 6.1%  | 6.1%  |
| MCFC Voltage (V)                                                            | 0.70       | 0.70  | 0.70  |  | 0.70               | 0.70  | 0.70  | 0.70  | 0.70  | 0.70  | 0.70  | 0.70  |
| MCFC Current Density (A/m <sup>2</sup> )                                    | 1015       | 1007  | 1000  |  | 889                | 889   | 889   | 889   | 889   | 889   | 889   | 889   |
| MCFC Area (k-m <sup>2</sup> )                                               | 184        | 215   | 197   |  | 179                | 179   | 179   | 179   | 179   | 179   | 179   | 179   |
| CO <sub>2</sub> Capture (%)                                                 | 72.5%      | 83.2% | 82.6% |  | 80.9%              | 80.9% | 80.9% | 80.9% | 80.9% | 80.9% | 80.9% | 80.9% |
| CO <sub>2</sub> Capture (Mtons/year)                                        | 1.62       | 1.88  | 1.84  |  | 1.54               | 1.54  | 1.54  | 1.54  | 1.54  | 1.54  | 1.54  | 1.54  |
| Area/Tons captured (k-m <sup>2</sup> *year/Mtons)                           | 113.9      | 114.2 | 107.6 |  | 116.3              | 116.3 | 116.3 | 116.3 | 116.3 | 116.3 | 116.3 | 116.3 |
| CO <sub>2</sub> emissions (from cathode exhaust, lbs CO <sub>2</sub> /MWhr) | 212.0      | 145.7 | 147.5 |  | 150.4              | 150.4 | 150.4 | 150.4 | 150.4 | 150.4 | 150.4 | 150.4 |
| Ratio H <sub>2</sub> :Reformable C (molar) in anode feed                    | 0.00       | 0.00  | 0.00  |  | 0.00               | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| N <sub>2</sub> in anode feed (%)                                            | 0%         | 0%    | 0%    |  | 0%                 | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    |
| Anode steam penalty (MW)                                                    | 10.4       | 12.0  | 11.0  |  | 5.0                | 5.0   | 5.0   | 5.0   | 5.0   | 5.0   | 5.0   | 5.0   |
| % turbine fuel that is H <sub>2</sub> or CO (LHV basis)                     | 0.0%       | 0.0%  | 0.0%  |  | 0.0%               | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  | 0.0%  |
| Total net power (MW)                                                        | 679        | 611   | 609   |  | 599                | 599   | 599   | 599   | 599   | 599   | 599   | 599   |
| Electrical efficiency (%)                                                   | 57.6%      | 51.2% | 52.1% |  | 55.5%              | 55.5% | 55.5% | 55.5% | 55.5% | 55.5% | 55.5% | 55.5% |

FIG. 14

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| CONCEPT 2: RECYCLE TO CTG |       |       |       |       |       |       |       |       |       |       |       |       | EGR   |
|---------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 3b                        | 3b    | 3b    | 3b    | 3d    | 3d    | 3d    | 3d    | 3d    | 3d    | 3d    | 3d    | 3g    |       |
| 75%                       | 75%   | 75%   | 75%   | 50%   | 50%   | 50%   | 50%   | 50%   | 50%   | 50%   | 50%   | 30%   | 50%   |
| 2.0                       | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   |
| 35%                       | 35%   | 0%    | 0%    | 35%   | 35%   | 35%   | 0%    | 0%    | 0%    | 0%    | 35%   | 35%   | 35%   |
| Yes                       | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| 20%                       | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   |
| 5.72%                     | 5.72% | 3.83% | 3.83% | 5.12% | 5.12% | 5.12% | 3.50% | 3.50% | 3.50% | 4.53% | 4.53% | 3.83% | 3.83% |
| 1.5%                      | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  |
| 6.2%                      | 6.2%  | 11.1% | 11.1% | 6.6%  | 6.6%  | 6.6%  | 11.2% | 11.2% | 11.2% | 6.5%  | 6.5%  | 6.9%  | 6.9%  |
| 0.70                      | 0.65  | 0.70  | 0.65  | 0.70  | 0.65  | 0.65  | 0.70  | 0.65  | 0.65  | 0.70  | 0.65  | 0.70  | 0.70  |
| 878                       | 1161  | 784   | 1018  | 916   | 1164  | 846   | 1053  | 1050  | 800   | 1050  | 1050  | 800   | 800   |
| 175                       | 132   | 167   | 128   | 144   | 113   | 133   | 107   | 106   | 165   | 106   | 106   | 165   | 165   |
| 80.7%                     | 80.7% | 69.0% | 69.0% | 80.0% | 79.5% | 68.5% | 68.5% | 80.2% | 79.8% | 80.2% | 80.2% | 79.8% | 79.8% |
| 1.62                      | 1.62  | 1.38  | 1.38  | 1.55  | 1.54  | 1.32  | 1.32  | 1.57  | 1.55  | 1.32  | 1.57  | 1.55  | 1.55  |
| 108.0                     | 81.7  | 121.0 | 93.2  | 93.1  | 73.5  | 100.8 | 80.8  | 67.8  | 106.3 | 67.8  | 67.8  | 106.3 | 106.3 |
| 147.8                     | 148.6 | 234.9 | 235.8 | 160.2 | 162.5 | 247.2 | 248.2 | 186.1 | 165.0 | 186.1 | 186.1 | 165.0 | 165.0 |
| 0.00                      | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| 0%                        | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    |
| 4.8                       | 4.8   | 4.1   | 4.1   | 6.2   | 6.1   | 5.3   | 5.3   | 8.7   | 6.2   | 5.3   | 8.7   | 6.2   | 6.2   |
| 6.6%                      | 6.6%  | 5.5%  | 5.5%  | 16.4% | 16.5% | 13.9% | 13.9% | 32.1% | 16.5% | 32.1% | 32.1% | 16.5% | 16.5% |
| 610                       | 607   | 613   | 610   | 571   | 570   | 581   | 580   | 501   | 568   | 580   | 501   | 568   | 568   |
| 57.7%                     | 57.4% | 58.3% | 58.1% | 55.4% | 55.4% | 56.5% | 56.4% | 47.2% | 54.8% | 47.2% | 47.2% | 54.8% | 54.8% |
| 1418                      | 1420  | 1422  | 1424  | 1426  | 1428  | 1430  | 1432  | 1434  | 1436  | 1432  | 1434  | 1436  | 1436  |

**FIG. 14**  
CONTINUED

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| Case                                                                        | BASE CASES |       |       |  | CONCEPT 4B: HIGH INERTS CASES ... |       |       |       |       |       |       |       |       |       |
|-----------------------------------------------------------------------------|------------|-------|-------|--|-----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                                                             | 0          | 1a    | 1b    |  | 4d                                | 4d    | 4d    | 4d    | 4d    | 4d    | 4d    | 4d    | 4d    | 4d    |
| Fuel Utilization (%)                                                        | 75%        | 75%   | 75%   |  | 50%                               | 50%   | 50%   | 50%   | 50%   | 50%   | 50%   | 50%   | 50%   | 50%   |
| Steam to Carbon Ratio                                                       | 3.6        | 3.6   | 3.6   |  | 2.0                               | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   | 2.0   |
| Exhaust Gas Recycle (%)                                                     | 0%         | 35%   | 35%   |  | 35%                               | 35%   | 35%   | 35%   | 35%   | 35%   | 35%   | 35%   | 35%   | 45%   |
| Water Gas Shift Reactors                                                    | No         | No    | Yes   |  | Yes                               | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| Internal Reforming (%)                                                      | 99%        | 99%   | 99%   |  | 20%                               | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   | 20%   |
| MCFC CO <sub>2</sub> Cathode Inlet Conc. (%)                                | 4.80%      | 7.36% | 6.87% |  | 5.56%                             | 5.56% | 5.56% | 5.56% | 5.56% | 5.56% | 5.56% | 5.56% | 5.56% | 6.50% |
| MCFC CO <sub>2</sub> Cathode Exhaust Conc. (%)                              | 1.5%       | 1.5%  | 1.5%  |  | 1.5%                              | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  |
| MCFC O <sub>2</sub> Cathode Exhaust Conc. (%)                               | 10.0%      | 4.2%  | 4.5%  |  | 6.3%                              | 6.3%  | 6.3%  | 6.3%  | 6.3%  | 6.3%  | 6.3%  | 6.3%  | 6.3%  | 3.8%  |
| MCFC Voltage (V)                                                            | 0.70       | 0.70  | 0.70  |  | 0.70                              | 0.70  | 0.70  | 0.70  | 0.70  | 0.70  | 0.70  | 0.70  | 0.70  | 0.70  |
| MCFC Current Density (A/m <sup>2</sup> )                                    | 1015       | 1007  | 1000  |  | 1096                              | 1364  | 1364  | 1364  | 1364  | 1364  | 1364  | 1364  | 1364  | 1080  |
| MCFC Area (k-m <sup>2</sup> )                                               | 184        | 215   | 197   |  | 135                               | 108   | 108   | 128   | 128   | 104   | 104   | 142   | 142   | 142   |
| CO <sub>2</sub> Capture (%)                                                 | 72.5%      | 83.2% | 82.6% |  | 80.5%                             | 80.4% | 80.4% | 69.7% | 69.7% | 69.2% | 69.2% | 83.9% | 83.9% | 83.9% |
| CO <sub>2</sub> Capture (Mtons/year)                                        | 1.62       | 1.88  | 1.84  |  | 1.60                              | 1.60  | 1.60  | 1.38  | 1.38  | 1.37  | 1.37  | 1.66  | 1.66  | 1.66  |
| Area/Tons captured (k-m <sup>2</sup> *year/Mtons)                           | 113.9      | 114.2 | 107.6 |  | 84.1                              | 67.7  | 67.7  | 92.8  | 92.8  | 76.1  | 76.1  | 85.3  | 85.3  | 85.3  |
| CO <sub>2</sub> emissions (from cathode exhaust, lbs CO <sub>2</sub> /MWhr) | 212.0      | 145.7 | 147.5 |  | 154.7                             | 156.3 | 156.3 | 229.6 | 229.6 | 233.3 | 233.3 | 128.6 | 128.6 | 128.6 |
| Ratio H <sub>2</sub> :Reformable C (molar) in anode feed                    | 0.00       | 0.00  | 0.00  |  | 1.18                              | 1.19  | 1.19  | 1.20  | 1.20  | 1.19  | 1.19  | 1.18  | 1.18  | 1.18  |
| N <sub>2</sub> in anode feed (%)                                            | 0%         | 0%    | 0%    |  | 0%                                | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    |
| Anode steam penalty (MW)                                                    | 10.4       | 12.0  | 11.0  |  | 5.3                               | 5.3   | 5.3   | 4.6   | 4.6   | 4.6   | 4.6   | 5.5   | 5.5   | 5.5   |
| % turbine fuel that is H <sub>2</sub> or CO (LHV basis)                     | 0.0%       | 0.0%  | 0.0%  |  | 9.3%                              | 9.3%  | 9.3%  | 7.9%  | 7.9%  | 7.8%  | 7.8%  | 9.8%  | 9.8%  | 9.8%  |
| Total net power (MW)                                                        | 679        | 611   | 609   |  | 587                               | 584   | 584   | 618   | 618   | 616   | 616   | 580   | 580   | 580   |
| Electrical efficiency (%)                                                   | 57.6%      | 51.2% | 52.1% |  | 55.5%                             | 55.3% | 55.3% | 58.6% | 58.6% | 58.4% | 58.4% | 55.1% | 55.1% | 55.1% |

FIG. 15

| ... CONCEPT 4B: HIGH INERTS CASES |       |       |       |       |       |       |       |       |       |       |       |       | EGR   |
|-----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 4e                                | 4e    | 4e    | 4e    | 4e    | 4e    | 4f    | 4f    | 4f    | 4f    | 4f    | 4f    | 4f    |       |
| 50%                               | 50%   | 50%   | 50%   | 50%   | 50%   | 33%   | 33%   | 33%   | 33%   | 33%   | 33%   | 33%   | 50%   |
| 1.0                               | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | 2.0   |
| 35%                               | 35%   | 0%    | 0%    | 45%   | 45%   | 35%   | 35%   | 35%   | 0%    | 0%    | 0%    | 0%    | 35%   |
| Yes                               | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   | Yes   |
| 0%                                | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    |
| 5.57%                             | 5.57% | 3.76% | 3.76% | 6.51% | 6.46% | 6.47% | 6.47% | 4.99% | 4.99% | 4.99% | 4.99% | 4.99% | 4.13% |
| 1.5%                              | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  | 1.5%  |
| 6.3%                              | 6.3%  | 11.1% | 11.1% | 3.8%  | 4.8%  | 4.8%  | 4.8%  | 9.5%  | 9.5%  | 9.5%  | 9.5%  | 9.5%  | 6.6%  |
| 0.70                              | 0.65  | 0.70  | 0.65  | 0.70  | 0.70  | 0.65  | 0.65  | 0.70  | 0.65  | 0.65  | 0.65  | 0.65  | 0.70  |
| 1104                              | 1372  | 999   | 1214  | 1094  | 1362  | 1682  | 1682  | 1227  | 1509  | 1509  | 1509  | 1509  | 950   |
| 134                               | 108   | 127   | 105   | 141   | 133   | 108   | 108   | 160   | 130   | 130   | 130   | 130   | 156   |
| 80.8%                             | 80.8% | 69.3% | 69.3% | 83.9% | 82.3% | 82.2% | 82.2% | 73.1% | 73.0% | 73.0% | 73.0% | 73.0% | 79.9% |
| 1.60                              | 1.60  | 1.37  | 1.37  | 1.65  | 1.74  | 1.75  | 1.75  | 1.63  | 1.63  | 1.63  | 1.63  | 1.63  | 1.60  |
| 84.1                              | 67.7  | 93.1  | 76.6  | 85.0  | 76.0  | 61.6  | 61.6  | 97.6  | 79.7  | 79.7  | 79.7  | 79.7  | 97.2  |
| 152.8                             | 153.8 | 232.0 | 231.9 | 128.8 | 148.3 | 150.1 | 150.1 | 217.5 | 217.3 | 217.3 | 217.3 | 217.3 | 158.1 |
| 1.17                              | 1.17  | 1.17  | 1.17  | 1.17  | 1.79  | 1.81  | 1.81  | 1.80  | 1.81  | 1.81  | 1.81  | 1.81  | 1.18  |
| 0%                                | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    | 0%    |
| 2.7                               | 2.7   | 2.3   | 2.3   | 2.8   | 4.3   | 4.3   | 4.3   | 4.7   | 4.7   | 4.7   | 4.7   | 4.7   | 5.3   |
| 9.3%                              | 9.3%  | 7.7%  | 7.8%  | 9.7%  | 24.0% | 24.2% | 24.2% | 25.6% | 25.7% | 25.7% | 25.7% | 25.7% | 9.2%  |
| 589                               | 586   | 620   | 618   | 584   | 602   | 598   | 598   | 654   | 652   | 652   | 652   | 652   | 595   |
| 55.6%                             | 55.3% | 58.7% | 58.5% | 55.2% | 53.1% | 56.2% | 56.2% | 54.9% | 54.6% | 54.6% | 54.6% | 54.6% | 55.9% |
| 1520                              | 1522  | 1524  | 1526  | 1528  | 1530  | 1532  | 1532  | 1534  | 1536  | 1536  | 1536  | 1536  | 1538  |

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FIG. 15  
CONTINUED

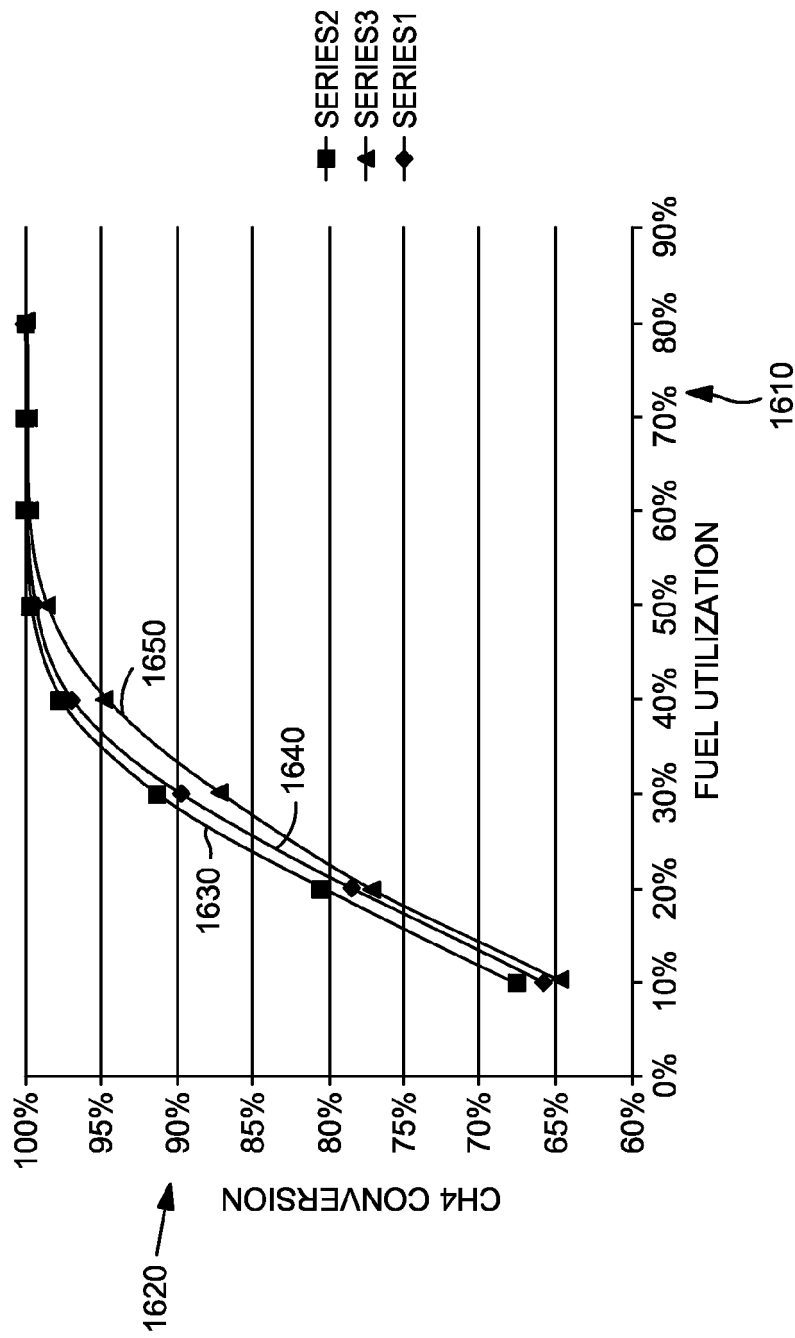


FIG. 16

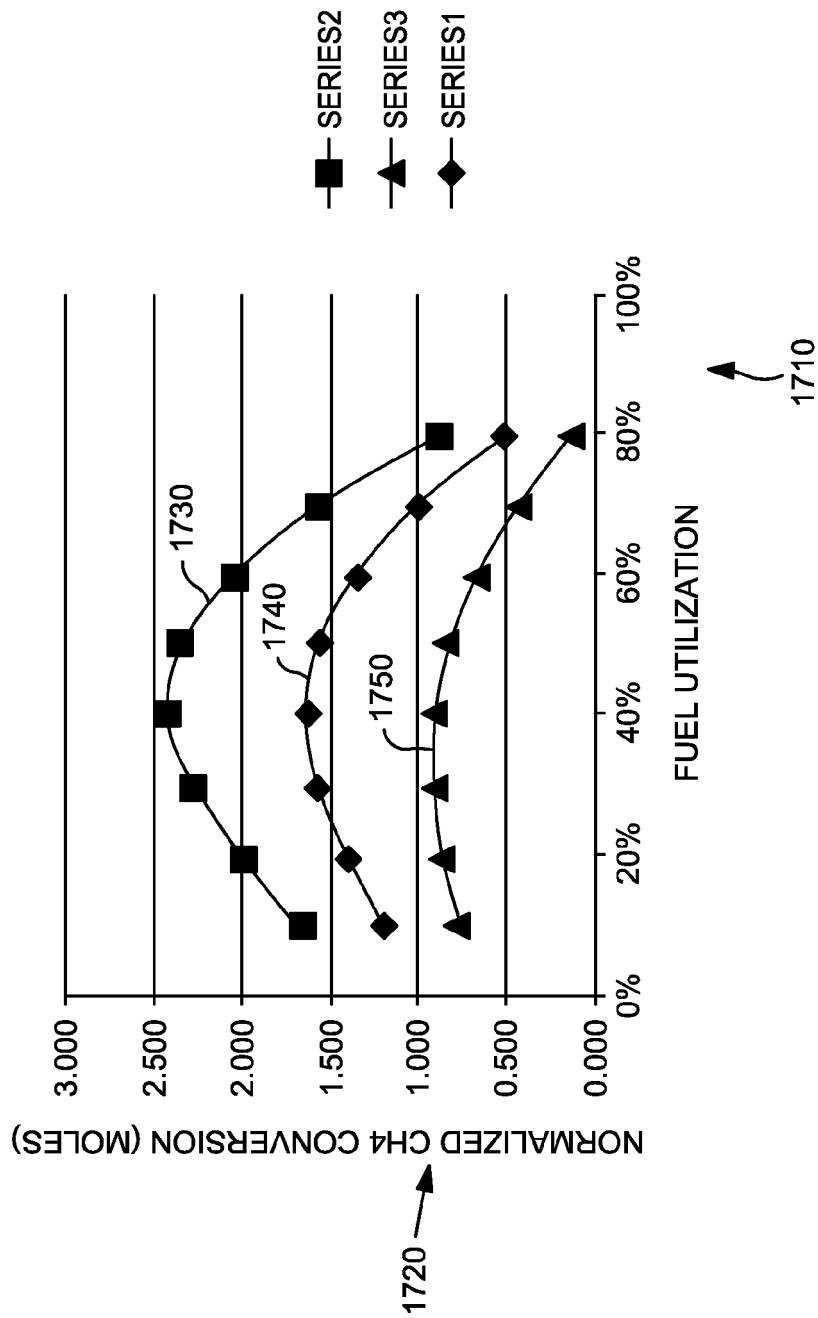


FIG. 17