Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.
STATEMENT OF THE CASE


We REVERSE.

1 Appellants identify GM Global Technology Operations LLC as the real party in interest. Appeal Br. 3.
CLAIMED SUBJECT MATTER

Claims 1 and 11 are independent. Claim 1 is reproduced below.

1. An engine control system for a vehicle, comprising:

   a flowrate module that determines a mass flowrate of exhaust gas recirculation (EGR) to an engine;
   a first mass fraction calculating module that, based on the mass flowrate of EGR, determines a first mass fraction of recirculated exhaust gas of a first gas charge for a first combustion event of the engine;
   a second mass fraction calculating module that determines a second mass fraction of recirculated exhaust gas of a second gas charge for a second combustion event of the engine based on an average of the first mass fraction and one or more other values of the first mass fraction determined for other combustion events, respectively; and
   an actuator control module that selectively adjusts an engine operating parameter based on the second mass fraction.

REJECTION


ANALYSIS

The Examiner finds that Bowyer discloses an engine control system and method as recited in independent claims 1 and 11 having a first mass fraction calculating module that determines a first mass fraction of exhaust gas recirculation (EGR) based on the EGR mass flowrate (citing paras. 69–71, equations 1–12, Fig. 7) and a second mass fraction calculating module that determines a second mass fraction of EGR based on the average of the first mass fraction and one or more other values of the first mass fraction for other combustion events (citing paras. 48, 89–97, equations 1–12, Fig. 7), and actuator control module 302, 711. Final Act. 2–3.
Appellants argue that Bowyer calculates a mass \textit{flow rate} of EGR as \text{MEGR}_{\text{MEAS}} and \text{MEGR}_1 but does not calculate a mass \textit{fraction} of EGR as recited in claim 1 and 11. Appeal Br. 7–8; Reply Br. 2–3. Appellants argue that Bowyer teaches a \textit{target} EGR fraction of 10%, but Bowyer does not disclose that the target EGR fraction of 10% is determined based on EGR mass flowrate as claimed. Appeal Br. 8; Reply Br. 3. Appellants also argue that Bowyer does not determine a second mass fraction of EGR based on an average of the first mass fraction of EGR and other EGR first mass fraction value(s) for other combustion events. \textit{Id.} at 9. We agree.

The Examiner has not established by a preponderance of evidence that Bowyer discloses first and second mass fraction calculation modules that determine first and second mass fractions of EGR based on a mass flowrate of EGR or the steps of determining these values recited in claims 1 and 11. We appreciate that Bowyer discloses a target EGR fraction of 10% and controller 201 tries to achieve an EGR fraction of 10%, but Bowyer \textit{selects} the EGR fraction set points based on engine characteristics and intended applications and \textit{based on} actual air fuel ratio (AFR) and EGR fraction (not based on EGR mass flowrate). Bowyer ¶ 120. Furthermore, predictive controller 602 determines the EGR mass \textit{flow rate} needed to achieve a 10% EGR fraction of inlet air 104. \textit{Id.} ¶ 69.

We agree that Bowyer calculates EGR mass \textit{flow rate} \text{MEGR}_{\text{MEAS}} by subtracting the mass air flowrate \text{MAIR}_{\text{MEAS}} from the total mass flow rate \text{MINLET}_{\text{MEAS}} into inlet manifold 104. \textit{Id.} ¶ 71; Ans. 6. We also appreciate that EGR mass fraction in Appellants’ claims could be understood as a ratio of the EGR mass flowrate to total flowrate \text{MINLET}_{\text{MEAS}}; however, Bowyer uses EGR mass fraction as a \textit{control target} as the Examiner notes. Ans. 6.
Appeal 2016-004528  
Application 13/425,723

Appellants disclose that first mass fraction calculating module 312 determines a steady state (SS) EGR fraction 316 for a next combustion event based on SS EGR mass flowrate divided by the total mass flowrate (SS EGR flowrate 308 and mass air flowrate MAF 320). Spec. ¶ 38. A first mass fraction of EGR is thus determined based, in part, on EGR mass flowrate.

The Examiner has not explained where Bowyer calculates a first mass fraction of EGR based on the EGR mass flow rate. Nor has the Examiner explained sufficiently how Bowyer further calculates a second mass fraction of EGR based on an average of the first mass fraction and other values of a first mass fraction of EGR for other combustion events. Instead, the Examiner cites Bowyer’s disclosure of equations for calculating mass flow rates of inlet air (MAIR\textsubscript{MEAS}) and EGR gas (MEGR\textsubscript{MEAS}). Ans. 7. These calculated values are used to determine the most optimal adjustment, if any, of variable geometry turbocharger and EGR actuators 125, 133 when events change a steady state of engine operation. Bowyers ¶¶ 68–71, Figs. 3, 5–7.

We also appreciate the Examiner’s finding that Bowyer buffers values from previous timesteps. Id. ¶ 77; Ans. 7. However, Bowyer buffers mass flowrates of air and EGR gas, not EGR mass fractions, as claimed. Bowyer does not use mass flow rates to calculate an EGR mass fraction, as claimed, nor does Bowyer average calculated first EGR mass fractions, as claimed.

To anticipate, every limitation of a claimed invention must be found in a single prior art reference, arranged as in the claim. Karsten Mfg. Corp. v. Cleveland Golf Co., 242 F.3d 1376, 1383 (Fed. Cir. 2001). There can be no difference between the claimed invention and the reference disclosure. Scripps Clinic & Research Found. v. Genentech, Inc., 927 F.2d 1565, 1576 (Fed. Cir. 1991).
The fact that Bowyer might be modified to calculate first and second EGR fractions from EGR mass flowrates is immaterial to anticipation. See *Dell Inc. v. Acceleron, LLC*, 818 F.3d 1293, 1299 (Fed. Cir. 2016). Bowyer receives mass flowrates of EGR and air (MEGR\text{MEAS} and MAIR\text{MEAS}), but instead of calculating a first or second EGR mass fraction, as claimed, these values are passed to predictor 706, which uses a linear model of MAIR and MEGR characteristics of diesel engine 100 and information about VGT and EGR actuators 125, 133 to calculate predicted changes in MAIR and MEGR. Bowyer ¶¶ 77, 78, 82, Figs. 6, 7.

Bowyer’s disclosure that an *actual* EGR mass fraction is typically less than the 10% EGR mass fraction *target* (id. ¶ 120) is some evidence that an EGR mass fraction is calculated. However, Bowyer does not disclose how such an actual EGR mass fraction is determined. Nor does Bowyer calculate a second mass fraction of EGR gas based on the first calculated EGR mass fraction and one or more other values of the EGR first mass fraction, as claimed. As discussed above, Bowyer instead buffers mass flowrates of air and EGR and uses these values to predict changes in MAIR and MEGR. *Id.* ¶¶ 77, 82.

Thus, we do not sustain the rejection of independent claims 1 and 11, or claims 2–10 and 12–20, which depend therefrom respectively.

DECISION

We reverse the rejection of claims 1–20.

REVERSED