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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte KEVIN ANDREW GADY and AMIN ABBOUD

Appeal 2014-009339
Application 12/578,899[1]
Technology Center 3700

Before JENNIFER D. BAHR, FREDERICK C. LANEY, and SEAN P. O'HANLON, *Administrative Patent Judges*.

LANEY, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Kevin Andrew Gady and Amin Abboud (Appellants) appeal under 35 U.S.C. § 134(a) from the Examiner's final decision rejecting claims 17–19 and 22 under 35 U.S.C. 102(b) as being anticipated by van Nieuwstadt (US 6,546,720 B2, iss. Apr. 15, 2003).[2] We have jurisdiction over this appeal under 35 U.S.C. § 6(b).

We REVERSE.

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[1] According to Appellants, the real party in interest is GM Global Technology Operations, Incorporated. Appeal Br. 3 (filed Jan. 21, 2014).

[2] The Examiner allowed claims 1–9, 11–16, and 21. Final Act. 3. Claims 10 and 20 have been canceled. *See* Appeal Br. 13, 15 (Claims App.).

INVENTION

Appellants' invention "relates to emission control systems, and more particularly to systems and methods for determining whether ammonia slip occurs in a selective catalytic reduction system." Spec. ¶ 2.

Claim 17, reproduced below, is independent and is representative of the claimed subject matter:

> 17. A method comprising:
>
> adjusting a flow rate of a dosing agent, wherein the adjusted flow rate controls an amount of ammonia (NH_3) in exhaust gas upstream from a catalyst;
>
> comparing first and second samples of a signal based on the adjusted flow rate, wherein the signal indicates an amount of nitrogen oxides (NOx) and an amount of NH_3 in exhaust gas downstream from the catalyst;
>
> determining whether NH_3 is present in the exhaust gas downstream from the catalyst based on the adjusted flow rate and the comparison; and
>
> determining whether a slip in the amount of NH_3 in the exhaust gas has occurred *based on whether the signal indicates a change in the amount of NOx by more than a predetermined amount*.

Appeal Br. 14–15 (Claims App.) (emphasis added).

ANALYSIS

The Examiner's anticipation rejection of claim 17, and thereby the rejections of dependent claims 18, 19, and 22, relies on van Nieuwstadt to disclose, "determin[ing] whether a slip in the amount of NH3 in the exhaust gas has occurred based on whether the signal indicates a change in the amount of NOx by more than a predetermined amount" (hereinafter, "the

slip determining step"). Final Act. 2–3; *see also* Adv. Act. 2 (filed Nov. 21, 2013); and Ans. 2–3. Appellants assert that van Nieuwstadt does not disclose the slip determining step and, more specifically, fails to disclose assessing whether the amount of NO_x in the exhaust gas has changed by more than a predetermined amount. Appeal Br. 5–7; *see also* Reply Br. 5–8. For the reasons that follow, we find Appellants' arguments persuasive.

Without explanation, the Examiner first identifies van Nieuwstadt's column 5, lines 8–50, and Figure 3, as showing the slip determining step. Final Act. 3, 4. In response, Appellants' properly point out that, at those locations, van Nieuwstadt describes "a technique for determining whether the output sensor [26] is indicating change in urea or change in NOx." Appeal Br. 5. Because practical automotive NO_x sensors are responsive to both NO_x and urea (or urea's byproduct NH_3), van Nieuwstadt teaches a detection method that "enables differentiation between the presence of urea and NOx by a sensor which is itself unable to differentiate between urea and NOx and to provide therefrom a control signal to optimize the injection of the reactant into the substance." van Nieuwstadt 1:66–2:4. At column 5, lines 8–50, and Figure 3, van Nieuwstadt describes a detection method that changes the amount of urea injected into the system and, based on whether the sensor produces a voltage with a corresponding direction of change, determines whether the sensor is measuring urea/NH_3 or NO_x. For example,

> the processor determines whether the direction of the change in output signal V(t) of the sensor **26** is the same as, or opposite to, the direction of the change in injected urea u(t). . . . [I]f they are the same direction, the sensor **26** is detecting urea whereas if the directions are opposite one another the sensor **26** is detecting NOx.

Id. at 5:34–40. Thus, rather than establishing an amount of change in NO_x and comparing that value to a predetermined value, as required by the slip determining step of claim 17, van Nieuwstadt teaches to look at the direction of change that an increase or decrease in urea causes to occur in the output voltage of an exhaust sensor 26, which indicates whether the sensor is measuring urea/NH_3 or NO_x (e.g., whether the voltage output increases with added urea or decreases with added urea, where an increase indicates the sensor is measuring urea/NH_3 and a decrease indicates the sensor is measuring NO_x).

The Examiner next identifies van Nieuwstadt's column 7, lines 34–37 and 46–60, and Figure 5, as showing the slip determining step, again without any explanation. Adv. Act. 2. We agree with Appellants' characterization of these van Nieuwstadt citations as relating to the control of the operation of a urea injector (e.g., urea injector 16). Appeal Br. 7. van Nieuwstadt states, at column 7, lines 39–44,

> Output signals nox**1**, nox**2** . . . produced by sensors **60**, **26** respectively are processed by a programmed processor **12'**, in a manner to be described, to produce the urea injection signal to urea injector **16**.

Although van Nieuwstadt indicates "part of the output nox**2** is due to urea slip," at column 7, lines 44–45, the Examiner does not explain why a skilled artisan would recognize van Nieuwstadt's description for controlling the urea injector necessarily includes an evaluation of the amount of NO_x in the exhaust gas compared to a predetermined amount to determine whether a slip in the amount of NH_3 in the exhaust gas has occurred. The remark by van Nieuwstadt regarding "urea slip" appears to be a *presumption*, rather

than a determination based on whether the measured amount of NO_x has changed more than a predetermined amount.

Finally, in the Answer, the Examiner identifies support from van Nieuwstadt column 3, lines 1–8 and 24–28, column 4, lines 9–20, column 7, lines 44–45, and column 8, lines 19–25, 33–50, and 59–61. Ans. 2–3. Having studied these citations to van Nieuwstadt, we again agree with Appellants' characterization of them as failing to evidence an evaluation of the amount of NO_x against a predetermined amount to determine whether a slip in the amount of NH_3 in the exhaust gas has occurred. *See* Appeal Br. 5–8; *see also* Reply Br. 5–8.

In particular, the Examiner finds, "[i]n van Nieuwstadt, the amount of change in NOx is nox2_hp which is given as an expression on lines 19–25 of col. 8," which is used to define a normalized change of NOx amount, dydu. Ans. 2–3. Further, the Examiner points out that a positive value for dydu indicates "the amount of urea (NH_3) addition to the catalyst (20) should be reduced." *Id.* at 3 (citing van Nieuwstadt 8:59–61). According to the Examiner, this shows, "van Nieuwstadt clearly discloses determining an amount of change in NOx, and if the change in NOx is greater than a predetermined value, an urea (NH_3) slip has been determined to occur." *Id.*

A preponderance of the evidence does not support the Examiner's finding. Although van Nieuwstadt states nox2_hp represents a change in the output signal produced by sensor 26 (van Nieuwstadt 8:19–22), we agree with Appellants that this is not the same thing as suggesting nox2_hp represents a change in the amount of NO_x. Instead, we understand the change to be simply a change in the voltage output, which is multiplied with the change in urea and normalized (i.e., divided) by nox1, to determine

dydu. *See* van Nieuwstadt 8:18–64. If the changes to the amount of urea and voltage output of nox2_hp is in the same direction, which is indicated by a positive dydu result, then the sensor is reacting to urea/NH_3 and the amount or urea should be reduced; whereas, if the changes are in different directions, which is indicated by a negative dydu result, then the sensor is reacting to NO_x and the amount of urea should be increased. *Id.* at 8:59–64; *see also id.* at 5:21–30. Rather than determining slip in the amount of NH_3 in the exhaust gas has occurred by comparing a measured amount of NO_x change against a predetermined amount of NO_x, van Nieuwstadt *presumes* there is NH_3 slip if the voltage output of sensor 26 changes in the same *direction* as the amount of urea being supplied to the system is changed.

While van Nieuwstadt and the claimed invention have a similar purpose (i.e., determining NH_3 slip), the Examiner has not established, by a preponderance of the evidence, that van Nieuwstadt accomplishes that purpose using the same steps recited by the method of claim 17. Therefore, for the foregoing reasons, we do not sustain the anticipation rejection of claim 17, and claims 18, 19, and 22 depending therefrom.

DECISION

We reverse the Examiner's rejection of claims 17–19 and 22.

REVERSED