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NORTON ROSE FULBRIGHT US LLP
1301 Avenue of the Americas
NEW YORK, NY 10019-6022

| EXAMINER | |
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| VILAKAZI, SIZO BINDA | |

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* GUENTER VEIT and STEFAN KELLER

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Appeal 2014-007653
Application 11/792,898
Technology Center 3700

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Before JENNIFER D. BAHR, WILLIAM A. CAPP, and SEAN P. O'HANLON, *Administrative Patent Judges*.

BAHR, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Guenter Veit and Stefan Keller (Appellants) appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 12, 14–17, and 20–22 under 35 U.S.C. § 103(a) as unpatentable over Demura (US 6,450,147 B2, iss. Sept. 17, 2002). We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

## THE CLAIMED SUBJECT MATTER

Claim 12, reproduced below, with emphasis added, is illustrative of the claimed subject matter.

> 12. A method for operating a fuel system of an internal combustion engine, comprising:
>
> ascertaining a raw precontrol signal by taking into account a predefined setpoint pressure in a fuel pressure accumulator of the fuel system;
>
> ascertaining a correction factor by taking into account (i) the value of a fuel quantity flowing through a pressure regulating device for the fuel pressure accumulator and (ii) actual pressure in the fuel pressure accumulator;
>
> ascertaining an adjusted precontrol signal by *multiplying* the raw precontrol signal by the correction factor; and
>
> precontrolling the pressure regulating device using the adjusted precontrol signal.

## DISCUSSION

Each of Appellants' independent claims 12, 20, and 21 requires ascertaining (or means for ascertaining) a correction factor by taking into account a fuel quantity flowing through a pressure regulating device and actual pressure in the fuel pressure accumulator and ascertaining an adjusted precontrol signal (or means for ascertaining an adjusted precontrol signal) by *multiplying* the raw precontrol signal by the correction factor.
Appeal Br. 10, 11 (Claims App.). The Examiner finds that Demura discloses ascertaining a correction factor (integral term DTi) by taking into account the value of fuel flowing through the fuel pressure accumulator (spill valve 54) and actual pressure in the fuel pressure accumulator.
Non-Final Act. 5.

The Examiner acknowledges that Demura differs from the invention claimed in claims 12, 20, and 21 in that in the claimed invention the raw precontrol signal is multiplied by the correction factor to ascertain the adjusted precontrol signal, whereas Demura adds the correction factor (integral term DTi) to the raw precontrol signal to obtain the adjusted precontrol signal. Ans. 4; *see* Demura, col. 7, l. 19, equation (1) (*DT=FF+DTp+DTi*). However, the Examiner finds that "[t]he exact equation . . . would be a matter dependent upon desired result and routine experimentation" and that "[t]he formulas used by Demura . . . and those set forth in the current application are considered obvious equivalents." Non-Final Act. 6. Thus, the Examiner determines that "it would have been obvious . . . to have incorporated the claimed formulas into the invention disclosed by Demura" because "it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable values or ranges involves only routine skill in the art." *Id.* According to the Examiner,

> although the specific equations for calculating the adjusted precontrol signal are not identical, the process of deciding to ***multiply*** as opposed to ***add*** a correction factor in an equation is considered to be a matter of routine experimentation as opposed to a novel step over the prior art, and thus would have been obvious to one having ordinary skill in the art.

Ans. 4.

Appellants submit that "the Examiner has not provided any explanation regarding why or how the disclosed formulas of Demura are equivalent to the disclosed formulas of the present specification." Appeal Br. 8. Appellants also contend that "the Examiner's 'routine experimentation' argument is logically incoherent." *Id.*

Appellants and Demura both disclose control routines for controlling the pressure of a fuel accumulator (i.e., Appellants' fuel accumulator 22 and Demura's delivery pipe 53) by controlling a pressure regulating valve (i.e., Appellants' pressure regulating device 32 and Demura's spill valve 54). Spec. 2, ll. 4–10, 22–28; Figs. 1, 2; Demura, col. 5, ll. 25–41; col. 6, ll. 20–62; *id.*, Figs. 1, 4. However, Appellants' pressure regulating device 32 and Demura's spill valve 54 are not functional equivalents in their respective systems. Appellants' pressure regulating device 32 is *not* located in the fuel supply line passing through presupply pump 16 and high-pressure fuel pump 18, but, rather, communicates with fuel reservoir 14 by a separate line (line 45). Spec. 5, ll. 28–30; Fig. 1. Demura's spill valve 54 is located in the fuel supply line (low-pressure fuel passage 50) passing through feed pump 46 and high-pressure fuel pump 47 and, thus, needs to be open during the intake stroke of pump 47 and is closed during at least some portion of the delivery stroke, with the duration of spill valve 54 being in the closed state controlling the pressure in delivery pipe 53. Demura, col. 4, l. 63–col. 5, l. 41; Fig. 1. In this regard, Demura' spill valve 54 is more similar in placement and function to Appellants' flow control valve or metering unit 20, which is not the valve controlled by control unit 34. *See* Spec. 4, l. 3; Fig. 1.

As a consequence of their different functions within their respective systems, Appellants' pressure regulating device 32 and Demura's spill valve 54 are controlled in different manners. More specifically, by way of example, Appellants' pressure regulating device 32 may be a pressure regulating valve having a spring-loaded valve element wherein a prestressing force of the spring may be varied using an electromagnetic

actuating force in order to adjust the opening pressure of the valve. Spec. 4, ll. 13–18. Thus, Appellants' control unit controls the current (precontrol current $I_{DRV}$) supplied to effect the electromagnetic actuating force. *See* Spec. 6, ll. 3–4 ("The result of the multiplication in block 48 is precontrol current $I_{DRV}$ by which pressure regulating device 32 is precontrolled."). Demura, on the other hand, calculates a duty ratio (DT), which ranges between 0% and 100% and which sets the valve closing start timing and valve closing duration of spill valve 54, thereby controlling the fuel pressure (P) in delivery pipe 53. Demura, col. 6, l. 20—col. 7, l. 9.

As the Examiner appreciates (Non-Final Act. 5–6; Ans. 4), Appellants and Demura use different formulas for effecting their control routines. Appellants generate correction factor KF using characteristics map 46 based on (i) the fuel flow ($q_{DRV}$) back from fuel accumulator 22 through pressure regulating device 32 and (ii) actual pressure in fuel accumulator 22 measured by pressure sensor 36. Spec. 5, ll. 23–34; Fig. 2. Appellants then multiply a raw precontrol signal generated by converting a setpoint pressure in fuel pressure accumulator 22 to a raw precontrol current ($I^*_{DRV}$) by correction factor KF to calculate the precontrol current ($I_{DRV}$). Spec. 5, l. 34–6, l. 4; Fig. 2. In order to calculate the duty ratio (DT), Demura uses a formula DT=FF+DTp+DTi. Demura, col. 7, l. 19 (equation (1)). The Examiner does not explain cogently, and we do not discern, how Appellants' formula for calculating the precontrol current ($I_{DRV}$) and Demura's formula for calculating the duty ratio (DT) could be considered "obvious equivalents," especially in view of the aforementioned differences in function between Appellants' controlled pressure regulating device 32 and Demura's spill valve 54.

The Examiner appears to be suggesting that the selection of Appellants' formula in place of Demura's formula would be a matter dependent upon desired result and routine experimentation. Non-Final Act. 6. However, as the desired result of the calculation in Demura is a duty ratio (DT), it is not apparent why a person having ordinary skill in the art would have been prompted to use Appellants' formula, which calculates a precontrol current ($I_{DRV}$), and not a duty ratio, in Demura's system or method. To the extent that the Examiner proposes to modify Demura's formula by multiplying one or more of the remaining components (FF and DTp) of Demura's DT formula by integral term DTi, such a modification lacks rational underpinnings, for the reasons set forth by Appellants. Reply Br. 4–5. Moreover, the change in formula proposed by the Examiner is not a mere discovery of optimum or workable values or ranges. Thus, we agree with Appellants that the routine optimization principle alluded to by the Examiner is inapplicable here.

For the above reasons, we do not sustain the rejection of claims 12, 14–17, and 20–22 under 35 U.S.C. § 103(a) as unpatentable over Demura.

## DECISION

The Examiner's decision rejecting claims 12, 14–17, and 20–22 is reversed.

REVERSED