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INTERNATIONAL ENGINE INTELLECTUAL PROPERTY COMPANY
Mark C. Bach
2701 Navistar Drive
Suite 7-3-P18-03
Lisle, IL 60532

EXAMINER
BRADLEY, AUDREY KLASTERKA

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mark.bach@navistar.com

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte XINQUN GUI, GUOQING ZHANG, and XINLEI WANG

Appeal 2010-004739
Application 10/369,016
Technology Center 3700

Before GAY ANN SPAHN, MICHAEL C. ASTORINO, and
JAMES P. CALVE, *Administrative Patent Judges*.

SPAHN, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Xinqun Gui et al. (Appellants) seek our review under 35 U.S.C. § 134 of the Examiner's rejection of claims 3 and 11 under 35 U.S.C. § 103(a) as unpatentable over Russell (US 6,237,326 B1, issued May 29, 2001) and Kumagai (US 6,090,187, issued Jul. 18, 2000). Appellants cancelled claims 1, 2, 4-10, and 12-18. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

The Claimed Subject Matter

The claimed subject matter "relates generally to diesel engines that have diesel particulate filters for treating exhaust gases passing through their exhaust systems" and more particularly, "to engine systems and methods employing exhaust back-pressure for burning soot trapped by such a filter." Spec. 1, para. [0001]. Claims 3 and 11 are independent and claim 11, reproduced below, with emphasis added, is illustrative of the subject matter on appeal.

> 11. A diesel engine comprising:
>
> an exhaust system comprising a diesel particulate filter that treats exhaust gas from the engine;
>
> an exhaust back-pressure control device for increasing exhaust back-pressure on the engine sufficiently to cause elevation of the temperature of exhaust gas entering and passing through the diesel particulate filter to a temperature sufficient to initiate combustion of soot trapped by the diesel particulate filter; and
>
> a control system for selectively forcing combustion of soot trapped in the diesel particulate filter, wherein the control system comprises a processor that with the engine running
>
> a) repeatedly processes data indicative of exhaust gas temperature, data indicative of pressure drop across the diesel particulate filter, data indicative of mass flow through the engine, and data correlating various combinations of pressure drop and mass flow with conditions distinguishing between mandating forced combustion of trapped soot, permitting forced combustion of trapped soot, and not forcing combustion of trapped soot, and
>
> b) *when a result of the processing discloses a condition mandating forced combustion of trapped soot, the control system operates the exhaust back-pressure control device, regardless of exhaust gas temperature, to increase exhaust back-pressure on the engine sufficiently to cause elevation of the temperature of exhaust gas entering and passing through*

> *the diesel particulate filter to a temperature sufficient to initiate combustion of trapped soot*, and
>
> c) *when a result of the processing discloses a condition permitting forced combustion of trapped soot, the control system operates the exhaust back-pressure control device, provided that exhaust gas temperature exceeds a defined temperature threshold, to increase exhaust back-pressure on the engine sufficiently to cause elevation of the temperature of exhaust gas entering and passing through the diesel particulate filter to a temperature sufficient to initiate combustion of trapped soot*, in which after the processing has disclosed a condition permitting forced combustion of trapped soot and that exhaust gas temperature exceeds the threshold, the processor processes data that correlates various combinations of engine speed data and engine load data with various degrees of operation of the exhaust back-pressure control device to yield data defining a certain degree to which the device should be operated, and then the control system operates the device to that certain degree.

Independent claim 3 is directed to a method for selectively forcing combustion of soot that has been trapped in a diesel particulate filter that treats exhaust gas passing through an exhaust system of a diesel engine including, *inter alia*, steps similar to the emphasized language in claim 11 *supra*.

OPINION

The Examiner finds that Russell discloses "an exhaust gas after-treatment system for a diesel . . . engine (10) comprising a particulate filter (95) . . . adapted to trap harmful particulate matter in an exhaust gas stream, [wherein] the filter is regenerated from time to time to restore its capacity of trapping particulate matter when the filter is deemed saturated," and the regeneration is accomplished "by increasing an exhaust gas temperature

through various means such as post fuel injection" using a fuel injector 80. Ans. 6. The Examiner also finds that: (1) Russell discloses "a degree or an adjusted amount of post injection (Δra) is controlled based on a released amount (rpa) of particulate matter during regeneration, wherein the released amount is based on the filter temperature that is correlated or estimated from engine operating conditions (engine speed and engine load)"; (2) "Russell performs a post injection of a diesel fuel via fuel injector (80) directly into a cylinder during a power stroke or an exhaust stroke to increase an exhaust gas temperature"; and (3) Russell's "post injection of fuel would not provide any additional work to a piston of the cylinder and instead, would burn in the cylinder, in an exhaust manifold, or at the filter to increase the exhaust gas temperature." Ans. 6-7.

Appellants argue that "one of ordinary skill in the art would not equate a fuel injector that performs a post-injection of fuel to an exhaust back-pressure control device." Reply Br. 3. Appellants also argue that because claims 3 and 11 both require that "the elevation of exhaust gas temperature occur because of an increase in exhaust back-pressure," the Examiner's rejection is in error because the combustion of post-injected fuel by the fuel injector 80 of Russell would be the cause of engine exhaust back-pressure increase. *Id*. In other words, "engine back-pressure increase would be a result, but not the cause, of temperature elevation," and "[t]he claims on appeal require that the desired effect (temperature elevation) <u>be caused</u> by increasing back-pressure," but "[a]ny increase in back-pressure that might occur by burning post injected fuel is an effect of burning fuel, and not the cause of exhaust temperature elevation." *Id*.

We are persuaded by Appellants' arguments. The Examiner's finding that "[o]ne having ordinary skill in the art will recognize that by increasing the exhaust gas temperature, a back-pressure of the exhaust gas or the engine is also increased" (Ans. 7), is the converse of what is required by the claim language, namely, that the exhaust back-pressure control device is operated "to increase exhaust back-pressure on the engine sufficiently to cause elevation of the temperature of exhaust gas entering and passing through the diesel particulate filter to a temperature sufficient to initiate combustion of trapped soot." App. Br., Clms. App'x.

Moreover, the Examiner's finding that Russell "teaches a device (post injection via fuel injector (80) [either during a power stroke or an exhaust stroke]) that increases exhaust back-pressure on the engine sufficiently to cause and elevation of exhaust gas temperature" (Ans. 7; *see also* Reply Br. 3) is not supported by a preponderance of the evidence. In particular, Appellants provide facts and/or technical reasoning as to why the Examiner's finding is in error. Reply Br. 3-4. First, Appellants explain that if post-injection occurs during an exhaust stroke, it would not be plausible for post-injected fuel, even if it did begin to combust in the cylinder, to create a sufficient back-pressure increase to cause elevation of the temperature of the exhaust gas entering and passing through the diesel particulate filter to a temperature sufficient to initiate combustion of trapped soot. Reply Br. 3, l. 30 through Reply Br. 4, l. 8. We adopt Appellants' explanation as our own. Second, Appellants also explain that if post-injection occurs during a power stroke, it would not create a back-pressure increase sufficient to cause elevation of the temperature of exhaust gas entering and passing through the diesel particulate filter to a temperature

sufficient to initiate combustion. Reply Br. 4, ll. 9-25. We again adopt Appellants' explanation as our own.

Because we are persuaded of error in the Examiner's finding that Russell's post-injection of diesel fuel through the fuel injector 80 constitutes claim 3 and 11's device operating to increase exhaust back-pressure on the engine sufficiently to cause an elevation of exhaust gas temperature entering and passing through the diesel particulate filter to a temperature sufficient to initiate combustion of trapped soot, we do not sustain the Examiner's rejection of claims 3 and 11 under 35 U.S.C. § 103(a) as unpatentable over Russell and Kumagai.

DECISION

We reverse the Examiner's decision to reject claims 3 and 11.

REVERSED

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