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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JON K. LOGAN, PATRICK J. MONSERE,
MARGARET C. RICHARDS, JONATHAN KING, and
DANNY Y. MUI

Appeal 2015-001170
Application 12/418,907
Technology Center 3600

Before CHARLES N. GREENHUT, MICHAEL L. HOELTER, and ANNETTE R. REIMERS, *Administrative Patent Judges*.

REIMERS, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Jon K. Logan et al. (Appellants) appeal under 35 U.S.C. § 134(a) from the Examiner's decision to reject under 35 U.S.C. § 103(a) claims 1–12 and 14–17 as unpatentable over Luckevich (US 6,226,586 B1; iss. May 1, 2001), Fulmer (US 2008/0265664 A1; pub. October 30, 2008), and Hosaka (US 2009/0096279 A1; pub. Apr. 16, 2009). Claim 13 has been canceled. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

CLAIMED SUBJECT MATTER

The claimed subject matter relates to "a method that compensates for fluid pressure variations in a vehicle brake system." Spec. ¶ 1, Fig. 3. Claims 1 and 10 are independent.

Claims 1 and 10 are illustrative of the claimed subject matter and recite:

> 1. A method for operating a vehicle brake system, comprising the steps of:
>
> (a) determining a driver braking intent;
>
> (b) determining a pressure compensation that compensates for fluid pressure variations in a master cylinder of the vehicle brake system, wherein the pressure compensation is determined with the use of empirically derived data accounting for imperfections in the operation of the master cylinder resulting in fluid pressure variations therein;
>
> (c) using the driver braking intent and the pressure compensation to generate compensated brake command signals that are compensated for fluid pressure variations in the master cylinder of the vehicle brake system; and
>
> (d) operating one or more aspects of the vehicle brake system according to the compensated brake command signals so that the effects of fluid pressure variations in the master cylinder of the vehicle brake system are mitigated.
>
> 10. A method for operating a vehicle brake system, comprising the steps of:
>
> (a) determining a driver braking intent;
>
> (b) determining a braking event stage that is representative of a discrete stage, phase, segment and/or portion of a braking event, and using the braking event stage to select a look-up table or other data structure from a plurality of such data structures each corresponding to a respective braking event stage, where the selected data structure is directed to that particular braking event stage and accounts for imperfections in the operation of the vehicle brake system resulting in fluid pressure variations therein during that particular braking event stage;

> (c) using the selected data structure and the driver braking intent to generate compensated brake command signals for the driver braking intent, wherein the compensated brake command signals are designed to compensate for fluid pressure variations that occur in a master cylinder of the vehicle brake system during that particular braking event stage and differ from fluid pressure variations that occur in other braking event stages; and
>
> (d) operating one or more aspects of the vehicle brake system according to the compensated brake command signals while the vehicle remains in the particular braking event stage.

ANALYSIS

Claims 1–9

Step (b) of independent claim 1 calls for "determining a pressure compensation that compensates for fluid pressure variations in a master cylinder of the vehicle brake system." Appeal Br. 12, Claims App. The Examiner finds that Luckevich teaches this limitation and relies on Figure 2 and column 3, lines 10–23 of Luckevich for support. Non-Final Act. 3. The Examiner asserts that: "[t]he system of Luckevich uses the master cylinder sensed brake travel and the **sensed** master cylinder pressure to effectively control the desired amount of hydraulic pressure need[ed] to be provided to each of the wheel cylinders." Ans. 3. The Examiner additionally acknowledges that Figure 2 of Luckevich discloses that "each of the individual wheels have a pressure transducer and each value are driven by the respective signals that correspond to the difference between the respective control signal and the respective feedback signal." *Id.* (citing Luckevich 3:35–43).

In response to the Examiner's findings, Appellants first correctly note that in Luckevich the master cylinder is located upstream of the closed loop

feedback pressure compensation system and therefore fluid pressure variations in the master cylinder are not taken into account in the closed loop. *See* Appeal Br. 4–5; *see also* Luckevich, Fig. 2. Second, Appellants "agree that Luckevich teaches a conventional closed loop system that controls the fluid pressure at each of the wheels by using the difference between control signals and respective feedback signals from pressure transducers 72." Reply Br. 2 (emphasis omitted). However, Appellants contend that, unlike Luckevich, "the methodology in claim 1 takes into account imperfections in the operation of the master cylinder that result in fluid pressure variations by determining a pressure compensation with the use of empirically derived data." *Id.*

Appellants' arguments are persuasive. Column 3, lines 10–23 of Luckevich refers to Figure 2 and states:

> Control Unit **50** outputs a control signal to a Valve Driver **52**, so as to place Valves **54** in a state such that a desired amount of brake pressure is supplied from the High Pressure Accumulator (HPA) **64** and is applied to Brake Calipers **80**. Each wheel of the vehicle has a Pressure Transducer (PT) **72** and a Brake Caliper **80**, as shown in FIG. **2**. Each valve **54** is independently controlled by a respective signal received from Valve Driver **52**. Pressure transducers (PT) **72** measure an amount of actual brake pressure at the Brake Calipers **80**, and these measurements are fed back as feedback signals to the Valve Driver **52**. Using these feedback signals, Valve Driver **52** provides closed loop pressure compensation to eliminate pressure command error so as to achieve the desired amount of braking pressure.

Further, Luckevich states, again in reference to Figure 2, that: "Master cylinder pressure is measured by a Pressure Sensor **16**, which outputs a signal indicating the master cylinder *pressure* to the Control Unit **50**." Luckevich 3:4–6 (emphasis added); *see also* Non-Final Act. 3.

Nowhere in the foregoing passages from Luckevich relied upon by the Examiner does Luckevich take into account *fluid pressure variations in the master cylinder* and *determining a pressure compensation that compensates for fluid pressure variations in the master cylinder*. In contrast, in the closed loop feedback pressure compensation system of Luckevich, pressure transducers (PT) 72 *measure an amount of actual brake pressure at the Brake Calipers 80*, and these measurements are fed back as feedback signals to the Valve Driver 52 for closed loop compensation. In other words, Luckevich discloses a feedback system where pressure measurements are taken at pressure transducers 72 at brake calipers 80 and pressure compensation occurs as a result of those measurements, whereas Appellants claim a method where the pressure compensation compensates for fluid pressure variations in the master cylinder itself. Fulmer and Hosaka are not relied upon by the Examiner to cure this deficiency in Luckevich. *See* Non–Final Act. 4–5.

For the foregoing reasons, we do not sustain the Examiner's rejection of claim 1 and claims 2–9, which depend therefrom.

Claims 10–12 and 14–17

Step (b) of independent claim 10 calls for:

> determining a braking event stage that is representative of a discrete stage, phase, segment and/or portion of a braking event, and using the braking event stage to select a look-up table or other data structure from a plurality of such data structures each corresponding to a respective braking event stage, where the selected data structure is directed to that particular braking event stage.

Appeal Br. 13, Claims App.

The Examiner finds that Luckevich and Fulmer disclose these limitations. In particular, for the limitation "determining a braking event stage that is representative of a discrete stage, phase, segment and/or portion of a braking event," the Examiner relies on column 10, line 58 through column 11, line 20 of Luckevich for support. Non-Final Act. 8; Ans. 6. As for the limitation "using the braking event stage to select a look-up table or other data structure from a plurality of such data structures each corresponding to a respective braking event stage, where the selected data structure is directed to that particular braking event stage," the Examiner relies on paragraphs 12 and 21 of Fulmer for support. Non-Final Act. 9–10. More specifically, with regard to paragraph 12, the Examiner finds that Fulmer discloses an "empirically-determined first look-up table 40 of stored master cylinder pressure values and corresponding stored brake pedal position values." *Id.* at 9 (emphasis omitted) (quoting Fulmer ¶ 12); *see also* Ans. 6–7; Appeal Br. 7. As for paragraph 21 of Fulmer, the Examiner relies on that passage for using pressure compensation when the deceleration of a vehicle is greater than a predetermined value. Non-Final Act at 9–10. As claim 10 does not include a limitation directed to using pressure compensation when the deceleration of a vehicle is greater than a predetermined value, we will limit our discussion to the Examiner's findings concerning paragraph 12 of Fulmer. The Examiner concludes that it would have been an "obvious design choice to modify Luckevich to include the teachings of using a lookup table of Fulmer with the motivation of reducing the amount of hardware and sensors required in the system." *Id.* at 10.

Appellants contend: "To the extent that the look-up tables 40, 42 [of Fulmer] could arguably correspond to a specific braking event stage, as

suggested by the Examiner, they at best correspond to a single stage, not different braking event stages each having its own lookup table or the like." Appeal Br. 7. Appellants elaborate on the subject matter of claim 10 as follows:

> When looking at the claimed subject matter as a whole, it is important to recognize that this is a multi-step process: first the claimed methodology determines a braking event stage (e.g., an apply stage, a steady-state stage, or a release stage) and then the methodology uses the determined braking event stage to select a corresponding look-up table or other data structure from a number of such structures. Each of the individual look-up tables or other data structures corresponds to a particular braking event stage (e.g., the apply stage can have its own look-up table, the steady-stage stage can have its own look-up table, and so on). Thus, the methodology of claim 10 uses <u>customized, stage-specific look-up tables to determine compensated brake command signals</u>.

Id.; *see also* Reply Br. 3.

Appellants' arguments are persuasive. Fulmer discloses a single look-up table 40 of stored master cylinder pressure values and corresponding stored brake position values. Fulmer ¶ 12. Fulmer is silent with regard to using a specific braking event *stage* to select *a corresponding look-up table or other data structure from a number of such structures* to determine compensated brake command signals designed to address the imperfections mentioned above *that are specific to that particular braking event stage*, as recited in claim 10.

Accordingly, for the foregoing reasons, we do not sustain the Examiner's rejection of claim 10 and claims 11, 12, and 14–17, which depend therefrom.

DECISION

We REVERSE the decision of the Examiner to reject claims 1–12 and 14–17.

REVERSED