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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte RYOMA KANDA and MASAKI IZAWA

Appeal 2018-007093
Application 14/410,808
Technology Center 3600

Before JENNIFER D. BAHR, LINDA E. HORNER, and MICHELLE R. OSINSKI, *Administrative Patent Judges.*

BAHR, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1 and 5–14. We have jurisdiction under 35 U.S.C. § 6(b). An oral hearing in accordance with 37 C.F.R. § 41.47 was held on January 7, 2020.

We REVERSE.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Honda Motor Co. Ltd. Appeal Br. 3.

CLAIMED SUBJECT MATTER

Appellant's invention is directed to "a vehicle suspension control system provided with a variable damper that can adjust the damping force thereof according to an input signal." Spec. ¶ 1. Claim 1, reproduced below, is the only independent claim and is representative of the claimed subject matter.

> 1. A suspension control system for a vehicle provided with a variable damper that can adjust a damping force according to an input signal, comprising:
>
> a wheel rotational speed sensor for detecting a wheel rotational speed;
>
> an un-sprung load computing means for computing an un-sprung load of the vehicle according to a wheel rotational speed variation detected by the wheel rotational speed sensor, the un-sprung load consisting of a road contact load variation of the vehicle;
>
> a state variable computing means for computing state variables of the vehicle by feeding the un-sprung load to a vehicle model representing a behavior of a sprung mass and an un-sprung mass of the vehicle in relation to the un-sprung load, the state variables including a sprung velocity and a suspension stroke speed of the vehicle; and
>
> a damper control means for controlling the damping force of the variable damper according to the computed state variables,
>
> wherein the un-sprung load computing means converts the wheel rotational speed variation into the un-sprung load based on a relationship between the wheel rotational speed variation and the un-sprung load, the relationship being predetermined based on actually detected values of the wheel rotational speed and a road contact load.

EVIDENCE

The prior art relied upon by the Examiner is:

Name	Reference	Date
Kim	US 2002/0103587 A1	Aug. 1, 2002
Brookes	US 2008/0228352 A1	Sept. 18, 2008
Poilbout	US 2009/0024277 A1	Jan. 22, 2009

REJECTION

Claims 1 and 5–14 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Poilbout, Brookes, and Kim.

OPINION

Independent claim 1 recites a suspension control system provided with a variable damper and comprising, in pertinent part, "a wheel rotational speed sensor" and "an un-sprung load computing means for computing an un-sprung load of the vehicle according to a wheel rotational speed variation detected by the wheel rotational speed sensor, the un-sprung load consisting of a road contact load variation of the vehicle," "wherein the un-sprung load computing means converts the wheel rotational speed variation into the un-sprung load based on a relationship between the wheel rotational speed variation and the un-sprung load, the relationship being predetermined based on actually detected values of the wheel rotational speed and a road contact load." Appeal Br. 15 (Claims App.). Pursuant to the sixth paragraph of 35 U.S.C. § 112, we construe the means-plus-function limitation "un-sprung load computing means for computing . . ." in claim 1 to cover the corresponding structure described in Appellant's Specification and equivalents thereof. Appellant's Specification identifies gain circuit 37 as the disclosed structure corresponding to the claimed "un-sprung load computing means." Spec. ¶ 55; *see id.* ¶¶ 56–58 (describing the relationship ($u_1=k\cdot\Delta Vw$) between the wheel rotational speed variation (ΔVw) and the un-sprung load (u_1) used by gain circuit 37 to compute the un-sprung load).

With the possible exception of not explicitly mentioning that the value computed is an "un-sprung load,"[2] the Examiner finds that Poilbout discloses an "un-sprung load computing means" as recited in claim 1. *See* Final Act. 4 (citing Poilbout ¶¶ 2, 3, 15, 26, 51, 95–97, 101, 102, 119, 154, 156, 157, 203–212, 237, 255). Appellant argues that Poilbout does not disclose an un-sprung load computing means that "converts the wheel rotational speed variation into the un-sprung load based on a relationship between the wheel rotational speed variation and the un-sprung load, the relationship being predetermined based on actually detected values of the wheel rotational speed and a road contact load," as recited in claim 1. Appeal Br. 7. Appellant emphasizes that by making use of the claimed relationship between the wheel rotational speed variation and the un-sprung load, the sprung velocity and stroke speed can be computed from the un-sprung load, without the need for a vertical G sensor or a stroke sensor, and without regard to the caster angle of the suspension system. *Id.* at 11 (citing Spec. ¶ 92). By contrast, Appellant argues, Poilbout's suspension control device "uses displacement sensors CAP-DEB to measure the (up and down) displacement DEB of associated wheels with respect to the body 2," and, "from the wheel displacement measurements DEB, the computer CSS calculates the heave modal acceleration of the body." *Id.* (citing Poilbout

[2] The Examiner relies on Brooks for this teaching. Final Act. 4; *see* Brookes ¶¶ 7, 8).

¶ 63). In other words, according to Appellant, Poilbout's suspension control device uses vertical displacement sensors (CAP-DEB) that are made unnecessary by Appellant's invention. *Id.*

For essentially the reasons set forth by Appellant on pages 11–12 of the Appeal Brief, we agree with Appellant that the Examiner does not explain with sufficient clarity and specificity how Poilbout discloses, or how the combination of Poilbout, Brookes, and Kim[3] renders obvious, "an un-sprung load computing means for computing an un-sprung load of the vehicle" (i.e., "a road contact load variation of the vehicle") by converting a wheel rotational speed variation detected by the wheel rotational speed sensor into the un-sprung load based on a relationship ($u_1=k \cdot \Delta Vw$) between the wheel rotational speed variation and the un-sprung load, as required in claim 1.

In particular, the Examiner maintains that paragraphs 95–97 and 102 of Poilbout disclose a wheel rotational speed sensor for detecting a wheel rotational speed. Ans. 5; *see also* Final Act. 4, 12. These findings are incorrect because, as Appellant points out (Appeal Br. 11–12), the displacements (DEB) and displacement speeds (VDEB, obtained by passing the displacements through a derivation module), discussed in paragraphs 95–97 are vertical (up and down) displacements and vertical displacement

[3] The Examiner relies on Kim for its teachings directed to controlling a variable damper according to a brake operation state and computing a damping force using random damping speed, and not, at least ostensibly, for any teachings directed to converting a detected wheel rotational speed variation into an un-sprung load based on a relationship ($u_1=k \cdot \Delta Vw$) between the wheel rotational speed variation and the un-sprung load. Final Act. 5.

speeds of the wheels with respect to the vehicle body, and not wheel rotational speeds, as the Examiner states. In paragraph 102 cited by the Examiner, Poilbout discloses that module MAS for calculating static attitude AS is part of static characteristics estimator 20, which receives *several* inputs, including vehicle speed VVH, which "is provided by a speed sensor, for example, or any other calculation means." Even assuming that vehicle speed VVH is determined or calculated from a wheel rotational speed detected by a wheel rotational sensor, Poilbout does not disclose, in paragraph 102, converting vehicle speed VVH into an un-sprung load based on an empirically-predetermined relationship (u_1=k·ΔVw) between the wheel rotational speed variation and the un-sprung load, as called for in claim 1. Rather, Poilbout discloses that module MAS calculates static attitude AS from the displacements (DEB) of the four wheels. Poilbout ¶ 101. Static characteristics estimator 20 includes a means for calculating front and rear apparent dynamic masses as a function of displacements DEB, a means for calculating front and rear aerodynamic biases from vehicle speed VVH, and a means for calculating the vehicle's sprung mass and a value for mass distribution between the front and rear wheels as a function of the front and rear apparent dynamic masses and front and rear aerodynamic biases. *Id.* ¶¶ 103–106.

In paragraph 212, cited by the Examiner (Ans. 5; Final Act. 4), Poilbout discloses retrieving, by linear interpolation (from a prerecorded reference table or curve providing the reference multiplier coefficient values as a function of the vehicle speed), the reference multiplier coefficients b_{zREF}, $b_{\theta REF}$, and $b_{\Phi REF}$ for heave, roll, and pitch, respectively, for each of the heave, roll, and pitch modal gains (b_z, b_θ, and b_ϕ) that correspond to the vehicle speed input value VVH. Thus, Poilbout appears to disclose a linear relationship between the vehicle speed and the reference multiplier coefficients. Poilbout ¶ 212. However, neither the reference multiplier coefficients nor the heave, roll, and pitch modal gains appear to be an un-sprung load. Rather, estimator 21 uses the heave, roll, and pitch modal gains, which are comprised in part of the reference multiplier coefficients, to calculate heave, roll, and pitch modal forces as a function of heave, roll, and pitch modal velocity values previously calculated as a function of wheel displacements DEB. *Id.* ¶¶ 63, 175, 192–202, 230–235.

Paragraph 237 of Poilbout, cited by the Examiner for wheel rotation speed (Ans. 6; Final Act. 4, 13), discloses estimator 32 for calculating an anticipated transverse jerk from the measured vehicle speed VVH and the rotation speed of the vehicle *steering* wheel using the equation set forth in paragraph 243. Even assuming that vehicle speed VVH is measured using a wheel rotation sensor, paragraph 237 does not appear to be related to computing an un-sprung load from this measured vehicle speed.

In paragraph 255, also cited by the Examiner for wheel rotation speed (Ans. 6; Final Act. 4, 13), Poilbout states merely that "ϕ_{ROUE} is the wheel rotation speed." Poilbout does not mention "ϕ_{ROUE}" elsewhere. *See* Poilbout *passim*. Poilbout does, however, disclose calculating anticipated engine torque C_R based in part on a value identified as "ω_{ROUE}" and then calculating an anticipated longitudinal jerk based in part on the derivative of the anticipated engine torque. *See id.* ¶¶ 251–254, 256–265. Assuming that Poilbout's reference to "ϕ_{ROUE}" is a typographical error, and that "ω_{ROUE}" denotes the wheel rotation speed, it is not apparent, and the Examiner does not explain, how this portion of Poilbout's disclosure might be related to computing an un-sprung load from the wheel rotation speed. Moreover, the Examiner does not identify any disclosure in Poilbout indicating that wheel rotation speed ("ω_{ROUE}" or "ϕ_{ROUE}") is detected by a wheel rotational speed sensor, rather than calculated from other measured parameters, such as vehicle speed VVH, for example.

The teachings of Brookes and Kim cited by the Examiner do not appear to remedy the aforementioned deficiency in the Examiner's findings regarding Poilbout. Brookes teaches that typical vehicle suspension systems support "a sprung mass of the vehicle (e.g., a body or chassis) on an unsprung mass of the vehicle (e.g., an axle or other wheel-engaging member)" and typically include spring elements "that are responsive to forces and/or loads acting on the sprung and/or unsprung masses of the vehicle." Brookes ¶ 7. Brookes also teaches using gas spring assemblies in suspension systems "to adjust the height and/or orientation of the sprung mass with respect to the unsprung mass." *Id.* ¶ 8. Kim teaches controlling a damping force of a variable damper in a suspension system "according to a vehicle speed, a steering angle, an opening amount of a throttle valve, an up/down acceleration, a brake operation state, and an axle acceleration," including, *inter alia*, "computing a damping force dV by reading vehicle speed" and "comparing a random damping speed dV1 with the damping speed dV." Kim ¶¶ 2, 17, 21.

Accordingly, we do not sustain the rejection of independent claim 1, or its dependent claims 5–14, as unpatentable over Poilbout, Brookes, and Kim.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 5–14	103(a)	Poilbout, Brookes, Kim		1, 5–14

REVERSED