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D E C I S I O N
of 9 September 1994

Case Number: T 0395/94 - 3.4.2

Application Number: 89309258.5

Publication Number: 0366249

IPC: G01C 25/00

Language of the proceedings: EN

Title of invention:
Method for correcting zero point of gyro and apparatus therefor

Applicant:
SUMITOMO ELECTRIC INDUSTRIES LTD

Opponent:
-

Headword:
-

Relevant legal norms:
EPC Art. 56

Keyword:
"Inventive step : (after amendment) : no"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0395/94 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 9 September 1994

Appellant: SUMITOMO ELECTRIC INDUSTRIES LTD
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Decision under appeal: Decision of the Examining Division of the European Patent Office dated 16 December 1993 refusing European patent application No. 89 309 258.5 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: E. Turrini
Members: M. Chomentowski
B. J. Schachenmann

Summary of Facts and Submissions

I. European patent application No. 0 366 249 (application No. 89 309 258.5) is directed to a method of correcting zero point of gyro and to an apparatus for such correcting and was refused on the grounds that the subject-matter of the submitted Claim 1 lacked an inventive step having regard to D1 = US-A-4 470 124. The Examining Division took in particular the view that the claimed method was distinguished from the known method in that the former comprised a method step with a duration which was constant and not variable and depending on the detection of a stopping state of the moving body, and that no advantage of the claimed method based on this particular feature was apparent.

II. The Appellant (Applicant) lodged an appeal against this decision. He submitted a new, amended page comprising Claims 1 and 2 and requested that the decision under appeal be set aside and that a patent be granted on the basis of the patent application documents on file. Claim 1 reads as follows:

"1. A method of correcting a zero point of a gyro, comprising the steps of: detecting a speed of a moving body and outputting a speed signal corresponding to said speed; when said speed signal is less than a predetermined reference for a first constant period of time from a certain time, determining that said moving body is in a stopped condition; computing an average value of output values of the gyro for a second predetermined period of time immediately after said first predetermined period of time, and setting a zero point correction value to said average value; determining whether said speed signal is less than said predetermined reference value for a third predetermined

period of time immediately after said second predetermined period of time; and when said speed signal is less than said predetermined reference for all said first, second and third predetermined periods of time, setting the zero point of the gyro to an updated value corresponding to said zero point correction value and correcting an output value of the gyro with said updated value of said zero point."

Claim 3 concerns an apparatus for correcting a zero point of a gyro and Claims 2 and 4 are dependent claims.

III. The Appellant submitted the following arguments in support of his request: The feature of present Claim 1 that the second period of time is constant is believed to result in an advantage, in the fact that a zero point correction value can be set with accuracy when the moving body repeatedly stops and moves at low speed for a long time, for example, due to traffic congestion. This is in particular the case when using a speed sensor designed to detect the vehicle speed based on the rotation of the vehicle wheel for judging whether the vehicle stops or not. Taking into account the constant time periods T0, T1 and T2 of 5 seconds and the characteristics of the speed sensor of the example mentioned in the present application, on the one hand, and first and third constant periods of 2 seconds and an intermediate second period assumed as being 1 second, in the known method, the criterion of judging whether the vehicle stops or not is more accurate in the present method than in the known method, thereby resulting in an advantage and thus in an inventive step of the present method.

Reasons for the Decision

1. The appeal is admissible.

2. *Patentability of Claim 1*

2.1 A method of correcting a zero point of a sensor such as a rate-type gyroscope for detecting azimuthal deviation of a moving body incorporating such a sensor is known from D1 (see column 1, lines 6 to 12 and 26 to 34; column 2, line 38 to column 3, line 26; column 3, line 57 to column 7, line 32; column 8, line 53 to column 9; line 15; Figures 1 and 2). The method uses a distance travel sensor (4) which generates electric pulse signals at a given interval of unit distance of travel of the moving body, said pulses being shaped in a pulse shaping circuit (5) and then transmitted to a signal processing unit (8) either through a running distance counter circuit (6) for counting the pulses or through a detecting circuit (7) for detecting the frequency of said pulses, i.e. a representation of the speed of the moving body; in particular, a frequency zero indicates a state of stopping. In the known method, when for a period of time (S) consisting of a first constant, predetermined period of time (t1), from a certain time, a second period of time (T) immediately after said first predetermined period of time, and a third predetermined and constant period of time (t2) immediately after said second period of time, said speed signal is zero and thus less than a predetermined reference, i.e. in the same way as in the present application (see page 6, lines 26 to 29), when no speed pulse signal occurs during the three successive periods of time (t1), (T) and (t2) constituting the period (S), there is a method step of determining that the moving body is in a stopped condition (frequency zero);

moreover, in that case, there is a step of computing an average value of output values of the gyro for said second time period (T) and setting a zero point correction value to said average value, and a step of setting the zero point of the gyro to an updated value corresponding to said zero point correction value and correcting an output value of the gyro with said updated value of said zero point. However, contrary to the method of correcting a zero point of a rate sensor of present Claim 1, wherein the second period of time is also predetermined (see lines 15, 21 to 23 and 26 to 27 of Claim 1 on file) and, moreover, as derivable from the present description (see page 3, line 24 to page 4, line 1), constant, in the known method the second period of time (T) is not a constant and is not predetermined because it is determined by taking into account the detection of the times at which the moving body stops and then starts again and thus depends from the detected duration of the stopping state of the moving body. Therefore, since the other prior art documents do not come closer to the present method, the subject-matter of present Claim 1 is novel in the sense of Article 54 EPC.

2.2 The Examining Division has convincingly stressed in the decision under appeal that the method of D1 allows to take optimal advantage of the available stopping time which is important as the average value improves with prolonging the average time whereas the method of the present application is affected by the serious disadvantage to have a constant averaging time, thereby losing data otherwise available for averaging or missing opportunities for zero-adjustment at all. Moreover, the Examining division has mentioned that no particular advantage of the claimed method which could compensate for said disadvantage other than possibly a marginally simpler circuit design was apparent.

2.3 According to the arguments of the Appellant in the written statement of grounds of appeal, the feature of present Claim 1 that the second period of time is constant is believed to result in an advantage, in the fact that a zero point correction value can be set with accuracy when the moving body repeatedly stops and moves at low speed for a long time, for example, due to traffic congestion. However, it is first to be noted that the Appellant's arguments stressing disadvantages of using a speed sensor designed to detect the vehicle speed based on the rotation of the vehicle wheel for judging whether the vehicle stops or not, are not relevant in that sense that present Claim 1 is not restricted to vehicles with wheels, and that no specific type of speed sensor is excluded from the present application for the reason that none is mentioned. As also argued by the Appellant, taking into account the numerical values of the constant time periods T0, T1 and T2 of 5 seconds each and the characteristics of the speed sensor of the only numerical example mentioned in the present application (see page 7, line 27 to page 8, line 5) and emitting a pulse signal of 40 Hz at a speed of 60 Km/hr, said constant time periods T0 = T1 = T2 = 5 seconds are such that T0 + T1 + T2 = 15 seconds corresponds to a speed of 0.1 Km/hr which is presented as a minimal speed indicating that the moving body cannot be considered as being in a cruising state. This part of the Appellant's argument, which is completed by the statement that, thus, a first constant period of 5 second is required, cannot convince for the following reasons: first, such a value of the first constant period is not mentioned in present Claim 1; moreover, with a speed limit, i.e. a predetermined reference of 0.1 Km/hr and with the same characteristics of the speed sensor of 1 pulse for 15 seconds, no pulse is detected in the first constant time period of 5 seconds and thus, contrary to the requirement of present Claim 1 (see

lines 9 to 12), it is not possible to determine during said first constant time period that the speed signal is less than the predetermined reference and thus the moving body is in a stopped condition. The same reasoning also applies to the other steps of the method of present Claim 1 (see lines 20 to 27) wherein it is to be determined whether the speed signal is less than said predetermined reference value for all three constant time periods T0, T1 and T2.

2.4 Moreover, the further argument of the Appellant based on the known method with both first and third constant periods of 2 seconds and an intermediate second period assumed as being 1 second, is insofar not relevant as, for the same speed sensor and the same lower detectable speed limit of 0.1 Km/hr, i.e. in the only technically correct way of comparing the methods, it is not possible to detect a pulse (occurring each 15 seconds) in a period of 2 + 1 + 2 seconds = 5 seconds; thus, with the same conditions, no stopped state of the moving body can be determined either in the known method or in the present method. This also applies, with the same speed sensor and the same speed limit, for any stopping state of the vehicle shorter than 15 seconds, either in the known or in the present method. Thus, since the same minimal period of 15 seconds is needed for determining that the moving body is stopped when keeping the same speed sensor and the same value of the minimal speed representing a stopped state, and since for longer periods of stopped state of the vehicle during which slight movement of the vehicle can take place independently of the implemented method of detection, it is not credible that the probability that the vehicle is stopped during the second, constant period in accordance with the present method is larger than the probability according to the known method with a second, variable and possibly larger period. In this sense, the criterion

in judging whether the vehicle stops or not is not more accurate in the present method than in the known method. Indeed, the constant durations of the first and third periods (t1, t2) of the method of D1 (see column 2, lines 11 to 35) are selected for specific reasons, namely for eliminating measured values of the angle of deviation which could provide erroneous results. On the one hand, the present method, wherein the middle part of the time period during which the vehicle is stopped and the angle of deviation is detected and used for correction is constant and predetermined, allows to eliminate values of the angle of deviation in the rest of the stopped period when said stopped period is long. On the other hand, as convincingly stressed by the Examining Division, by eliminating such available values of the angle of deviation during a part of the stopped period, the present method cannot provide an improvement of the average value with averaging time, so that there is a serious disadvantage, as compared to the known method, of loosing those data outside of the constant and predetermined averaging time (T1) which are otherwise available for averaging or of missing opportunities for zero-adjustment at all. Therefore, since having regard to the objections of the Examining Division and the Appellant's arguments in response there can be seen no particular advantage of the present method as compared to the known method, and thus no specific problem to be solved and its solution, the subject-matter of Claim 1 lacks an inventive step in the sense of Article 56 EPC and Claim 1 is not allowable (Article 52(1) EPC).

3. *Procedural matters*

The main amendment introduced in present Claim 1 as compared to the text on which the decision under appeal was taken is the introduction of the word "first" in

Claim 1 (see line 10 of the claim on file). However, since at other text locations of in particular Claim 1 the same word "first" was already there in the same context, and since the other amendments, whereby "predetermined" is substituted for "constant", are understood, in particular by referring to the description (see page 3, line 11 to page 4, line 4), as resulting in no change of meaning, the application cannot be considered as having been amended in substance after the decision under appeal. Moreover, the Appellant's arguments are not convincing for the reasons mentioned here above. It is also to be noted that said arguments do not allow to detect allowable matter, either in the description and in the drawing or in the further claims 2 to 4, which had been objected by the Examining Division. Therefore, a decision can be taken immediately and the present application must be refused (Article 97(1) EPC).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar

P.Martorana

The Chairman

E.Turrini

MCH