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Datasheet for the decision of 2 June 2025

Case Number: T 0728/23 - 3.2.02

Application Number: 19177792.9

Publication Number: 3581089

IPC: A61B3/16

Language of the proceedings: EN

Title of invention:
REBOUND TONOMETRY METHOD AND APPARATUS

Patent Proprietor:
Reichert, Inc.

Opponent:
Icare Finland Oy

Headword:

Relevant legal provisions:
EPC Art. 100(a), 100(b), 56

Keyword:
Inventive step - (yes)
Insufficiency of disclosure (no)

Decisions cited:

Catchword:

Europäisches Patentamt
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Office européen des brevets

Beschwerdekammern

Boards of Appeal

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Case Number: T 0728/23 - 3.2.02

D E C I S I O N
of Technical Board of Appeal 3.2.02
of 2 June 2025

Appellant: (Opponent)	Icare Finland Oy Äyritie 22 01510 Vantaa (FI)
Representative:	Heinonen & Co Attorneys-at-Law Ltd Fabianinkatu 29 B 00100 Helsinki (FI)
Respondent: (Patent Proprietor)	Reichert, Inc. 3362 Walden Avenue, Suite 100 Depew, NY 14043 (US)
Representative:	Dehns Germany Partnerschaft mbB Theresienstraße 6-8 80333 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 20 February 2023 rejecting the opposition filed against European patent No. 3581089 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	M. Alvazzi Delfrate
Members:	A. Martinez Möller
	Y. Podbielski

Summary of Facts and Submissions

I. The appeal is directed against the decision of the Opposition Division rejecting the opposition against European patent No. 3581089.

II. Oral proceedings before the Board took place on 2 June 2025.

The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed. As an auxiliary measure, the respondent requested that the patent be maintained on the basis of one of the first to sixth auxiliary requests filed with the reply to the grounds of appeal.

III. Claims 1 to 4 and 7 to 10 of the main request (patent as granted) read as follows, with the feature numbering for independent claims 1 and 7 added in bold by the board.

1. "**[1.a]** A tonometer comprising:

[1.b] a probe;
[1.c] a conductive drive coil in which the probe is received;
[1.d] a controller configured to momentarily energize the coil to propel the probe toward a cornea of an eye of a test subject, wherein the probe contacts the cornea of the eye and is

rebounded from the cornea in a reverse direction opposite the forward direction;
[1.e] a conductive measurement coil through which the probe moves;
[1.f] wherein the controller is further configured to measure a current induced in the measurement coil by the moving probe and provide a measurement signal representing velocity of the probe as a function of time;
characterised by:
[1.g] signal processing logic configured to calculate a first derivative of the measurement signal at a moment in time when velocity of the probe is zero due to contact of the probe with the cornea and correlate the first derivative to an intra-ocular pressure value."

2. "The tonometer according to claim 1, wherein the signal processing logic is further configured to calculate at least one viscoelastic parameter of the eye based on the measurement signal."

3. "The tonometer according to claim 2, wherein the at least one viscoelastic parameter includes at least one parameter selected from the group of parameters consisting of: a Lost Energy Ratio, a Time Shift, a damping parameter, and an elastic parameter."

4. "The tonometer according to claim 2 or claim 3, wherein the signal processing logic is further configured to adjust the intra-ocular pressure value based on the at least one viscoelastic parameter."

7. "**[7.a]** A tonometry method comprising:

[7.b] propelling a probe in a forward direction toward a cornea of an eye of a test subject, wherein the probe contacts the cornea of the eye and is rebounded from the cornea in a reverse direction opposite the forward direction;
[7.c] detecting a measurement signal representing velocity of the probe as a function of time;
characterised by:

[7.d] calculating a first derivative of the measurement signal at a moment in time when velocity of the probe is zero due to contact of the probe with the cornea; and
[7.e] correlating the first derivative to an intra-ocular pressure value."

8. "The tonometry method according to claim 7, further comprising calculating at least one viscoelastic parameter of the eye based on the measurement signal."

9. "The tonometry method according to claim 8, wherein the at least one viscoelastic parameter includes at least one parameter selected from the group of parameters consisting of: a Lost Energy Ratio, a Time Shift, a damping parameter, and an elastic parameter."

10. "The tonometry method according to claim 8 or claim 9, further comprising adjusting the intra-ocular pressure value based on the at least one viscoelastic parameter."

IV. The following documents are relevant to the present decision.

D1 US 6,093,147

D2 "Dynamic Tonometry", H. M. Dekking and H. D. Coster, Opthalmologica 154:59-74 (1967)

V. The appellant's arguments, where relevant to the present decision, can be summarised as follows.

Main request - inventive step starting from D2

Article 100(a) EPC prejudiced the maintenance of the patent as granted because claims 1 and 7 lacked an inventive step when starting from D2.

D2 disclosed in the embodiment of Figure 4 a tonometer and a tonometry method in which the maximum deceleration of the probe was measured using a piezoelectric accelerometer and correlated to an intraocular pressure (IOP) value.

As shown in Figure 2 of D2, at the moment in time when the velocity of the probe was zero, the deceleration was at its maximum. Therefore, the only difference to feature 7.d of claim 7 and to feature 1.g of claim 1 was that the first derivative (i.e. the acceleration) was not calculated but directly measured.

Also according to Figure 3 of the opposed patent, in an ideal system the velocity of the probe was zero when the deceleration was at its maximum, and the ideal system was also covered by the wording of features 1.g and 7.d.

Therefore, D2 disclosed all of the features of claim 7, the only difference was that the first derivative was not calculated as required by feature 7.d but directly measured. For the same reasons, D2 also disclosed

features 1.f and 1.g of claim 1 with the same difference that the derivative was directly measured.

Starting from D2, it would have been obvious to measure the velocity instead of the acceleration and to calculate the acceleration as a first derivative of the velocity. Therefore, the subject-matter of claim 7 was obvious in view of D2 combined with common general knowledge.

The subject-matter of claims 1 and 7 did not provide an inventive step over the combination of D2 with D1. The distinguishing features related to a specific realisation of the tonometer that was simple and reliable. The person skilled in the art would combine the tonometer and tonometry method of D1 with the basic idea of D2 to determine the maximum deceleration of the probe.

Main request - sufficiency of disclosure for claims 4 and 10

The invention as defined in dependent claims 4 and 10 was not sufficiently disclosed because the opposed patent did not disclose how the IOP value could be adjusted based on the at least one viscoelastic parameter.

VI. The respondent's arguments, where relevant to the present decision, can be summarised as follows.

Main request - inventive step starting from D2

The subject-matter of each of claims 1 and 7 was inventive when starting from D2.

Neither D2 nor D1 disclosed to calculate a first derivative of the velocity at a moment in time when velocity of the probe was zero and to correlate it to an IOP value (features 1.g, 7.d and 7.e).

The curves in Fig. 2 of D2 were presented as being somewhat idealised, the velocity curves shown therein were not symmetrical around the moment of zero velocity and the maximum deceleration did not coincide with the moment in time when the velocity of the probe was zero. In an ideal system, the probe's maximum deceleration may coincide with the moment in time in which the velocity was zero. But the eye was not an ideal system and the invention was directed at addressing this non-ideality of the eye.

Main request - sufficiency of disclosure for claims 4 and 10

Tonometry measurements were routinely calibrated, and the person skilled in the art knew how to take into account viscoelastic parameters to adjust the IOP value. Therefore, claims 4 and 10 were sufficiently disclosed.

Reasons for the Decision

1. Patent

1.1 The patent relates to rebound tonometers for measuring intraocular pressure (IOP). During a measurement, a probe is moved towards the cornea of an eye, contacts the cornea, is decelerated at a rate which depends on IOP (greater deceleration correlates to a higher IOP), and then rebounds in a direction away from the cornea

back toward the instrument housing. The rebound tonometer detects the motion of the probe and determines IOP based on it.

1.2 For example, the probe may have a magnetised shaft that travels within one or more coils in the instrument housing. A coil can be used to propel the probe towards the cornea. The same or another coil may then be used to, by means of the current induced in the coil by the moving probe, provide a detectable voltage signal representing velocity of the probe as a function of time.

1.3 IOP measurements as described above are susceptible to measurement error caused by viscoelastic forces attributed to biomechanical properties of the corneal tissue and, in particular, to the stiffness of the cornea. The patent addresses this problem by taking a first derivative of the measured voltage signal at a moment in time when the velocity of the probe is zero due to contact of the probe with the cornea, and correlating the first derivative to an IOP value. Figure 1 reproduced below shows an embodiment of the invention, including a probe 12, a drive coil 18, a measurement coil 22 and a controller 20.

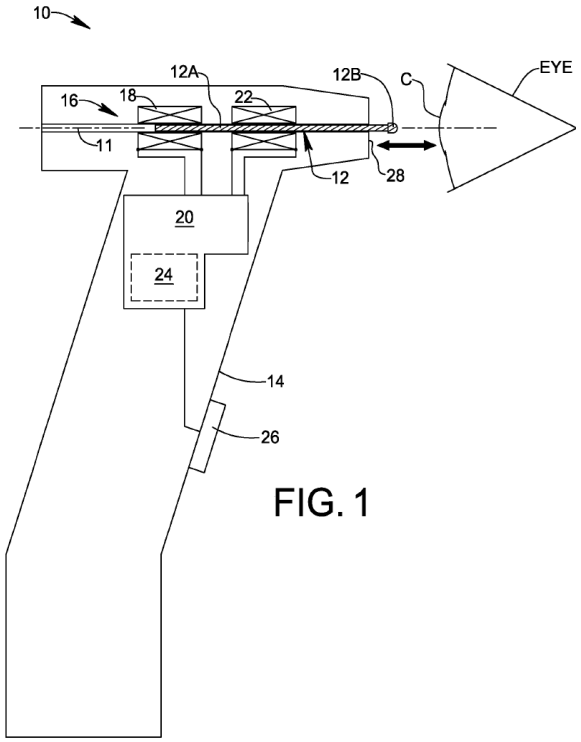

FIG. 1

2. Main request - inventive step starting from D2

2.1 D2 discloses, in the embodiment of Figure 4, a tonometer in which a probe is propelled towards the cornea of an eye and rebounds from it. This tonometer uses a pivoted hammer like the one of the schematic tonometer shown in Figure 1 "but with the counterweight replaced by a piezoelectric accelerometer" (see the first two sentences in the section "Experimental Tonometers of Type A and Type T" on page 65).

2.2 It is common ground that D2 does not disclose at least "calculating a first derivative of the measurement signal at a moment in time when velocity of the probe is zero due to contact of the probe with the cornea", as required by each of claim 7 (feature 7.d) and, within the configuration of the signal processing logic, claim 1 (part of feature 1.g). It is however disputed to which extent this feature is not disclosed in D2.

2.3 The appellant argues that, in view of Figure 2 of D2, the maximum deceleration measured by the tonometer in Figure 4 occurs at the time of impact and at the moment in time when the probe's velocity is zero, and that the difference as regards the above feature is only that in D2 the value is not calculated as a first derivative but directly measured.

2.4 The board comes to a different conclusion. The contact of the probe with the cornea has a certain temporal duration (see part (c) of the curve in Figure 2 of D2 and portions 30B and 30C in Figure 2 of the contested patent). Contrary to the appellant's arguments, it cannot be unambiguously derived from D2, either from Figure 2 or from the text, that the maximum deceleration will occur exactly at the moment in time when the probe's velocity is zero. This is all the more so as D2 acknowledges in the legend of Figure 2 that the graphs are "somewhat idealized", implying that real measurements will differ from what is shown in Figure 2. As discussed in the contested patent, maximum deceleration would coincide with the moment in time in which the probe velocity is zero in an ideal system, but as the eye system is not perfectly elastic and there is viscous damping, there will be a difference in time ("Time Shift") between the moment when velocity is equal to zero and the moment when the deceleration is maximum (see paragraphs [0009], [0021] to [0023] and Figures 3 and 4 of the patent).

2.5 The appellant's argument that the claims of the contested patent cover an ideal case is also unconvincing, as the claims refer to the "cornea of an eye of a test subject" which is not an ideal system. This is acknowledged both in the contested patent (see

passages cited above) and in D2 (loss of energy during the collision on page 60, first full paragraph). The relevant question is whether D2 anticipates the corresponding feature of the tonometer of claim 1 and of the method of claim 7. D2 discloses the measurement of the maximum deceleration (the "pulse height" on page 62, second full paragraph), rather than acceleration when the probe's velocity is zero. D2 thus uses the acceleration at a different point in time, even if these points in time may coincide in a hypothetical perfectly elastic scenario.

2.6 In summary, the difference between the method of claim 7 and that of D2 is not merely that the former calculates the first derivative rather than measuring it, as submitted by the appellant, but also that the first derivative is calculated in claim 7 at a different moment in time. As D2 does not disclose feature 7.d of claim 7, it also does not disclose feature 7.e. For the same reasons, D2 does not disclose feature 1.g of claim 1.

2.7 These distinguishing features result in an IOP value that is less susceptible to measurement error caused by viscous forces associated with the cornea (see paragraphs [0012] and [0028] of the specification).

2.8 The appellant argues that starting from D2 and using only common general knowledge, it would be obvious to replace the direct measurement of maximum deceleration by a measurement of velocity and to calculate the first derivative of velocity to obtain the maximum deceleration, arriving at a method anticipating the method of claim 7.

2.9 Even if the method disclosed by D2 were modified as submitted by the appellant, the resulting method would calculate the maximum value of the first derivative (i.e. the maximum deceleration) and correlate it to an IOP value, and not the first derivate at a moment in time when velocity of the probe is zero as required by features 7.d and 7.e. The inventive-step objection relying on the combination of D2 with common general knowledge is thus not convincing.

2.10 The appellant submits that the subject-matter of each of claims 1 and 7 is not inventive in view of the combination of D2 with D1. According to the appellant, the person skilled in the art would use the basic idea of D2 and replace the tonometer of D2 by the tonometer of D1.

2.11 Even if D2 and D1 were combined as submitted by the appellant, the resulting tonometer and tonometry method would still rely on determining the maximum deceleration and correlating it to an IOP value, as taught in D2. Neither D1 nor D2 disclose determining or calculating the acceleration "at a moment in time when velocity of the probe is zero due to contact of the probe with the cornea" and correlating it to an IOP value. Therefore, combining D2 with D1 would not result in a tonometer that comprises feature 1.g or a tonometry method that comprises features 7.d and 7.e.

2.12 It follows that the subject-matter of each of claims 1 and 7 is inventive when starting from D2.

3. Main request - sufficiency of disclosure for claims 4 and 10

3.1 The appellant submits that the invention as defined in dependent claims 4 and 10 is not sufficiently disclosed because the opposed patent does not disclose how the IOP value could be adjusted based on the at least one viscoelastic parameter.

3.2 As noted in the decision under appeal, the claims do not specify any degree of accuracy. The person skilled in the art knows how a value can be adjusted based on another value, especially in the absence of any requirement as to which effect this adjustment should have. Moreover, paragraph [0026] of the contested patent teaches that an elastic parameter η can be calculated that "correlates strongly with IOP", hence providing a parameter that can be taken into account when adjusting the IOP value. Therefore, the person skilled in the art would be able to carry out the invention as defined in claims 4 and 10.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

A. Chavinier-Tomsic M. Alvazzi Delfrate

Decision electronically authenticated