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Datasheet for the decision of 30 April 2015

Case Number: T 1930/12 - 3.5.05

Application Number: 04254383.5

Publication Number: 1619578

IPC: G06F3/033

Language of the proceedings: EN

Title of invention:
Optical device, and optical mouse incorporating the optical device

Applicant:
STMicroelectronics (Research & Development) Limited

Headword:
Prism-based optical mouse/STM

Relevant legal provisions:
EPC Art. 56
RPBA Art. 13(1), 13(3)

Keyword:
Request for oral proceedings via video-conference - (refused)
Admission of request filed during oral proceedings - (yes)
Inventive step - (yes, after amendment)

Decisions cited:
T 1266/07

Catchword:

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Case Number: T 1930/12 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 30 April 2015

Appellant: (Applicant)	STMicroelectronics (Research & Development) Limited Planar House Parkway, Globe Park Marlow, Buckinghamshire SL7 1YL (GB)
Representative:	Style, Kelda Camilla Karen Page White & Farrer Bedford House John Street London, WC1N 2BF (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 20 February 2012 refusing European patent application No. 04254383.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair	A. Ritzka
Members:	K. Bengi-Akyuerek
	F. Blumer

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division to refuse the present European patent application on the grounds of lack of inventive step (Article 56 EPC) with respect to the claims of a main request and an auxiliary request, having regard to the disclosure of

D1: DE-A-102 20 890,

combined with the skilled person's common general knowledge as exemplified by

D2: US-A-2003/0034959.

II. With the statement setting out the grounds of appeal, the appellant filed new claims according to a main request and two auxiliary requests. It requested that the decision of the examining division be set aside and that a patent be granted on the basis of the main request or either of the auxiliary requests.

III. In an annex to a summons to oral proceedings pursuant to Article 15(1) RPBA, the board gave its preliminary opinion on the appeal. In particular, it raised objections under Articles 123(2) and 84 EPC as well as Articles 54 and 56 EPC, mainly having regard to D1.

IV. By its letter of reply, the appellant submitted amended claims according to a main request and five auxiliary requests alongside counter-arguments on the objections raised in the board's communication under Article 15(1) RPBA. As to the scheduled oral proceedings, it also "precautionarily request[ed] the opportunity to attend

by video-conference means as indicated by OJ 2006,585".

V. The board informed the appellant via a communication that it refused the request that the scheduled oral proceedings be held via video conferencing.

VI. Oral proceedings were held as scheduled, during which the appellant filed a new main request, replacing the former claim requests, in response to objections raised under Articles 84 and 56 EPC by the board and discussed during the oral proceedings.

The appellant's final request was that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 to 17 of the main request filed during the oral proceedings before the board.

At the end of the oral proceedings, the decision of the board was announced.

VII. Claim 1 of the main (sole) request reads as follows:

"An optical device which in use is positioned on a surface (24) and which illuminates an area of said surface under the device; the device comprising a printed circuit board (50) arranged parallel to said surface (24); a light source (28) and a light guide for projecting light from the light source (28) onto said area; wherein the light guide comprises a body of optically transparent material formed to provide an[sic] prism (10;30) having an input face (12) facing the light source (28) and an output face (14) spaced from and at an angle to the input face (12); characterised in that:

the light source is arranged horizontally with respect to said surface;

with reference to the perpendicular to said surface as 0°, the input face (12) is positively curved and has an angle from -10° to +60°, the output face (14) has an angle from -60° to +10°, and one of said faces has an angle less than ±5°, such that in use, light from the light source (28) passing through the input face undergoes bending and passage through the output face provides further bending such that light from the light source is refracted from the horizontal onto said surface by the prism (10;30); and

said light source (28) and light guide are provided beneath an underside surface of said printed circuit board (50)."

Claim 12 of the main request is directed to an optical mouse comprising *inter alia* the optical device according to claim 1.

Reasons for the Decision

1. The appeal is admissible.

2. *Request for oral proceedings via video-conference*

In its letter of 27 March 2015, the appellant requested that the oral proceedings before the board be held as a video-conference (point IV above). The board refused this request for the following reasons:

2.1 On the one hand, video-conferences before an examining division are subject to the rules set out in the "Updated information from the EPO dated 1 May 2012 concerning interviews and oral proceedings to be held as a video-conference" (OJ EPO 2012, 354, replacing the earlier version published in OJ EPO 2006, 585). There

are presently no corresponding provisions for the Boards of Appeal. In particular, there are no provisions concerning video-conferences in the Rules of Procedure of the Boards of Appeal (RPBA).

2.2 On the other hand, oral proceedings held before the examining division are, in accordance with Article 116(3) EPC, not public, whereas those before the Boards of Appeal are public pursuant to Article 116(4) EPC. In any future arrangements concerning video-conferences in appeal proceedings, it would be necessary to ensure that the use of video-conferencing is reconciled with the requirement that second-instance oral proceedings are public.

2.3 As those two issues have not yet been clarified, the board was not in a position to allow the appellant's request (see T 1266/07, point 1).

3. MAIN REQUEST

This request was submitted during the oral proceedings before the board, i.e. at a very late stage of the overall procedure. Nonetheless the board admitted it into the appeal proceedings under Article 13(1) and (3) RPBA, since it was regarded as a legitimate and successful attempt to overcome the objections raised by the board, and since the board was able to deal with it without having to adjourn the oral proceedings.

The present main request differs from the main request refused by the examining division essentially in that claim 1 no longer includes the feature that light is refracted "without undergoing reflection", as a reaction to the objection raised by the board under Article 84 EPC (cf. board's communication pursuant to

Article 15(1) RPBA, section 3.2.1), and that it further specifies that

A) the optically transparent material is formed to provide a prism;
B) with reference to the perpendicular to said surface as 0°, the input face is positively curved and has an angle from -10° to +60°, the output face has an angle from -60° to +10°, and one of said faces has an angle less than ±5°, such that in use, light from the light source passing through the input face undergoes bending and passage through the output face provides further bending such that light from the light source is refracted from the horizontal onto said surface by the prism;
C) the light source and the light guide are provided beneath an underside surface of said printed circuit board.

Feature A) is supported e.g. by page 3, lines 16-19 and claim 1, whilst feature B) is based on page 5, lines 14-18 and claim 5 in conjunction with page 3, line 30 to page 4, line 2 of the application as filed. Furthermore, feature C) finds its basis e.g. in Fig. 3 (see reference signs 28, 30 and 50) of the original application.

Hence, the board is satisfied that the above amendments comply with Article 123(2) EPC.

3.1 Article 52(1) EPC: Novelty and inventive step

The board judges that claim 1 of the sole request meets the requirements of Article 52(1) EPC in conjunction

with Articles 54 and 56 EPC, for the following reasons:

3.1.1 The present invention concerns an optical pointing device, more particularly a low-profile optical mouse, which relies upon the use of light refraction, rather than reflection, caused when light emitted by the device's light source passes a light guide and impinges on a base surface such as a mouse mat. According to the patent application, the problem to be solved by the present invention is to overcome or mitigate the problems of the prior-art optical mice related to additional costs and complexity due to the use of multiple reflecting surfaces of a light guide (cf. page 1, line 21 to page 2, line 5 of the application as filed).

3.1.2 The board accepts that prior-art document D1 represents a suitable starting point for the assessment of inventive step (cf. appealed decision, sections 2 and 4), since it is, like the present invention, related to an optical device ("optische Maus") that comprises a light source ("LED 100") and a refractive light guide ("Brechungslinse 135"), which may include a prism ("keilförmiges Prisma") with a positively curved input face ("Eintrittsoberfläche 110") facing the light source and an output face ("Austrittsoberfläche 115") spaced from and at an angle to the input face for projecting light from the light source onto an area ("Zielgebiet 120") of a base surface such as a table surface or a mouse mat (see e.g. D1, column 6, lines 52-63 and column 7, lines 61-66 in conjunction with Fig. 1A). Also, the device comprises a printed circuit board ("Leiterplatte 105") arranged parallel to the base surface (see e.g. column 3, lines 35-36 in conjunction with Figs. 1A and 1B).

3.1.3 It is also apparent that D1 additionally shows an embodiment in which the LED is horizontally mounted within the optical mouse (see e.g. Fig. 5). That embodiment is, however, exclusively related to the use of a *reflective* rather than a *refractive* light guide (see also point 3.1.7 below). Therefore, the board concurs with the examining division (see appealed decision, section 2.2) that D1 fails to disclose the feature of claim 1 that the light source is arranged horizontally with respect to the base surface in combination with its other features. Furthermore, the board also finds that D1 does not directly and unambiguously disclose added features B) and C) of claim 1, i.e. the concrete shape and angle ranges of the input and output faces of the light guide, i.e. prism, and the location of the light source and the light guide with respect to the printed circuit board.

Consequently, the subject-matter of claim 1 is found to be novel over D1 (Article 54 EPC).

3.1.4 With regard to the distinguishing feature that the light source is arranged horizontally, the board agrees with the finding of the decision under appeal (see sections 2.3 to 2.6) that, in view of embodiments of D1 or D4 relating to the use of a horizontally placed light source within an optical device (see D1, Fig. 5 or D4, Fig. 4) and the known benefits and drawbacks of making a device thinner or shorter, this feature - by and of itself - cannot contribute to an inventive step.

3.1.5 As to the technical effects achieved by distinguishing features B) and C), the appellant was able to convince the board that feature B) is causally responsible for guiding the light such that it only undergoes bending, i.e. *deflection*, at the prism's input and output face,

without making further use of internal *reflection* and that thereby the resulting light guide requires only two accurate optical surfaces (cf. page 3, line 30 to page 4, line 2 together with page 5, lines 14-18 and page 7, lines 14-17 of the application as filed). Thus, such an arrangement credibly ensures that the light emitted by the device's light source needs to interact with only two surfaces, namely the prism's input face and its output face, thereby reducing the number of critical surfaces needed for an error-free optical detection (by the corresponding optical sensor) and thus also reducing manufacturing costs.

The board further accepts that feature C) enables integration of the device's essential components with the printed circuit board (PCB) in an aligned way, avoiding the need for providing extra holes (i.e. apertures/cut outs) in the PCB. Thereby, the optical coupling between the light source and the light guide is improved, whilst costs of manufacture are further decreased. The appellant also plausibly argued at the oral proceedings before the board that the above distinguishing features contributed to a synergistic effect of providing an easy-to-manufacture low-profile optical device.

3.1.6 In view of the above, the objective problem to be solved by claim 1 may be formulated as "how to provide an optical pointing device with less error-prone light detection while keeping the device's profile low".

3.1.7 Starting from the teaching of D1, the skilled person would readily notice that D1 covers essentially two embodiments, i.e. a first embodiment (most notably represented by Fig. 1A) which uses a refractive prism but has an inclined light source (see paragraphs [0011]

and [0024] to [0035] in conjunction with Figs. 1A, 1B and 2), and a second embodiment (most notably represented by Fig. 5) which relies upon reflective surfaces of a light guide ("kegelförmige Lichtröhre") alongside a horizontally arranged light source (see paragraphs [0012], [0013] and [0036] to [0045] in conjunction with Figs. 3A to 6). The first embodiment is supposed to avoid total internal optical reflections at the light guide by using a refractive optical lens (prism) as a light guide (see column 4, lines 14-20, column 7, lines 61-66 and column 8, lines 29-53 in conjunction with Fig. 1A; see also appealed decision, page 5, penultimate paragraph), in accordance with the present invention. However, this embodiment is related to a structural setting (see in particular Figs. 1A and 1B) in which the light source is in fact tilted against the base surface (rather than being arranged horizontally), i.e. resulting in an additional height, and in which the light source is located *above* the optical device's PCB ("Leiterplatte 105") while the light guide is positioned *beneath* that PCB (rather than both being provided beneath the PCB), i.e. making necessary an extra aperture on the PCB. On the other hand, the second embodiment relating to a horizontally mounted light source deploys a cone-type light tube which definitely relies upon total internal light reflections, i.e. "TIR" (see e.g. D1, column 11, lines 35-38: "Bei allen Ausgestaltungen ... kann jedes beliebige Material verwendet werden, mit denen eine Lichtröhre hergestellt werden kann, die die TIR-Bedingung erfüllt") and uses an aperture for the light beam within the PCB, again requiring an extra hole in the PCB.

However, it is apparent to the board that each of those distinct embodiments is so conclusively and completely

defined in D1 that the skilled person in the field of optical pointing devices would be led away from a potential "pick-and-mix" approach in attempting to solve the above-identified objective problem by combining or optimising the device's design parameters. The board considers that this is mainly due to the fact that the skilled person would be aware that, when substantially altering the proposed device configurations of D1, the extent to which the desired effect of providing an efficient light detection within an optical mouse is achieved (see e.g. D1, paragraph [0006]) may dramatically deteriorate, e.g. by the proper distance and/or angle between the light source and the light guide deployed being adversely affected.

In summary, apart from the fact that any angle ranges are completely missing from D1's teaching, this document is silent as to the express need to rely on merely two accurate optical surfaces and to avoid extra apertures, i.e. protrusions, in its printing circuit board. Rather, the board holds that the skilled person, in his attempt to find a possible solution to the above objective problem, would instead apply to the optical mouse in question a high-power LED or optimise the angle between the LED and the light guide in the case of the first embodiment based on a refractive lens. Alternatively, he would use different shapes of the reflecting surfaces in the case of the second embodiment based on the overall teaching of D1 (see e.g. paragraphs [0010], [0012], [0032] or [0041]) instead of adapting the angular relationship in terms of the input and output faces of the refractive lens of the first embodiment according to feature B) and altering the location of the LED and said lens with

regard to the PCB according to feature C) of claim 1.

3.1.8 Likewise, the board finds that the other relevant prior-art documents on file, i.e. D2 and D4, may not render the subject-matter of claim 1 obvious:

Document D2, cited as an example of the skilled person's common knowledge as to combining optical and mechanical functions within sub-units of an optical device in the decision under appeal (see sections 3.3 and 4.2), relates to an optical mouse which, even though using a prism ("prism 38D") as a light guide and a light source ("LED 34") which is horizontally placed (see D2, Figs. 2 and 3), needs an extra hole 36A for emitting the LED's light onto the prism (see e.g. D2, Fig. 2) and makes additional use of light reflections at the prism deployed (see e.g. D2, Fig. 3).

Document D4 was referred to as evidence of the skilled person's common knowledge with regard to horizontally mounting an LED in an optical mouse in the decision under appeal (see section 2.6) and it also teaches the use of a horizontally placed LED and a refractive lens. Nonetheless, it likewise fails to provide any incentive or motivation to use a prism with such a shape that it would allow to avoid the use of total internal light reflections. Furthermore, it relies on a light source which is located above the PCB with the light guide extending below the PCB (see D4, Fig. 4), thus again necessitating extra apertures on the PCB.

Therefore, even if the teachings of D2 and/or D4 were combined with the disclosure of D1, the board is convinced that the skilled person would not arrive at the claimed solution.

3.1.9 In view of the above and contrary to the finding in the decision under appeal (in respect of former dependent claims) that the particular values and ranges relating to the shape of the light guide as claimed were arbitrarily chosen and did not constitute a purposive selection which would provide a technical effect other than avoiding internal optical reflection (cf. appealed decision, section 3.2), the board rather considers that supporting solely light *deflections* instead of *reflections* at the respective prism together with placing the light source and the light guide beneath the PCB according to distinguishing features B) and C) cannot, in the present case, be derived by the mere application of trial-and-error or normal design procedures. This is due to the fact that those device characteristics are strongly interrelated with each other and appropriately reflect the desired result to be achieved according to the present application.

Thus, the board cannot discern any hint in the cited prior art - whether starting from D1, D2 or D4 - which could cogently demonstrate that the skilled person would indeed take up the overall solution according to claim 1, out of many others, in particular the definition of the shape of the light guide and its position together with that of the light source in the context of providing a low-profile optical mouse with less error-prone light detection.

3.2 Accordingly, in the light of the cited prior art, the subject-matter of claim 1 is held to be new and to involve an inventive step within the meaning of Article 52(1) EPC in conjunction with Articles 54 and 56 EPC. The above observations also apply to claim 12, directed to a corresponding optical mouse which

comprises the optical device as defined by claim 1.

4. Since all the other requirements of the EPC are also found to be fulfilled, the board decides to grant a patent on the basis of claims 1 to 17 according to the main request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division with the order to grant a patent on the basis of the following documents:

   - Claims 1-17, filed as main request during the oral proceedings before the board;

   - Description:
     - page 1 as filed with the statement setting out the grounds of appeal on 20 June 2012
     - page 2 as filed during the oral proceedings before the board
     - pages 3-8 as originally filed;

   - Figures 1, 2, 3, 3a, 3b as originally filed.

The Registrar: The Chair:

K. Götz-Wein A. Ritzka

Decision electronically authenticated