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Datasheet for the decision of 14 May 2018

Case Number: T 1768/12 - 3.5.06

Application Number: 03009031.0

Publication Number: 1355226

IPC: G06F1/32

Language of the proceedings: EN

Title of invention:
Wireless interface device with reduced power consumption

Applicant:
Avago Technologies General IP
(Singapore) Pte. Ltd.

Headword:
Wireless mouse/keyboard with reduced power consumption/AVAGO

Relevant legal provisions:
EPC Art. 123(2)
EPC 1973 Art. 56, 111(1)

Keyword:
Amendments - added subject-matter (no)
Inventive step - after amendment
Remittal to the department of first instance - (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
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Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 1768/12 - 3.5.06

D E C I S I O N
of Technical Board of Appeal 3.5.06
of 14 May 2018

Appellant: (Applicant)	Avago Technologies General IP (Singapore) Pte. Ltd. 1 Yishun Avenue 7 Singapore 768923 (SG)
Representative:	Jehle, Volker Armin Bosch Jehle Patentanwaltsgesellschaft mbH Flüggenstrasse 13 80639 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 19 March 2012 refusing European patent application No. 03009031.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	W. Sekretaruk
Members:	A. Teale
	S. Krischer

Summary of Facts and Submissions

I. This is an appeal against the decision, dispatched with reasons on 19 March 2012, to refuse European patent application No. 03 009 031.0 on the basis that the amendments to the independent claims according to a main and three auxiliary requests did not comply with Article 123(2) EPC regarding added subject-matter.

II. In the course of examination proceedings the following documents in the European Search Report, amongst others, were referred to:

D1: US 2002/0035701 A1 and

D4: Haartsen J. et al., "Bluetooth: Vision, Goals, and Architecture", 1 October 1998, Mobile Computing and Communications Review, Volume 2, Number 4, pages 38 to 45, ISBN: 1091-1669, XP000784002.

III. A notice of appeal and the appeal fee were received on 21 May 2012. The appellant requested that the decision be set aside and that a patent be granted. An auxiliary request was also made for oral proceedings.

IV. With a statement of grounds of appeal, received on 20 July 2012, the appellant submitted claims according to a main and two auxiliary requests and requested that the decision be set aside and that a patent be granted on the basis of one of said requests.

V. In an annex to a summons to oral proceedings the board set out is preliminary opinion that the amendments to the claims complied with Article 123(2) EPC, thus overcoming the reasons for the appealed decision. The

independent method claims of all requests were however unclear, Article 84 EPC 1973, and the subject-matter of the independent claims of all requests seemed to lack inventive step, Article 56 EPC 1973.

VI. With a letter received on 13 April 2018 the appellant submitted amended claims according to a main and two auxiliary requests.

VII. In view of the amendments made to the claims of the main request, the board then cancelled the oral proceedings.

VIII. The application is being considered in the following form:

Description (all requests):
pages 1 to 25, as originally filed.

Claims (all received with the submission received on 13 April 2018):
Main request: 1 to 19.
First auxiliary request: 1 to 17.
Second auxiliary request: 1 to 3.

Drawings (all requests):
Pages 1/11 to 11/11, as originally filed.

IX. The independent claims according to the main request read as follows

"1. An integrated circuit (202, 400, 800, 1100) contained within a user input device (104, 108) that services communications between a wirelessly enabled host (102, 106) and the user input device (104, 108), the integrated circuit (202, 400, 800, 1100)

comprising: a wireless interface unit (404, 804) that wirelessly interfaces with the wirelessly enabled host (102, 106); a processing unit (402, 802) operably coupled to the wireless interface unit (404, 804); an input/output unit (406, 806) operably coupled to the wireless interface unit (404, 804), to the processing unit (402, 802), and to the user input device (104, 108); and a power management unit (408, 808) operably coupled to the wireless interface unit (404, 804), the processing unit (402, 802), and the input/output unit (406, 806), wherein the power management unit (408, 808) controls the power consumption of the integrated circuit (202, 400, 800, 1100) by: assisting the processing unit (402, 802) in entering one of a plurality of power conserving modes including a power down mode; and if a notification is received at the power management unit (408, 808) from the input/output unit (406, 806) that indicates activity by the user input device (104, 108), causing the processing unit (402, 802) to exit the one of the plurality of power conserving modes in response to the notification; characterized in that in the power down mode: the processor unit (402, 802) causes the wireless interface unit (404, 804) to be powered down; the power management unit (408, 808) causes a processing unit clock (1112) to be disabled such that it does not oscillate; and in response to the notification, the power management unit (408, 808) causes the processing unit (402, 802) to exit the power down mode and to power up the processor unit (402, 802), the wireless interface unit (404, 804) and a clock oscillator(1112) of the processing unit clock (1112)."

"17. A method for controlling the operation of a wireless interface device (400, 800) that services communications between a wirelessly enabled host (102,

106) and at least one user input device (104, 108), the wireless interface device (400, 800) including a wireless interface unit (404, 804), a processing unit (402, 802), and an input/output unit (406, 806) that couples to the at least one user input device (104,108), the method comprising: when the at least one user input device (104, 108) is active, powering the wireless interface unit (404, 804), the processing unit (402, 802), and the input/output unit (406, 806), and fully enabling operation of the wireless interface unit (404, 804); when the at least one user input device (104, 108) has been inactive according to a first inactivity criterion, entering a reduced power mode that includes powering the wireless interface unit (404, 804), the processing unit (402, 802), and the input/output unit (406, 806), and partially disabling operation of the wireless interface unit (404, 804); when the at least one user input device (104, 808) has been inactive according to a second inactivity criterion, entering a power down mode that includes powering down the wireless interface unit (404, 804), causing the processing unit (402, 802) to enter a power conservation state, and continuing to power the input/ output unit (406, 806); and when the at least one user input device (104, 808) becomes active from an inactive state, powering the wireless interface unit (404, 804), the processing unit (402, 802), and the input/output unit (406, 806), and fully enabling operation the wireless interface unit (404, 804); characterized in that in the power down mode: the processing unit (402, 802) causes the wireless interface unit (404, 804) to be powered down; a processing unit clock (1112) is disabled to disable its oscillation; and when the at least one user input device (104, 808) becomes active from an inactive state, the processing unit (402, 802) is caused to exit the power down mode and to power up a

clock oscillator (1112) of the processing unit clock (1112)."

In view of the board's decision, the text of the claims of the auxiliary requests is not material to the decision.

Reasons for the Decision

1. The admissibility of the appeal

In view of the facts set out at points I, III and IV above, the appeal complies with the admissibility criteria under the EPC and is consequently admissible.

2. Summary of the invention

2.1 The application relates to an integrated circuit contained within a wireless input device, for instance a mouse (see figures 1A; 104 and 2) or a keyboard (see figures 1B; 108 and 3), for use with a computer, termed the "wirelessly enabled host". As shown in figures 2 and 3, in addition to an integrated circuit (IC) such wireless input devices comprise switches and/or sensors (212, 214), for instance responding to mouse movement, a scroll wheel or a button/key press, and a battery (204). As shown in figures 4 and 8, the IC comprises a wireless interface unit (404, 804), a processing unit (402, 802), a power management unit (408, 808) and an input/output unit (406, 806), the latter being connected to the sensors/switches; see figure 7.

2.2 In order to extend battery life, the input device can operate in one of four power modes, described in the specification of the Bluetooth standard (see page 19,

lines 8 to 9, and figures 9 and 10): "busy" mode (the usual operating mode in which all functions are enabled) and three low power modes which achieve progressively lower power consumption by turning off progressively more functions: "idle" mode (in which the wireless interface unit is turned off), "suspend" mode (in which the clock of the processing unit is gated) and "power down" mode (in which the clock of the processing unit is stopped); see page 3, line 13, to page 4, line 18, and page 19, line 11, to page 20, line 17. The reduction in power consumption achieved by these measures, illustrated in figure 10, is summarized on page 24 in table 1.

2.3 If the device is already in busy mode, any user input arriving at the input/output unit, termed "activity" in the claims, will keep the device in busy mode. If however the device is in one of the power saving modes, then user activity will cause it to enter busy mode.

2.4 The independent claims of the main request set out the "power down" mode, which achieves the lowest power consumption of all the low power modes. According to the invention, the "power down" mode is realized by turning off power to the clock of the processing unit, thus stopping it from oscillating and stopping the processing unit; see page 4, lines 13 to 18. The board understands the references on page 4, lines 16 to 18, and page 24, lines 7 to 9, to the power management unit "power[ing] up the clock oscillator" when user input occurs and the device transitions from "power down" mode to "busy" mode to mean that in "power down" mode the clock oscillator is powered down, thus eliminating the current consumed in the clock oscillator; see page 24, lines 4 to 6. This functionality is realized by clock/voltage regulator "CLK/VR" 1112, shown in figure

11, which supplies a supply voltage (VDD_PU) and a clock (CLK) to the processing unit (802); see page 24, lines 4 to 9.

3. Clarity, Article 84 EPC 1973

3.1 The amendments made to the current claims overcome the clarity objections raised by the board in its preliminary opinion.

3.2 The board however notes that claims 1 and 17 set out the processing unit powering itself up on exiting the power down mode, which is not only self-contradictory but also contradicts the passages in the description (see page 4, lines 13 to 18, and page 24, lines 6 to 9) which state that the power management unit powers up the clock oscillator, the processing unit and the wireless interface unit. For the purposes of this decision, the board has construed these passages in claims 1 and 17 in the light of the description. Remittal of the case will allow the appellant to remedy this deficiency.

3.3 Furthermore, both claims 1 and 17 use inconsistent terminology, Rule 35(13) EPC 1973, regarding the clock oscillator (see page 4, lines 13 to 18), referring to "a processing unit clock (1112)" as well as "a clock oscillator (1112) of the processing unit clock (1112)". Claim 1 is also inconsistent in referring to both a "processing unit (402, 408)" and "processor unit (402, 408)".

4. Added subject-matter, Article 123(2) EPC

4.1 According to the reasons for the appealed decision, the expression in claim 1 of the main request "an

integrated circuit (202, 400, 800, 1100) contained within a wireless interface device" was not directly and unambiguously derivable from the application as filed because the description, in particular page 16, lines 6 to 7, and page 4, lines 19 to 21, disclosed a wireless interface device in an integrated circuit form, rather than disclosing a wireless interface device containing an integrated circuit. Present claim 1 uses a similar expression, setting out an integrated circuit contained within a user input device in the context of a wireless interface. The board disagrees with the decision on this point, since page 4, lines 20 to 21, of the description states that "The single monolithic integrated circuit may be contained within a wireless mouse or within a wireless keyboard when installed." In the board's view, this is a direct and unambiguous disclosure of an integrated circuit contained within a wireless interface device. Hence present claim 1 overcomes this ground for the decision.

4.2 The decision also found that there was no basis in the application as filed for the deletion from claim 1 of the main request of the expression "entering a power down mode". Present claims 1 and 17 both set out entering a power down mode (in claim 1 from line 24 onwards, in claim 17 from line 25 onwards), hence overcoming this reason for the decision.

4.3 According to the reasons for the decision, the expression in *inter alia* claim 1 of the main request "and the wireless interface unit (404, 804) requests the wirelessly enabled host (102, 106) to enter a sniff mode with a sniff interval that is chosen based on desired latency and average power consumption;" was not directly and unambiguously derivable from the application as filed. Present claims 1 and 17 do not

use this, or similar, expressions and hence overcome this reason for the decision.

4.4 The decision also found that there was no basis in the application as filed for the deletion from independent method claim 25 of the main request of the expression "when the at least one user input device has been inactive according to a second inactivity criterion, entering a power down mode that includes powering down the wireless interface unit, causing the processing unit to enter a power conservation state, and continuing to power the input/output unit;". Present claims 1 and 17 both set out entering the "power down" mode when the input device has been inactive according to a second inactivity criterion and hence overcome this reason for the decision.

4.5 The decision also found that there was no basis in the application as filed for the deletion of the expression "when the at least one user input device becomes active from an inactive state, powering the wireless interface unit, the processing unit, and the input/output unit, and fully enabling operation the wireless interface unit" from method claim 25 of the main request. Present independent method claim 17 sets out powering up/fully enabling all the device functions which are powered down in the "power down" mode, thus also overcoming this reason for the decision.

4.6 The board is satisfied that, interpreted in the light of the description (see the discussion of clarity above), the amendments to claims 1 and 17 comply with Article 123(2) EPC.

5. Document D1

5.1 D1 relates to power management in a battery-powered wireless optical mouse for use with a host computer (see figure 6 and paragraph [0026]). As such devices are often left turned on, but idle, for significant periods of time, measures are taken to extend battery life by switching between various power states based upon the presence or absence of input activity, sensed by capacitive user proximity detection; see abstract, lines 18 to 23.

5.2 The mouse saves power by only selectively supplying power to two input signal generating means (see paragraph [0014], lines 4 to 6) depending on a signal (TouchVal) indicating whether the user is touching, or in close proximity to, the mouse; see paragraph [0013], last six lines. The first signal generating means consumes more power than the second (see claim 29) and is an "optical tracking engine" (see claim 30). As shown in figure 4, this comprises an LED (81) light source which illuminates the work surface (92) upon which the mouse is being used, light from the work surface being directed to an image detector (89) connected to a controller (91); see paragraph [0055]. The second input signal generating means is a "scrolling device" which optically monitors the scroll wheel of the mouse; see claim 44, figure 2;19 and paragraph [0069].

5.3 Figure 8 shows a state machine diagram for the mouse, which is normally operating in the "active" state (see paragraphs [0072, 0078]) in which power is supplied to the optical tracking engine and scroll device, but successively enters the following low power states (listed in order of decreasing power consumption) if it

is left idle, so that a respective timer expires: "idle", "extended idle"/"beacon", and "shutdown". Should any input activity be detected in the low power states, then the mouse immediately switches back to the "active" state; see paragraph [0074].

5.4 In the "shutdown" state, which consumes the least power, the "optical tracking engine" is turned off (see switch 130 controlling V_OPT in figure 1), but the microprocessor (1) and "scroll device" are periodically - at "wake interrupt" intervals - powered up to *inter alia* monitor the scroll wheel; see paragraphs [0071, 0091]. When the microprocessor is powered down, it is referred to as being in "stop" mode; see paragraph [0080].

5.5 In the "idle" state the mouse cycles between the "active" state for 50 ms and the shutdown state for 80 ms; see paragraphs [0072, 0080 and 0081]. The "extended idle" state differs from the "idle" state in that the shutdown time per cycle is increased by a factor of 12; see paragraphs [0072, 0083]. The "beacon" state occurs when no light from the work top is detected and differs from the "extended idle" state only in that the LED light source 9/81 is flashed once a second; see paragraphs [0073, 0085, 0086].

5.6 The board regards the microprocessor 1 as an integrated circuit and the transmitter 5 as a wireless interface unit. The microprocessor interface connection to the "Z PCB" (153) in figure 1 (connected to the scroll wheel sensor (157)) is regarded as an input/output unit. The board notes that, although D1 mentions (see paragraph [0080]) the microprocessor being "put in a STOP mode", an external RC network (figure 1;177 and "wake" input to microprocessor) being used to wake the

microprocessor processor after a delay of 80 ms, this does not necessarily mean that the microprocessor clock does not oscillate. The microprocessor could, for instance, merely ignore the clock signal or the clock signal could be gated and thus not passed to the microprocessor.

5.7 Hence, in terms of claim 1 of the main request, D1 discloses an integrated circuit (1) contained within a user input device (figure 2; mouse 13) having a wireless interface unit (5) that wirelessly interfaces with the wirelessly enabled host (figure 2; computer 11), the integrated circuit comprising: a processing unit (1) operably coupled to the wireless interface unit (5); an input/output unit (1, interface to 157) operably coupled to the wireless interface unit, and to the user input device (scroll wheel optical detector 157); and a power management unit (in microprocessor) operably coupled to the wireless interface unit, the processing unit, and the input/output unit, wherein the power management unit controls the power consumption of the integrated circuit (figure 8; low power states 171, 169 and 165) by: assisting the processing unit in entering one of a plurality of power conserving modes including a power down mode; and if a notification is received at the power management unit from the input/ output unit (see paragraph [0091]; button activation causes a microprocessor interrupt) that indicates activity by the user input device, causing the processing unit to exit the one of the plurality of power conserving modes in response to the notification.

5.8 In terms of claim 17 of the main request, D1 also discloses corresponding method features to the apparatus features set out above.

6. Document D4

D4 provides an introduction to the Bluetooth wireless interface standard. The last two paragraphs on page 41 and figure 3 on page 42 mention three low power modes. In order of decreasing duty cycle and increasing power saving these are termed: "sniff", "hold" and "park". No further details of the modes are given.

7. Inventive step, Article 56 EPC 1973

7.1 A section headed "Obiter dictum" at the end of the appealed decision states that all features of claim 1 as originally filed were known from D1; see figure 1 and paragraphs 65, 70, 74 and 80. The amended claims filed during examining proceedings shared the additional feature of the idle (sniff) mode, taken from the description; see page 19, lines 7 to 22, and the paragraph bridging pages 21 and 22. As the idle mode was known from the Bluetooth specification, it was obvious to include this feature in the wireless device of D1 in order to solve the trivial problem of making it compatible with the Bluetooth standard.

7.2 The board finds that the subject-matter of an amended claim 1, clarified according to the description (see page 4, lines 13 to 18, and page 24, lines 6 to 9) as mentioned above, would differ from the disclosure of D1 in the following features:

a. the integrated circuit further comprises a wireless interface unit that wirelessly interfaces with the wirelessly enabled host,

b. wherein in the power down mode the processor unit causes the wireless interface unit to be powered down,

c. the power management unit causes a processing unit clock to be disabled such that it does not oscillate and

d. in response to the user activity notification, the power management unit causes the processing unit to exit the power down mode and powers up the wireless interface unit and the processing unit clock.

7.3 The board accepts the appellant's argument that disabling the processing unit clock so that it does not oscillate in the power down mode, set out in both claim 1 and 17 and understood by the board to mean powering the clock down, is not the same as reducing the processor supply voltage, known from D1 (see paragraph [80]), nor is it disclosed in D1 or D4 as being specified in the Bluetooth standard. The board also takes the view that feature "c" understood in the light of feature "d", being constant in the power down mode, is not the same as the periodic powering up and down known from the "shutdown" mode in D1.

7.4 The board concludes that at least features "c" and "d" are neither disclosed by D1, not are they an obvious solution to an obvious problem starting from D1, even in the light of D4. Method steps corresponding to features "c" and "d" of claim 1 are also set out in method claim 17. Hence the board finds that the subject-matter of claims 1 and 17 would involve an inventive step, Article 56 EPC 1973, in view of D1, even in the light of D4.

7.5 Since the appealed decision only briefly commented on inventive step, the board uses its discretion and decides to remit the case to the examining division, Article 111(1) EPC 1973, so that a complete examination of inventive step and clarity can be carried out at first by the department of first instance.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance for further prosecution.

The Registrar: The Chairman:

B. Atienza Vivancos W. Sekretaruk

Decision electronically authenticated