

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 29

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DENNIS LEE, MARK W. KNECHT,
KALAINA M. WONG,
and OIKWAN TSANG

Appeal No. 1997-2297
Application No. 08/337,636

ON BRIEF¹

Before BARRETT, FLEMING, and LEVY, Administrative Patent Judges.
LEVY, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 1-21².

¹ The Oral Hearing was waived by appellants in a communication received July 31, 2001 (Paper No. 28).

² An amendment (Paper No. 15, filed July 30, 1996) filed subsequent to the final rejection (Paper No. 8, mailed February 26, 1996) was denied entry by the examiner (Paper No. 16, mailed August 12, 1996). In the brief (page 2) appellants proposed an amendment of the claims to clarify the issues on appeal. These proposed changes appear in the appendix to the brief. In the answer, (page 3) the examiner states, inter alia, that the proposed amendment is acceptable, and that "[t]he examiner will base this Examiner's Answer on the appended claims." An amendment (Paper No. 22, filed February 24, 1997) incorporating these changes to the claims was subsequently filed, and was

BACKGROUND

Appellants' invention relates to an input buffer that includes a driver circuit and a buffer connected to the output of the driver circuit. An understanding of the invention can be derived from a reading of exemplary claim 1, which is reproduced as follows:

1. An input buffer for an integrated circuit for receiving an input signal from a passive pull-up output driver, the input signal having a rise timer slower than a fall time, comprising:

a Schmitt trigger comprising:

an input, coupled to an input pad of the integrated circuit, for receiving the input signal;

a pull-up driver, coupled to said input, having a first drive capability due to a first gate size; and

a pull-down driver, coupled to said input, having a second drive capability due to a second gate size, wherein said second gate size is greater than said first gate size; and

a buffer, coupled to an output of said Schmitt trigger and having a first input gate size of a pull-down device of said buffer that is at least five times greater than said first gate size.

The prior art references of record relied upon by the examiner in rejecting the appealed claims are:

entered by the examiner (Paper No. 24, mailed March 14, 1997).

Koker	5,341,033	Aug. 23, 1994
McClure	5,349,246	Sep. 20, 1994

Claims 1, 2, 6, and 9 stand rejected under 35 U.S.C. § 103 as being unpatentable over Koker.

Claims 3-5, 7, 8, and 11-21 stand rejected under 35 U.S.C.

§ 103 as unpatentable over Koker in view of McClure.

Rather than reiterate the conflicting viewpoints advanced by the examiner and appellants regarding the above-noted rejections, we make reference to the examiner's answer (Paper No. 21, mailed January 6, 1997) for the examiner's complete reasoning in support of the rejections, and to appellants' brief (Paper No. 20, filed November 4, 1996) for appellants' arguments thereagainst. Only those arguments actually made by appellants have been considered in this decision. Arguments which appellants could have made but chose not to make in the brief have not been considered. See 37 CFR 1.192(a).

OPINION

In reaching our decision in this appeal, we have carefully considered the subject matter on appeal, the

rejections advanced by the examiner, and the evidence of obviousness relied upon by the examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, appellants' arguments set forth in the brief along with the examiner's rationale in support of the rejections and arguments in rebuttal set forth in the examiner's answer.

It is our view, after consideration of the record before us, that the evidence relied upon and the level of skill in the particular art would not have suggested to one of ordinary skill in the art the invention as set forth in claims 1-21. Accordingly, we reverse.

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior

art or to combine prior art references to arrive at the claimed invention. Such reason must stem from some teaching, suggestion or implication in the prior art as a whole or knowledge generally available to one having ordinary skill in the art. Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir. 1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985); ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). These showings by the examiner are an essential part of complying with the burden of presenting a prima facie case of obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). If that burden is met, the burden then shifts to the applicants to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole. See id.; In re Hedges, 783 F.2d 1038, 1039, 228 USPQ 685, 686 (Fed. Cir. 1986); In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir.

1984); and In re Rinehart, 531 F.2d 1048, 1052, 189 USPQ 143, 147 (CCPA 1976).

We begin with the rejection of claims 1, 2, 6, and 9 under 35 U.S.C. § 103 as unpatentable over Koker. Turning first to claim 1, the examiner asserts (answer, page 5) that "Koker indicates that the buffer (inverter I1)[sic, INV1] has transistors with gate sizes equal to the pullup [sic, pull-up] transistors." Koker teaches (figure 2) an inverter INV1 coupled to the output of a Schmitt trigger. However, Koker does not disclose a buffer having a first input gate size of a pull-down device that is at least five times greater than the first gate size. To overcome this deficiency in the teachings of Koker, the examiner has made a determination that this difference would have been obvious to an artisan. The examiner takes the position (id., pages 5 and 6) that "it is [sic, was] notoriously well known to implement relatively large transistors at the output of a buffer in order to have adequate driven power for succeeding circuit stages." The examiner concludes that "it would have been obvious to have implemented an inverter with large transistor gate widths as

claimed by applicant in the event the Schmitt trigger circuit of Koker was driving other circuitry."

Appellants note (brief, page 7) that Koker does not show the components that make up inverter INV1, but presumes the inverter to comprise a pull-up device and a pull-down device. Appellants argue that the applied prior art to Koker does not suggest the claimed subject matter, asserting (id.) "that one circuit with a Schmitt trigger and a buffer does not make all other circuits with Schmitt triggers and buffers obvious, since changes to relative gate sizes are not always obvious." We agree.

Claim 1 requires that the buffer has a first input gate size of a pull-down device that is at least five times greater than the first gate size. We are not persuaded by the examiner's assertion (answer, page 9) that "[o]bvious changes in size are not patentable limitations" because we find no teaching in the prior art to suggest that making the first input gate size of a pull-down device in the buffer five times greater than the first gate size would have been an obvious change in size. Appellants disclose (specification, page 8) that "noise filtering capability is due to the hysteresis of

Schmitt trigger 13, Schmitt trigger 13 device sizing, and the unusual sizing of NMOS transistor 31 so that it is from five to fifteen times larger than the gate sizes of the pull-up driver 15." Thus, we find that NMOS transistor helps provide noise filtering and is not just a mere "change in size." We observe that Koker (figure 5) resorts to the use of additional inverter circuits to protect against glitches in the input circuit, and that the examiner is correct (answer, page 10) to the extent that in general, adjusting the relative sizes of transistors is known to those of ordinary skill in the art. However, we find no suggestion in Koker, who teaches that the gate width of the inverter is the same 6 microns as the gate width of the first gate P1pa, to configure the inverter (buffer) such that the inverter has a first input gate size of a pull-down device that is at least five times greater than the first gate size of the Schmitt trigger, as recited in claim 1. In our view, the only suggestion for modifying Koker in the manner proposed by the examiner to meet the above-noted limitation stems from hindsight knowledge derived from the appellants' own disclosure. The use of such hindsight knowledge to support an obviousness rejection under 35 U.S.C.

§ 103 is, of course, impermissible. See, for example, W. L. Gore and Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

In responding to appellants' argument that Koker discloses the constraints on relative sizing when the scaling of different transistors differ by significant amounts, the examiner asserts (answer, page 9) that "[w]hile the Examiner agrees that Koker mentions difficulties with scaling transistors, he does not say that it is impossible." The fact that modifying the transistor scaling to the proportions recited in claim 1 "is not impossible" is not a suggestion of the specific claimed scaling wherein the inverter has a first input gate size of a pull-down device that is at least five times greater than the first gate size of the Schmitt trigger.

The examiner's conclusionary statement is not a substitute for evidence, and does not meet the substantial evidence standard necessary to support a conclusion of obviousness. It follows that we cannot sustain the examiner's rejection of claim 1. Accordingly, the rejection of claim 1 and dependent claims 2, 6, and 9 under 35 U.S.C. § 103 is reversed.

Turning next to the rejection of claims 3-5, 7, 8, and 10-21 under 35 U.S.C. § 103 as unpatentable over Koker considered with McClure, we turn first to independent claims 12 and 21. The examiner (answer, pages 7 and 8) relies upon McClure for a teaching of a Schmitt trigger circuit where the pull-down driver has a gate size five times greater than the pull-up driver. We find however, that the examiner's reference to McClure (col. 1, lines 61-65) is referring to the difference in gate sizes between the pull-up and pull-down transistors of the Schmitt trigger and not the gate sizes of the inverter 3, 13, etc., of the buffer circuit.

We note that each of independent claims 12 and 21 recite a similar limitation as claim 1, i.e., in claim 12 "said buffer has a first input gate size of a pull-down device of said buffer that is at least five times greater than said gate sizes of said first and second MOS transistors" and claim 21 "said CMOS inverter has a first input gate size of a pull-down device that is about ten times greater than said gate sizes of said first and second PMOS transistors." As McClure is silent as to the relative scaling of the transistors in the buffer circuit inverters 3, 13, etc., to the scaling of the drive

transistors 2p and 2n, 12p and 12n, etc., we find that McClure does not make up for the deficiency of Koker. Accordingly, the rejection of independent claims 21 and 21, and dependent claims 3-5, 7, and 12-20 under 35 U.S.C. § 103 is reversed.

We turn next to the rejection of independent claim 10. From our review of Koker and McClure, we are in agreement with appellants (brief, page 9) that Koker does not disclose the specific devices that comprise inverter INV1, but presume that INV1 includes equivalents to E and F³. We also agree with appellants (id.) that Koker does not appear to disclose the lengths of the gates of E and F of INV1, but does disclose the gate width to be 6 microns, which is the same as the gate widths of transistors P1pa (A1) and P2pa (A2). In addition, Koker discloses a ratio of 1:3 for A:B (col. 8, lines 8-17). McClure, similarly, does not disclose the contents of inverters 3, 13, etc. We agree with appellants (brief, page 10) that McClure does not appear to disclose values for E and F. McClure discloses that conventionally, the drive transistors 2n may have a width/length ratio of three to five

³ For purposes of clarity, we refer to these terms, as well as A, B, etc., as set forth in appellants' Exhibit 1.

times, i.e., a ratio of 1:5 for A:B, that of drive transistor 2p. As acknowledged by appellants (brief, page 10) "[i]f the E and F values from Koker and the values of McClure, col. 1, lines 56-66 were combined, $((F/A / E/B))$ would be 'approximately 3 to 5'." We agree. We find that upon providing the transistor 2n of Koker with the conventional three to five scaling between the pull-up and pull-down transistors 2p, 2n of the Schmitt trigger as disclosed by McClure, would meet the claim limitation "wherein a ratio of the first input gate size divided by said first gate size to a second input gate size of a pull-up device of said buffer divided by said second gate size is at least five" i.e., $((F/A / E/B)) \geq 5$. We are unpersuaded by appellants assertion (brief, page 10) that the teachings of McClure cannot be applied to Koker because "McClure teaches away from using such 'heavily ratioed' drive transistors. See, for example, col. 1, line 56 to col. 2, line 68. In fact, it appears that the entire motivation of McClure is to avoid such situations." In Koker, the gate size of the transistors N1pa and N2pa of the Schmitt trigger are three times the gate size of transistors P1pa and P2pa. Although McClure is directed to providing

hysteresis transistors that have the same gate width as the drive transistors (col. 3, lines 39-45 and col. 4, lines 35-39), McClure still discloses that it is conventional for the drive transistors $2n$ to be three to five times the size of the drive transistors $2p$ depending on the threshold voltage. From these teachings of the prior art, we find that an artisan would have been taught that the pull-down transistors be five times the size of the pull-up transistors.

Appellants further assert (brief, page 5) that the ratios disclosed in the references and used in the rejections are not the ratios claimed. We note that claim 10 additionally recites, similar to claim 1 but somewhat broader, that the first gate size of a pull-down device of the buffer is greater than the first gate size. As Koker discloses (col. 8, lines 8-17) that the inverter INV1 has a gate width that is the same 6 micron size as the width of transistor P1pa, and McClure is silent as to the size of the inverter, we find that the prior art does not teach or suggest that the first input gate size of a pull-down device of the buffer is greater than the first gate size, as recited in claim 10. Accordingly, we cannot sustain the examiner's rejection of claim 10, or claim 11

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