

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 37

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GIULIO RICOTTI and
DOMENICO ROSSI

Appeal No. 1998-0992
Application 08/706,978¹

ON BRIEF

Before Lee, Gardner-Lane and Medley, Administrative Patent Judges.

Lee, Administrative Patent Judge.

Decision on Appeal

¹ Application for patent filed September 3, 1996.

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Application 08/706,978

This is an appeal under 35 U.S.C. § 134 from the examiner's rejection of the appellants' claims 1-3 and 6-22. Claims 4 and 5 have been allowed. The real party in interest is SGS-Thomson Microelectronics, S.r.l. of Italy.

The References

Yu et al. (Yu) 28, 1995	5,394,026	Feb.
Henry 1995 Kimura 08, 1995	4,525,663 5,440,224	Jun. 25, Aug.

The Invention

The claimed invention is directed to a circuit and method for generating a temperature stable reference voltage. According to the claimed invention, the invention generates a stabilized voltage as a sum of two terms, the first being a fraction of the base-emitter voltage of a bipolar transistor. In the appeal brief on page 8, the appellants use the following equation to characterize the reference voltage generated:

$$V'_{ref} = K'V_{be} + aV_{be}$$

Claims 1, 6, 11, 15 and 19 are independent claims.

Claims 1 and 6 are reproduced below:

1. A circuit for generating a temperature stable reference voltage, said circuit comprising:

a first circuit comprising a first bipolar transistor, and connected to provide as output a first voltage equivalent to a constant fraction, which is less than unity, of the base-emitter voltage of said first bipolar transistor;

an operational amplifier, configured as a noninverting buffer, and operatively connected to receive said first voltage and to produce a control voltage equal to the sum of said first voltage and a predefined and controlled intrinsic offset voltage and a predefined and controlled intrinsic offset voltage of a differential input pair of transistors of said operational amplifier and said temperature stabilized reference voltage, which is proportional to said control voltage, a first one of said differential input pair of transistors having an emitter area different from a second one of said differential input pair of transistors; and

said operational amplifier having a feedback loop for controlling a bias current forced through said input pair of transistors.

6. A method for generating a small reference voltage without thermal drift, comprising the steps of:

(a) generating a first voltage which is a pre-established fraction of a base-emitter junction voltage of a bipolar transistor;

(b) deriving a $^aV_{be}$ voltage, which corresponds to the difference between V_{be} voltages of two transistors with different current densities, and

(c) producing a voltage proportional to the sum of said $^aV_{be}$ and said first voltage to produce an output signal.

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The Rejections

Claims 1-3 and 6-22 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Henry.

Claims 1-3 and 6-22 stand rejected under 35 U.S.C. § 103 as being unpatentable over Kimura and Yu.

Opinion

We reverse. A reversal of the examiner's rejection is not a pronouncement by this panel that the claims on appeal are patentable over the prior art. We focus on and consider only the positions and rationale as set forth by the examiner and on which the examiner's rejection of the claims on appeal is based.

Each of the appellants' independent claims on appeal requires the summation of a first term and a second term to produce a temperature stable reference voltage. The first component of the sum is recited as a fraction of the base-emitter voltage of a bipolar transistor. In that regard, claims 1, 11 and 15 recite a "constant fraction"; claim 6 recites a "pre-established fraction"; and claim 19 recites a "divided-down fraction." In the context of the appellants'

specification, these terms can be properly interpreted no broader than meaning that the first component of the sum has a fixed and proportional relationship to the base-emitter voltage of a bipolar transistor. The specification gives no indication and the examiner has pointed to no disclosure therein that the base-emitter voltage of the bipolar transistor can vary one way while the first component of the sum either stays fixed or varies in a non-proportional way.

The Anticipation Rejection

The rejection of claims 1-3 and 6-22 under 35 U.S.C. § 102(b) as being anticipated by Henry cannot be sustained.

The voltage V_o relied on by the examiner as the first component of the claimed summation is itself the output voltage of Henry's bandgap generator and thus has a fixed value regardless of any change or temperature variation in the base-emitter voltage V_{be} of Q7. Note that in column 5, lines 51-53, Henry states: ". . . , and hence the output voltage at the output 117 is precisely defined and substantially independent of temperature." The examiner's position is that because V_o is a constant and V_{be} of Q7 is a constant, there is a fixed fractional relationship between V_o and V_{be} of Q7.

However, in the context of bandgap generators for generating a temperature stable reference voltage, the examiner is misplaced to ignore the temperature sensitivities of the base-emitter voltage V_{be} of Henry's Q7 and to assume that it is a constant value. From the appellants' specification it is abundantly clear that because the first component is not temperature compensated that the second term is needed as an offset to produce a sum that is temperature stable. In the context of the appellants' invention, it is without sufficient basis for the examiner to treat the base-emitter voltage of Henry's bipolar transistor Q7 as a constant. Because V_{be} is not a constant but V_o is a constant, the appellants' claimed feature is not met by the examiner's reliance on Henry's V_o and V_{be} of Q7.

To the extent that the examiner regards the configuration of elements 23 and 24 in Henry as together constituting a divider circuit, it has not been explained how that arrangement produces a value for V_o that is a fixed proportion of the base-emitter voltage V_{be} of Q7. The examiner has not indicated what that fractional proportion might be in terms of an expression of the resistance values, i.e., V_o equals V_{be} of

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Q7 times what? Nothing meaningful in that regard has been set forth by the examiner as an explanation. On this record, we have only the examiner's speculation. Moreover, V_o is temperature stable and V_{be} is not. That indicates that V_o is not simply a divided down fraction or fixed proportion of the base-emitter voltage V_{be} of Q7.

The rejection of claims 1-3 and 6-22 as being anticipated by Henry is reversed.

The Obviousness Rejection

The rejection of claims 1-3 and 6-22 under 35 U.S.C. § 103 as being unpatentable over Yu and Kimura cannot be sustained.

As in the case of Henry already discussed above with regard to the anticipation rejection, the examiner has not, in this obviousness rejection, sufficiently accounted for the "constant fraction," "pre-established fraction," and "divided down fraction" feature contained in the claims on appeal with respect to the relationship between the first component term to be summed and the base-emitter voltage V_{be} of a bipolar transistor.

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According to the examiner, with respect to Kimura, V_{REF} is fixed at 1.2 volts, and V_{be} of transistors Q3 or Q4 is 1.3 volts (if power supply V_{cc} is given as 2.5 volts). Thus, the examiner states (answer at 7, lines 2-3): "Clearly, since all these values are fixed, 1.2 is a fraction of 1.3." But, again, the examiner is improperly treating the base-emitter voltage V_{be} of Q3 and Q4 in Kimura as though it were an unvarying constant.

We have already explained above that such an assumption in the context of producing a temperature stable reference voltage as is claimed by the appellants is improper. We have noted also that according to the specification it is because the first component term in the summation is not temperature compensated that the second component is needed as an offset to produce a sum that is temperature stable. It is without sufficient basis for the examiner to treat the base-emitter voltage of Kimura's Q3 or Q4 bipolar transistor as a constant. V_{REF} , on the other hand, is described in column 4, lines 58-61, of Kimura as "substantially constant in the wide temperature range so that [it] scarcely has a temperature characteristic." Indeed, V_{REF} is the temperature stable output of Kimura's

bandgap generator circuit. Because V_{be} of Q3 or Q4 is not temperature independent and V_{REF} is, the appellants' claimed feature is not met by the examiner's reliance on Kimura's V_{REF} and V_{be} of Q3 or Q4. The appellants correctly note that if V_{be} itself can be assumed as a constant, then V_{be} alone already provides a temperature stable reference voltage. That is not consistent with the appellants' specification.

The examiner also has not expressed any fraction in terms of the general resistor variables R1 and R3, which define a relationship between V_{REF} and V_{be} of Q3 or Q4. In any event, no matter what operative values R1 and R3 take on, it does not change the fact that V_{REF} is temperature stable and V_{be} of Q3 or Q4 is not. An ability to set values for resistors R1 and R3 does not salvage or otherwise restore merit to the stated rejection.

As for the reference Yu, it does not, as applied by the examiner, make up for the deficiencies of Kimura as discussed above. The examiner acknowledges in the answer on page 4, lines 8-10, that Yu does not disclose "any specific details for the bandgap voltage generator."

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The rejection of claims 1-3 and 6-22 under 35 U.S.C. § 103 as being unpatentable over Kimura and Yu is reversed.

Conclusion

The rejection of claims 1-3 and 6-22 under 35 U.S.C. § 102(b) as being anticipated by Henry is reversed.

The rejection of claims 1-3 and 6-22 under 35 U.S.C. § 103 as being unpatentable over Yu and Kimura is reversed.

REVERSED

JAMESON LEE)
Administrative Patent Judge)
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