Internal distribution code:

(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 1 August 2025

Case Number: T 0619/24 - 3.2.05

Application Number: 19706194.8

Publication Number: 3710268

IPC: B41J2/045, B41J2/175

Language of the proceedings: EN

Title of invention:
INTEGRATED CIRCUITS INCLUDING CUSTOMIZATION BITS

Applicant:
HEWLETT-PACKARD DEVELOPMENT COMPANY, L.P.

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - main request (yes)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0

Case Number: T 0619/24 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 1 August 2025

Appellant: (Applicant)	HEWLETT-PACKARD DEVELOPMENT COMPANY, L.P. 10300 Energy Drive Spring, TX 77389 (US)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 23 October 2023 refusing European patent application No. 19706194.8 pursuant to Article 97(2) EPC**

Composition of the Board:

Chairwoman	M. Blasi
Members:	M. Holz
	C. Kujat

Summary of Facts and Submissions

I. The applicant (appellant) filed an appeal against the decision of the examining division to refuse European patent application No. 19 706 194.8 (the application).

In the decision under appeal, the examining division concluded that while the claims of the main request complied with the requirements of Article 123(2) EPC, the subject-matter of claims 1 and 11 of the main request did not involve an inventive step in view of a combination of document D1 and any of documents D3, D4 and D5, and the subject-matter of claim 1 of the main request did not involve an inventive step in view of a combination of document D3 and the common general knowledge.

With the statement of grounds of appeal, the appellant filed sets of claims of a main request and first to eighth auxiliary requests and an alternative third auxiliary request.

II. In a communication issued on 6 June 2025, the board informed the appellant that it intended to set aside the decision under appeal and remit the case to the examining division with the order to grant a patent with claims 1 to 14 of the main request filed with the statement of grounds of appeal and a description and figures to be adapted if necessary.

III. The following documents were cited in the decision under appeal.

D1: WO 2019/009904 A1
D3: WO 2018/190861 A1
D4: WO 2018/190869 A1
D5: WO 2019/005091 A1

IV. The appellant requests that the decision under appeal be set aside and a patent be granted on the basis of the set of claims of the main request or one of the first, second, third, alternative third, fourth, fifth, sixth, seventh and eighth auxiliary requests, all filed with the statement of grounds of appeal. The appellant requests oral proceedings if the board does not find the set of claims of the main request allowable.

V. Claim 1 of the main request reads as follows (the feature numbering used by the board is indicated in square brackets).

"[1.0] An integrated circuit (100) for driving a plurality of fluid actuation devices (128), the integrated circuit comprising:
[1.1] a plurality of first non-volatile memory cells (102), each first non-volatile memory cell (102) storing a customization bit; and
[1.2] control logic (106) to configure an operation of the integrated circuit (100) based on the customization bits;
[1.3] wherein the operation is to modify an address input to the integrated circuit (100) based on the customization bits."

Claim 11 of the main request reads as follows.

"[11.0] A method (800) for operating an integrated circuit (100) for driving a plurality of fluid actuation devices (128), the method (800) comprising:

[11.1] reading (802) a plurality of customization bits stored in a corresponding plurality of first non-volatile memory cells (102);
[11.2] receiving (804) an address from a nozzle data stream; and [11.3] summing (806) the customization bits and the address to generate a modified address."

VI. The appellant submitted the following.

The subject-matter of claims 1 and 11 of the main request involved an inventive step in view of a combination of document D1 and any of documents D3, D4 and D5 or a combination of document D3 and the common general knowledge. Document D1 did not disclose feature 1.3. The technical effect of feature 1.3 went beyond the technical effect considered by the examining division. By using a customisation bit to modify the address input itself, the whole address input could be modified, and therefore the behaviour of all the nozzles intended to be addressed with the address input could be modified. As recited in paragraph [0013] of the application, this could be advantageous as it allowed an entire integrated circuit to behave differently for various geographic regions, for subscription or non-subscription customers, or for other reasons. It avoided having to fabricate multiple physical integrated circuits designed to behave differently, for example, by individually programming the memory element 304 for every fire memory cell 210 of document D1, and instead only required a small number of non-volatile memory customisation bits to be written to an integrated circuit to change the behaviour of the integrated circuit. The objective technical problem was thus how to provide an integrated circuit which enabled different die behaviour to be set

for different die usage cases, while reducing manufacturing complexity and costs.

Document D3 did not disclose feature 1.3. In Figure 4 of document D3, the displacement bit from the nozzle displacement mask register 13 did not modify an address input to the integrated circuit. At the point where the address decoder 90 took the address data from the address bus and turned it into an "ON" or "OFF" signal for each nozzle, the data ceased to be an address input as would be understood by the skilled person. At this point, the address had been decoded and did not identify a specific nozzle or nozzles any more. Rather, the signal at this point became an actuation signal for a specific nozzle which was then combined with the displacement bit to actuate that nozzle or a neighbouring nozzle. The displacement bit therefore caused a diversion of the actuation signal. Document D4 did not disclose feature 1.3 either. The mask register 318 disclosed in document D4 did not modify an address input to the integrated circuit. At the point where the actuation register 316 provided values to the actuation logic 20, the address had been decoded. The signal at this point became an actuation signal for a specific nozzle which was then filtered by the mask register to determine whether a specific nozzle was to be actuated for a specific actuation event. The individual bits of the mask register 318 therefore caused an activation or deactivation of a nozzle-specific actuation signal which was not the same as feature 1.3. Nor was this feature disclosed in document D5. The circuit of document D5 did not modify an address input but deactivated a fluid actuation device and redirected a firing signal to a neighbouring fluid actuation device. For the same reasons as given for document D3, the skilled person would not have

considered the redirection of a firing signal to correspond to feature 1.3. Claim 11 of the main request recited method features corresponding to the features of claim 1 of the main request. The subject-matter of claim 11 of the main request was therefore inventive in view of the cited prior art for corresponding reasons as claim 1. Moreover, none of the cited prior-art documents disclosed the summation of customisation bits and an address for generating a modified address as required by feature 11.3.

Considering document D3 to be the closest prior art, this document not only failed to disclose that the memory cells were non-volatile memory cells but did not disclose feature 1.3 either. Nor was this feature disclosed in any of the other cited prior-art documents.

VII. The present decision is issued in writing as the board grants the appellant's main request.

Reasons for the Decision

1. Main request: inventive step (Article 56 EPC)

The set of claims of the main request filed with the statement of grounds of appeal is identical to the set of claims of the main request underlying the decision under appeal which the appellant filed by letter dated 26 July 2023.

1.1 Claim 1: document D1 as the starting point

1.1.1 In points 12.3.1 and 12.3.2 of the Reasons of the decision under appeal, the examining division concluded

that the only differentiating feature of claim 1 of the main request in view of document D1 was feature 1.3.

The appellant does not contest the examining division's view. The board also sees no error in this regard.

1.1.2 The examining division considered that feature 1.3 had the technical effect of activating nozzles based on both an address input and the customisation bits. The same technical effect was also achieved in view of the device disclosed in document D1, although possibly in an alternative way. It therefore considered the objective technical problem to be providing a specific implementation of the activation of a nozzle in a fluid actuation device which took both an address input and the customisation bits into account.

The appellant did not dispute that the objective technical problem formulated by the examining division was solved by feature 1.3. However, it submitted that the technical effect of feature 1.3 went beyond the technical effect considered by the examining division. In the appellant's view, the objective technical problem was how to provide an integrated circuit which enabled different die behaviour to be set for different die usage cases, while reducing manufacturing complexity and costs.

The examining division considered the objective technical problem formulated by the appellant and, in points 12.1.10 to 12.1.13 of the Reasons of the decision under appeal, set out why it could not be accepted. The appellant's submissions on appeal do not allow concluding that the examining division's view in this regard were incorrect. The data in the fire memory 210, such as the data to enable or disable

selected nozzles (see paragraph [0024] of document D1), can be used for the same purpose of customising the integrated circuit for different die usage cases, while reducing manufacturing complexity and costs. While document D1 does not disclose when and for what purpose the data in the fire memory 210 is stored, it is also left open in claim 1 of the main request when and for what purpose the customisation bits are stored, except for its use in modifying the address. The appellant's submission that claim 1 only required a "small" number of non-volatile memory customisation bits to be written as compared to a large number of fire memory cells that needed to be programmed in document D1 is not based on features of claim 1 of the main request. The claim does not put any limits on the number of customisation bits.

The objective technical problem was thus correctly formulated by the examining division.

1.1.3 Combination of documents D1 and D3

The examining division took the view that document D3 disclosed modifying an address input (see reference numeral 44 in Figure 2) to the integrated circuit (fluidic die 10, see Figures 2 and 4) based on locally stored customisation bits (nozzle displacement mask register 13, see Figure 4). Regarding a modified address, the examining division referred to reference numeral 36 in Figures 2 and 3 of document D3.

The board notes that the examining division and the appellant referred to an "address input" or an "address" without explaining the difference between these terms.

The skilled person would have understood feature 1.3 as referring to an address that was input to the integrated circuit. It is uncontested that the result of the operation defined in feature 1.3 is a modified address (see, for example, points 12.1.5 and 12.1.15 of the Reasons of the decision under appeal). The board shares this view. In claim 1 of the main request, the operation of modifying an address necessarily results in another address, i.e. a modified address, and not, for example, a collection of binary control or actuation signals provided on different control lines for different devices. This interpretation is consistent with claims 2 and 3 of the main request, which also refer to a modified address, and the description as filed (see, for example, paragraph [0014] of the application as published).

Document D3 distinguishes between an address of an actuator (for example, having a value between 0 and 7, see paragraph [0014]) and address data corresponding to each nozzle 18 and having, for each nozzle 18, an enable value or a non-enable value indicative of whether the nozzle 18 is enabled for the ejection of fluid drops during a given actuation event (see paragraph [0025]).

As shown in Figure 4 of document D3, for each nozzle 18-1 to 18-N, nozzle select logic 12 includes a corresponding address decoder 90-1 to 90-N to decode the address on the address bus 82 and a corresponding AND-gate 92-1 to 92-N, the output of which represents the nozzle select signal 32-1 to 32-N for the corresponding nozzle (see also paragraph [0040] of document D3). The encoded address on address bus 82 is provided to each address decoder 90-1 to 90-N. Each of the address decoders 90 corresponding to the address

encoded on bus 82 provides an active or "HI" output to the corresponding AND-gate 92 (see paragraph [0045] of document D3). Each of the address decoders 90-1 to 90-N thus receives the encoded address as an input from address bus 82, interprets the address and provides a binary control signal (which does not have a reference numeral or designation in document D3) as an output. The binary control signals select a specific target based on the address. The skilled person would not have considered the binary control signal output by one of the address decoders 90-1 to 90-N to be an address. For example, the binary control signal does not indicate different nozzles depending on whether it is "HI" or "LOW". The same applies to nozzle select signals 32-1 to 32-N, each of which selects a specific target based on the address but is not itself an address.

Similarly, the skilled person would not have considered the collection of actuation signals 36-1 to 36-N to be a modified address. Each of the actuation signals 36-1 to 36-N is a binary signal that indicates whether the nozzle controlled by the actuation signal should be activated. It does not indicate a different nozzle depending on whether the signal is "HI" or "LOW". The actuation signals do not individually or collectively form an address. This view is unaffected by the consideration that the address on address bus 82 indicates a particular target nozzle and that the nozzle whose actuation signal is "HI" and that is accordingly activated may correspond to an address that is different from the address on address bus 82.

In point 12.1.4 of the Reasons of the decision under appeal, the examining division stated that since the actually activated nozzle was at a specific address that was different from the original address, the data

leading to the activation of the actually activated nozzle was *de facto* a modified address.

The reason why a nozzle that is different from the target nozzle indicated by the address on address bus 82 is activated in document D3 is not that the address is modified. The address is interpreted by the address decoders to provide control signals. The control signals are then processed to provide an actuation signal for each nozzle. Due to the processing, the actuation signals may be different from the control signals output by the address decoders based on the address. Consequently, a nozzle may be activated that is different from the nozzle indicated in the address. However, this is not the same as an operation of modifying the address as defined in feature 1.3. Even assuming that the same actuation signals 36-1 to 36-N disclosed in document D3 could alternatively be obtained by first modifying the address and then inputting the modified address to address decoders to output actuation signals, this is not what document D3 discloses. The skilled person starting from document D1 and consulting document D3 would thus have arrived at a solution to the objective technical problem different from the claimed solution.

Document D3 does not disclose or suggest feature 1.3, and therefore the subject-matter of claim 1 of the main request involves an inventive step within the meaning of Article 56 EPC in view of a combination of documents D1 and D3.

1.1.4 Combination of document D1 and document D4 or D5

In point 12.1.6 of the Reasons of the decision under appeal, the examining division took the view that

Figures 5 and 6 of document D4 and Figure 7 of document D5 disclosed arrangements similar to document D3 in which a different nozzle was addressed based on customisation data. In the Reasons of the decision under appeal, the examining division provided no further reasoning and did not specify what elements shown in these figures it considered to be an address or a modified address.

The examining division's conclusions seem to be based on a broad understanding of the term "address" that is not supported by the common general knowledge, any of the cited documents, the claims or the application as a whole. The fact that a selection signal is modified and that, consequently, a nozzle different from an originally targeted nozzle is activated does not necessarily mean that an address is modified. Figures 5 and 6 of document D4 and Figure 7 of document D5 neither disclose nor suggest feature 1.3.

The subject-matter of claim 1 of the main request involves an inventive step within the meaning of Article 56 EPC in view of a combination of document D1 and document D4 or D5.

1.2 Claim 11: document D1 as the starting point

In point 12.3.5.6 of the Reasons of the decision under appeal, the examining division concluded that the subject-matter of claim 11 of the main request did not involve an inventive step in view of a combination of documents D1 and D3. The offsetting by one to a neighbouring nozzle depending on the disabled state of the customisation bit implemented feature 11.3. In point 12.3.5.7 of the Reasons of the decision under appeal, the examining division considered that similar

arguments applied to the combination of document D1 and document D4 or D5.

Regarding claim 11 of the main request, the appellant referred to its submissions on claim 1 of the main request.

The examining division's conclusion is based on its view that the skilled person would have considered the actuation signals 36-1 to 36-N disclosed in document D3 to be a modified address. For the reasons set out above, this view is not convincing.

Nor do Figures 5 and 6 of document D4 or Figure 7 of document D5 disclose a method step of summing customisation bits and an address to generate a modified address as defined in feature 11.3. For example, the skilled person would not have considered on-die firing signals 105 shown in Figure 7 of document D5 an address, either individually or collectively. None of the cited figures shows an address or a modified address as specified in feature 11.3.

The subject-matter of claim 11 of the main request thus involves an inventive step within the meaning of Article 56 EPC in view of a combination of document D1 and any of documents D3, D4 and D5.

1.3 Claim 1: document D3 as the starting point

The examining division's conclusion on document D3 as the starting point is based on its view that the only differentiating feature of claim 1 of the main request is the definition in feature 1.1 that the first memory cells are non-volatile memory cells (see point 12.3.5.8

of the Reasons of the decision under appeal). In its opinion, the alternative implementation of the memory cells as non-volatile memory cells would have been a routine implementation decision in view of the skilled person's common general knowledge and would thus not have involved an inventive step.

As set out above, document D3 also fails to disclose feature 1.3. There is no reason to assume that this feature would have been suggested by common general knowledge. Nor was this put forward in the decision under appeal. The subject-matter of claim 1 of the main request thus involves an inventive step in view of a combination of document D3 and the common general knowledge.

2. Conclusions

The subject-matter of claims 1 and 11 of the main request involves an inventive step in view of a combination of document D1 and any of documents D3, D4 and D5, and the subject-matter of claim 1 of the main request involves an inventive step in view of a combination of document D3 and the common general knowledge. The objections on which the decision under appeal is based with regard to the main request do not therefore support the view that the requirements of the EPC have not been met. The decision under appeal thus has to be set aside.

The board notes that the examining division had come to a positive finding on compliance with Article 123(2) EPC.

The board sees no reason for not granting a patent based on the set of claims of 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 with the following claims and a description and drawings to be adapted if necessary:

   claims 1 to 14 of the main request filed with the statement of grounds of appeal

The Registrar: The Chairwoman:

D. Hampe M. Blasi

Decision electronically authenticated