

EXHIBIT E



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

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SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
08/179,926	01/11/94	BLOMGREN	J RM1

VJ, V EXAMINER

23M1/1116

STUART T. AUVINEN
429 26TH AVE.
SANTA CRUZ, CA 95062

ART UNIT	PAPER NUMBER
2315	6

DATE MAILED: 11/16/94

This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

This application has been examined Responsive to communication filed on 9-23-94 This action is made final.

A shortened statutory period for response to this action is set to expire 3 month(s), 0 days from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- | | |
|---|--|
| 1. <input checked="" type="checkbox"/> Notice of References Cited by Examiner, PTO-892. | 2. <input type="checkbox"/> Notice re Patent Drawing, PTO-948. |
| 3. <input type="checkbox"/> Notice of Art Cited by Applicant, PTO-1449. | 4. <input type="checkbox"/> Notice of Informal Patent Application, Form PTO-152. |
| 5. <input type="checkbox"/> Information on How to Effect Drawing Changes, PTO-1474. | 6. <input type="checkbox"/> _____ |

Part II SUMMARY OF ACTION

1. Claims 1-20 are pending in the application.
Of the above, claims _____ are withdrawn from consideration.
2. Claims _____ have been cancelled.
3. Claims _____ are allowed.
4. Claims 1-20 are rejected.
5. Claims _____ are objected to.
6. Claims _____ are subject to restriction or election requirement.
7. This application has been filed with informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.
8. Formal drawings are required in response to this Office action.
9. The corrected or substitute drawings have been received on _____. Under 37 C.F.R. 1.84 these drawings are acceptable, not acceptable (see explanation or Notice re Patent Drawing, PTO-948).
10. The proposed additional or substitute sheet(s) of drawings, filed on _____, has (have) been approved by the examiner, disapproved by the examiner (see explanation).
11. The proposed drawing correction, filed on _____, has been approved, disapproved (see explanation).
12. Acknowledgment is made of the claim for priority under U.S.C. 119. The certified copy has been received, not been received been filed in parent application, serial no. _____; filed on _____.
13. Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
14. Other

EXAMINER'S ACTION

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PART III: DETAIL OF ACTION

1. This office action responds to applicants' amendment filed on September, 20, 1994. Claims 1-20 remain pending.

2. Claims 1-4, 14 and 18-20 are rejected under 35 U.S.C. § 112, first paragraph, as the disclosure is enabling only for claims limited to decoder capable of directly decoding a subset and not the entire non-native instruction set. See M.P.E.P. §§ 706.03(n) and 706.03(z).

3. The specification clearly shows that only some and not all of the non-native instructions can be directly decoded and executed by the decoder unit and the execution unit. While it is not clear how to design a decoder unit and an execution unit capable of executing both entire native and non-native instruction sets as claimed based on the disclosure of the invention, it is submitted that the design of such decoder and execution units is not obvious to one skilled in the art without further requiring undue experimentation because the complexity of the processor for performing such functions would increase significantly.

Thus, the disclosure of the present invention is not commensurate in scopes with claims 1-4, 14 and 18-20 because claims 1-4, 14 and 18-20 fail to explicitly recite the limitation that

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only a subset of the non-native instructions can be directly decoded by the decoder unit.

4. The text of 35 U.S.C. § 103 not cited here can be found in the first office action.

5. Claims 1-5, 14-16 and 18-20 are rejected under 35 U.S.C. § 103 as being unpatentable over Portanova et al (hereafter portanova), U.S. pat. no. 4,992,934 in view of Onishi, U.S. pat. no. 3,764,988.

6. As to claims 1-2, Portanova teaches a system capable of executing both RISC and CISC instructions (see abstract). In particular, the system comprises a core structure of a RISC computer, and an emulation unit using RISC routine for emulating the execution of CISC instruction (see summary). The CISC emulation can be implemented with hardwired or firmware (see col 29, line 60 - col 30, line 12 and figures 9-10). It is noted that the hardware implementation of the CISC emulation would have required a modification to the RISC processor for providing the additional capability to decode and execute CISC instructions.

Portanova does not specifically teaches using two separate decoder units for decoding RISC and CISC instructions respectively. The use of multiple decoder units for decoding different types of instructions is however well-known in the art. The use of multiple

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decoders, each designated to decode certain type of instructions, is desirable because it allows a simple and efficient design of the instruction decoder. Onishi teaches a processor comprising two instruction decoders, the first decoder for decoding normal instructions and the second decoder for decoding branch instructions (see abstract). By using the second instruction decoder, the decoding sequence of a branch instruction can be reduced (see summary). It is noted that a selector is obviously needed to select decoded instructions from the first and second decoders.

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Portanova's system to utilize two instruction decoders as taught by Onishi for decoding RISC and CISC instructions respectively. This is because the use of separate instruction decoder units for RISC and CISC instructions allows more simple and efficient design of the decoder units.

7. As to claims 3-4, it would have been obvious to one skilled in the art to utilize an execution mode register for indicating the execution of native and non-native instructions.

8. As to claim 5, Portanova further teaches that the CISC emulation unit can also be implemented by using both hardware and

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software in which some CISC instructions would be directly decoded and executed by the execution unit and the execution of the rest of CISC instructions is emulated by using RISC routines (see col 30, lines 13-28 and figure 11). Thus, it would have been an obvious engineering design choice to one of ordinary skill in the art at the time of the invention to utilize both software and hardware implementation to emulate CISC instructions on a RISC computer. The implementation of both software and hardware approaches could have been motivated because of the combined advantages of both techniques, i.e. the simpleness and flexibility of the software emulation approach and the speed of the hardware emulation approach.

9. Claims 14-16 and 18-20 are rejected for the same rationales set forth above for claims 1-5.

10. Claims 6-13 and 17 are rejected under 35 U.S.C. § 103 as being unpatentable over Portanova and Onishi as set forth above for claims 1-5, 14-16 and 18-20 further in view of Bullions, III et al, (hereafter Bullions) U.S. pat. no. 4,456,954.

11. As to claims 6-7, 9-10 and 17, neither Portanova nor Onishi teach using a translation look aside buffer (TLB). Bullions teaches using a TLB for translating a virtual address to a physical

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address for both host and guest instructions (see abstract). In particularly, a TLB is utilized to address emulation host routine for a guest instruction. Bullions further teaches that a miss in TLB also triggers a change of execution modes, i.e. from host to guest (see summary and claims).

12. As to claim 8, Bullions also teaches switching the execution mode in response to an interrupt (see col 13, line 18-62).

13. As to claim 11, Bullions further teaches using a special instruction to initiate the software routine emulation and reload the TLB (see col 12, lines 63-67).

14. As to claims 12-13, it would have been obvious to one skilled in the art to reset the system execution mode to a normal operation in response to a system reset signal.

15. All pending claims are rejected in this office action. Applicants' arguments filed on September 23, 1994 have been fully considered but are moot in view of new grounds of rejection.

16. As to the remarks, applicants argue that none of the cited teach or suggest the two instruction decoder and the selecting means for selecting the decoded instruction from the two decoders.

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It is submitted that the newly cited art, Onishi, now clearly suggests the implementation of two instruction decoders in the processor.

The applicants further assert that the hardware implementation of prior art to emulate the guest instructions only suggests the use of a "co-processor" for executing the guest instructions and not the claimed invention which utilizes the same execution unit for executing both host and guest instructions.

The examiner disagrees. It is submitted that the use of either software or hardware approach or the combination of both to implement instruction emulation is well-known in the art (see Portanova). To the extent of the hardware implementation, whether the whole or part of the emulation unit is designed to be integrated to or separated from the host processor is merely a design of choice in which each design approach can be viewed as a tradeoff and balance among factors such as speed, cost and flexibility. Onishi is a clear evidence of a system employing partly duplicated hardware resources where a separate instruction decoder is provided to decode only branch instructions. It is noted that some prior art systems even go a step further to provide a complete branch instruction execution unit for decoding and executing only branch instructions to further reduce execution delay of a branch instruction.

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Thus, the implementation of two instruction decoders for decoding RISC and CISC instructions respectively and the selecting means as claimed would have been obvious to one skilled in the art in light of the cited arts' teachings and discussions above.

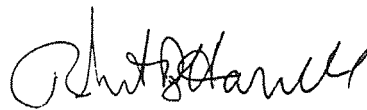
17. The following references are cited by the examiner as of general interest.

a. Tanenbaum, "Structured Computer Organization", Prentice-Hall Inc. 1984, p. 10-12.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to V. Vu whose telephone number is (703) 305-9597.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-9600.

V. Vu
Art Unit 2315
11/8/94



ROBERT B. HARRELL
PRIMARY EXAMINER
GROUP 2300

NOTICE OF DRAFTSPERSON'S PATENT DRAWING REVIEW

PTO Draftpersons review all originally filed drawings regardless of whether they are designated as formal or informal. Additionally, patent Examiners will review the drawings for compliance with the regulations. Direct telephone inquiries concerning this review to the Drawing Review Branch, 703-305-8404.

The drawings filed (insert date) 11/11/94 are:
A. not objected to by the Draftperson under 37 CFR 1.84 or 1.152.
B. objected to by the Draftperson under 37 CFR 1.84 or 1.152 as indicated below. The Examiner will require submission of new, corrected drawings when necessary. Corrected drawings must be submitted according to the instructions on the back of this Notice.

- 1. DRAWINGS. 37 CFR 1.84(a): Acceptable categories of drawings:
Black ink. Color.
 Not black solid lines. Fig(s) _____
 Color drawings are not acceptable until petition is granted.
- 2. PHOTOGRAPHS. 37 CFR 1.84(b)
 Photographs are not acceptable until petition is granted.
- 3. GRAPHIC FORMS. 37 CFR 1.84 (d)
 Chemical or mathematical formula not labeled as separate figure. Fig(s) _____
 Group of waveforms not presented as a single figure, using common vertical axis with time extending along horizontal axis. Fig(s) _____
 Individual waveform not identified with a separate letter designation adjacent to the vertical axis. Fig(s) _____
- 4. TYPE OF PAPER. 37 CFR 1.84(c)
 Paper not flexible, strong, white, smooth, nonshiny, and durable. Sheet(s) _____
 Erasures, alterations, overwritings, interlineations, cracks, creases, and folds not allowed. Sheet(s) _____
- 5. SIZE OF PAPER. 37 CFR 1.84(f): Acceptable paper sizes:
21.6 cm. by 35.6 cm. (8 1/2 by 14 inches)
21.6 cm. by 33.1 cm. (8 1/2 by 13 inches)
21.6 cm. by 27.9 cm. (8 1/2 by 11 inches)
21.0 cm. by 29.7 cm. (DIN size A4)
 All drawing sheets not the same size. Sheet(s) _____
 Drawing sheet not an acceptable size. Sheet(s) _____

6. MARGINS. 37 CFR 1.84(g): Acceptable margins.

Paper size			
21.6 cm. X 35.6 cm. (8 1/2 X 14 inches)	21.6 cm. X 33.1 cm. (8 1/2 X 13 inches)	21.6 cm. X 27.9 cm. (8 1/2 X 11 inches)	21.0 cm. X 29.7 cm. (DIN Size A4)
T 5.1 cm. (2")	2.5 cm. (1")	2.5 cm. (1")	2.5 cm.
L .64 cm. (1/4")	.64 cm. (1/4")	.64 cm. (1/4")	2.5 cm.
R .64 cm. (1/4")	.64 cm. (1/4")	.64 cm. (1/4")	1.5 cm.
B .64 cm. (1/4")	.64 cm. (1/4")	.64 cm. (1/4")	1.0 cm.

Margins do not conform to chart above.
Sheet(s) _____
Top (T) _____ Left (L) _____ Right (R) _____ Bottom (B) _____

- 7. VIEWS. 37 CFR 1.84(h)
REMINDER: Specification may require revision to correspond to drawing changes.
 All views not grouped together. Fig(s) _____
 Views connected by projection lines. Fig(s) _____
 Views contain center lines. Fig(s) _____
- Partial views. 37 CFR 1.84(h)(2)
 Separate sheets not linked edge to edge. Fig(s) _____
 View and enlarged view not labeled separately. Fig(s) _____
 Long view relationship between different parts not clear and unambiguous. 37 CFR 1.84(h)(2)(ii) Fig(s) _____
- Sectional views. 37 CFR 1.84(h)(3)
 Hatching not indicated for sectional portions of an object. Fig(s) _____
 Hatching of regularly spaced oblique parallel lines not spaced sufficiently. Fig(s) _____
 Hatching not at substantial angle to surrounding axes or principal lines. Fig(s) _____
 Cross section not drawn same as view with parts in cross section with regularly spaced parallel oblique strokes. Fig(s) _____
 Hatching of juxtaposed different elements not aligned in a different way. Fig(s) _____
- Alternate position. 37 CFR 1.84(h)(4)
 A separate view required for a moved position. Fig(s) _____

Modified forms. 37 CFR 1.84(h)(5)
 Modified forms of construction must be shown in separate views. Fig(s) _____

- 8. ARRANGEMENT OF VIEWS. 37 CFR 1.84(i)
 View placed upon another view or within outline of another. Fig(s) _____
 Words do not appear in a horizontal, left-to-right fashion when page is either upright or turned so that the top becomes the right side, except for graphs. Fig(s) _____

- 9. SCALE. 37 CFR 1.84(k)
 Scale not large enough to show mechanism without crowding when drawing is reduced in size to two-thirds in reproduction. Fig(s) _____
 Indication such as "actual size" or "scale 1/2" not permitted. Fig(s) _____
 Elements of same view not in proportion to each other. Fig(s) _____

- 10. CHARACTER OF LINES, NUMBERS, & LETTERS. 37 CFR 1.84(l)
 Lines, numbers & letters not uniformly thick and well defined, clean, durable, and black (except for color drawings). Fig(s) _____

- 11. SHADING. 37 CFR 1.84(m)
 Shading used for other than shape of spherical, cylindrical, and conical elements of an object, or for flat parts. Fig(s) _____
 Solid black shading areas not permitted. Fig(s) _____

- 12. NUMBERS, LETTERS, & REFERENCE CHARACTERS. 37 CFR 1.84(p)
 Numbers and reference characters not plain and legible. 37 CFR 1.84(p)(i) Fig(s) _____
 Numbers and reference characters used in conjunction with brackets, inverted commas, or enclosed within outlines. 37 CFR 1.84(p)(i) Fig(s) _____
 Numbers and reference characters not oriented in same direction as the view. 37 CFR 1.84(p)(i) Fig(s) _____
 English alphabet not used. 37 CFR 1.84(p)(2) Fig(s) _____
 Numbers, letters, and reference characters do not measure at least .32 cm. (1/8 inch) in height. 37 CFR(p)(3) Fig(s) _____

- 13. LEAD LINES. 37 CFR 1.84(q)
 Lead lines cross each other. Fig(s) _____
 Lead lines missing. Fig(s) _____
 Lead lines not as short as possible. Fig(s) _____

- 14. NUMBERING OF SHEETS OF DRAWINGS. 37 CFR 1.84(t)
 Number appears in top margin. Fig(s) _____
 Number not larger than reference characters. Fig(s) _____
 Sheets not numbered consecutively, and in Arabic numerals, beginning with number 1. Sheet(s) _____

- 15. NUMBER OF VIEWS. 37 CFR 1.84(u)
 Views not numbered consecutively, and in Arabic numerals, beginning with number 1. Fig(s) _____
 View numbers not preceded by the abbreviation Fig. Fig(s) _____
 Single view contains a view number and the abbreviation Fig. Fig(s) _____
 Numbers not larger than reference characters. Fig(s) _____

- 16. CORRECTIONS. 37 CFR 1.84(w)
 Corrections not durable and permanent. Fig(s) _____

- 17. DESIGN DRAWING. 37 CFR 1.152
 Surface shading shown not appropriate. Fig(s) _____
 Solid black shading not used for color contrast. Fig(s) _____

REVIEWER _____

DATE 3/2/94

TO SEPARATE, HOLD TOP AND BOTTOM EDGES, SNAP-APART AND DISCARD CARBON

FORM PTO-892 (REV. 2-92)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	SERIAL NO. 08/179,926	GROUP PART UNIT 2315	ATTACHMENT TO PAPER NUMBER 6
NOTICE OF REFERENCES CITED		APPLICANT(S) Blomgren et al		

U.S. PATENT DOCUMENTS									
*	DOCUMENT NO.	DATE	NAME	CLASS	SUB-CLASS	FILING DATE IF APPROPRIATE			
A	3764988	10-9-73	Onisli	395	375 ⁵⁸¹				
B	4456954	6-26-84	Bullions, III et al	345 ³¹¹	400 ²⁰⁷				
C									
D									
E									
F									
G									
H									
I									
J									
K									

FOREIGN PATENT DOCUMENTS									
*	DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS. DWG. PP. SPEC.		
L									
M									
N									
O									
P									
Q									

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)									
R	Tanenbaum, "Structured Computer Organization", Prentice-Hall 1984, p. 10-12.								
S									
T									
U									

EXAMINER V. Ju	DATE 11-8-94
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* A copy of this reference is not being furnished with this office action.
(See Manual of Patent Examining Procedure, section 707.05 (a).)