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(71) 2200

(72) 95670 11717

가 , 95630 257

95630 104

95630 1093

(74)

:

(54)

2 / 1 가
1 , / () 2 가
/ ()

1

가 .

DRAM 가 (fetch)

(pipeline) (latency)

/

(reorder buffer), (oder buffer), /

가 가

/ 가

1 (hint buffer)

2 , ,

3 3A 3B (memory fetch request)

4 (flush)

(130) (110) (130) CRT(cathode ray tube)
 (132) (132)
 (112) AGP(accelerated graphics port) (130)

I/O (140) (110) I/O (140) I/O (112)
 I/O (140) I/O (140)

ROM(compact disc read only memory) HDD(hard disk drive) CD
 IDE(integrated drive electronics)
 (142), USB(universal serial bus) (144) USB
 / () (146), (148) I/O (140)
 (151), (152), (153) (155) I/O (150)
 (154)

I/O (140) PCI(peripheral component interconnect)
 PCI (162) I/O (140) PCI
 , ISA(industry standard architecture) (164) PCI I/O (140)
 ISA ISA (164) ISA ISA
 (166) ISA

I/O (140) (firmware) (170) (170)
 (170) I/O (140) I/O (140) (170)
 (170) / I/O (150)
 BIOS (172) BIOS (172) BIOS(basic input/output system)

(110) (100)
 (110) (120), (130), / I/O ()
 140) (112)

2 (110) (112), (112)
 (210), (210) (212), (210)
 (220), (220), (220) (220)
 (230), (230) (240)

(210), (212), (220), (222)
 (230) /

(210) (212) (230) /
 (210) , (230)
 (112) (120) / (212) (212)
 / (120) / (212) / (212)

(210) (212)

(220) (222) (230) /
 (222)

(112) (220) (230) (210)
 (212) / (120) , (210) (210)
 (220) / (222) (222)

(220) (120) (220) (220)

가 (222) (230) 가 (220) (230)
) 가 (222) (212) / (222)
 가 (222) (212) / (222) (222)
 (222) (210), (210), (212), (220), (230) /
 (caching scheme) (230) /
 (210), (212), (220), (222)
 , (110) (230)
 (230) /
 (230) , 2 / (232), (234), /
 (236), (retire unit)(238) / (232)
) (220) (234) / (232), / (236)
 (238) / (236) / (232) (220)
 (238) (240) (220)
 / (232) (222), (212), / (120)
 / (232)
 (230) / (232) / (232)
 (230) (220), (210) /
 (112) (222), (212), (120)
 (branch instruction) (exception handling routin
 e)
 / (232)
 . / (232) - (micro-operation)
 rations) . 3 가 - (operational code) opcode 2
 (logical source operands) (logical destination operand)
 / (232)
 (rename) / (232)
 (rename map)
 / (232) (234) (234)
) (status information) 가 (232)
 (234) / (232) - (234)
 / (236) (retire) -
 (234) CAM(content-addressable memory)
 / (236) (234) -
 - 가 / (236) (234) -
 / (236) (234) -
 / (236) (236)
 , (reservation station) (234) -

가 - , 가 -
 (234) - (234) ,
 / (236) - (220)
 (222), (210), / (212), (112) (120) (220),
 (238) - (238) (234) (234)
 - (234) (120) (220),
 (210), (112) (240) (238)
 / (232) - (238)
 2 (230) ,
 , , / (232) (234) , / (236)
 (236) (238) (234) , /
 / (232) -

(Hiding Memory Access Latency)

(110) 3 (300) (112) (120)
 (112) (110)
 (130), 2 (112) (210),
 (202) I/O (140) (202); (2)
 02) (114); (202) (204); (206)
 (202) (204)
 (204) (120) (204)
 (120) (114) (204)
 CAM(content-addressable memory)
 3 302 , (230) / ,
 / (232) (236)
 (230) (220) / 가
 (cacheable) , 가 (lock transaction), 가
 304 , (220) / () (222)
 (220) , , (222)가 (306)
 (222) (222) (230)
 (210) (222)가 (220)

308 , (112) 가 . (220)
 (112) (220) (224) (112) .
 (224) (210) (220)
 (112) (210) (214)
 (214) (112) / (210)
 (210) (214)
 (112) / ()
 / ()
 (stride)
 (202)

310 , (210) / () (212) 312
 (210) , / () (220)
 (212) () (230) (222) (210)
 / 312 () (112) (112)
 (120) (212) (212)가 (miss) / ()
 (210) (214) (112) 314 ,
 가 (210) (224) 가 (22)

4) (112) 가

(112)가 (210) (112) 가
 (112) 가 (112) (speculative) (dema
 nd) 가 (202) 314 , (speculative) (dema
 nd)

316 , (210) (214) (112)
 (210) (124) /
 () (220) (210) , (210) /
 () (212) (112) 316
 / () (120) 가 ,
 (212) (112)
 (120)

() , 318 (202) /
 (114) , (114)가
 (112) ()
 (requester)
 / ()
 (114) / ()
 (114) ()
 (202) / ()
 (114)가 , 322 / ()
 (206) (114) , (206) / ()
 (206)

(206) (120) / () (230)
 / () (206) , (202)

(230) / () (210) (220)
 (212) (222) (210) / ()
 () (202) / 332 (114)

334 / () (206) (206)가 (114)
 (202) (114)가 336 (210)
 (220) (114) (230) (212)
 (210) (220) / () (222) (114)
 336 (202) (114)

338 / () (114) (114)가 (120)
 (202) / () 338 (114)

(120)가 (202) / () (202)
 (204) (204) (120) (204)
 / () (202) 340 (220)
 (202) (120) / () (210) ()
 202) (210) / () (114) (212)
 (220) / () (222)

/ () (206) (114)가 (114)가
 / () (206) (114) (114) , 가
 (206) (112)가 (206) , (202) , (20
 2) (206) (114) / () (206)

/ () (206) (114)가 (206)
 (202) (114) (400) (206)
 (flushing) 4

4 402 , (202) (206) (206)
 (120) (120) 가 , (206)
 가 / () (pending) / () / (2
 06) (206) (202) , (202) (206)
 가 , (206)

(206) (114)가 (206) (206)가
 , 가 (202) (114) , 404 (206)
 / ()

(114)가, (206) 가 가
 / () (120) (202) (206)
 / () (206) (114)가
 , (202) (120) (206)
 / () (114) (206)
 , 5 (114) (500) (114)
 (500) (502) (504) (500)
 (506), (508), (done flag field)(510),
 (512)
 (502) / () (504)
 (206) (120) (502) (504) (502) 가
 () ()
 (206) (506) (500) / () ()
 (202) (206) / () (202)
 (506) (506) (112)가 (206)
 , 가 (202) (114)
 / () (506)
 (506)
 / () , (506) (500)
 (504) (206) (206)
 (508) , (500) 가 (202) (500)가
 (114) (202) , (508) (202) (504)
 () / () / ()
 () (206) (202) (508) ()
 (114) (508)가 (202) (508)
 (206) / () , (508) (500)
 (510) (500) / () ()
 / () (500)
 (510) (510) (202) (510)
 (202) (510) (500)
 (512) (500)가 (114)

() (206) (202) , (500)가 (114) /
 (512) (202) / () (202)
) , 가 () (500) / () /
 (510) (512) / 가 (114) (202)
 (512)
 (500) (202) (512) ,
 (500)가
 (112) (202) , (114)
 () (202) / () /
 / () (210) / () (212)
 (114) (222) , (114) (202)
 / ()
 , 1 2 (110) 6 (600) (112)
 (120) (600) , (602, 604, 606, 608, 61
 0, 612, 614, 616, 618, 620, 622, 624, 626, 628, 630, 632, 634, 636, 638, 640) 3 (300)
 (302, 308, 304, 306, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340)
 (222) 3 308 (600)
 (222) , (220) 606 / ()
 (222) 가 , (112) (120) (112)
 222)가 () () ()
 / () 608 (220) (222)
 (112) (230) 608 (220) ,
 (120) (112) (112)
 (110) (230) 604 (112)
 (110) (230) (112)
 , (230) (220) (210)
 (110) (112) (prefetch)
 , , (110)
 (tight loops)
 (110)
 (110) , (120)
 (120)
 가 , (110) , , /
 (140)가 (110) , 1 2 (130) / I/O
 (110) (112) (120)

(57)

1. / (request hint) ; () 1 / () (fetch) 2 ; 2 / () ; () / () 1 , / ()

2. 1 , / ()

3. 1 , / () 3 , / () 3

4. 1 , / () (memory fetch request)

5. 4 , / ()

6. 1 ; 1 , / () 1 () 1 ; / () 1 /

() 2 / / () ()

6 7. ,

1 (primary cache memory) .

6 8. ,

1 (secondary cache memory) .

6 9. ,

3 , / () 3 / () 3

6 10. ,

2 / () / ()

6 11. ,

2 / () ()

6 12. ,

(instruction processing logic) .

6 13. ,

(primary cache control logic) .

14. ; ;

() / () , / () ; , / () / () ;

/ / () () ,

14 15. ,

14 16. ,

14 17. ,

() , / () /

14 18. ,

, / () / ()

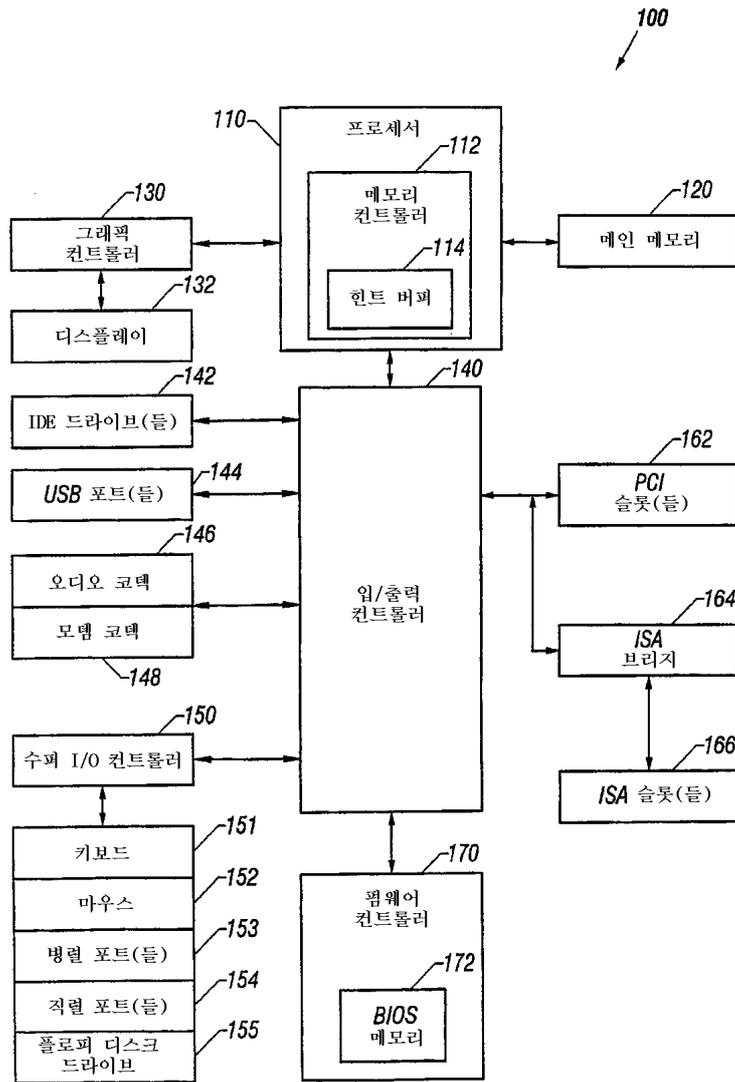
14 19. ,

, / () ()

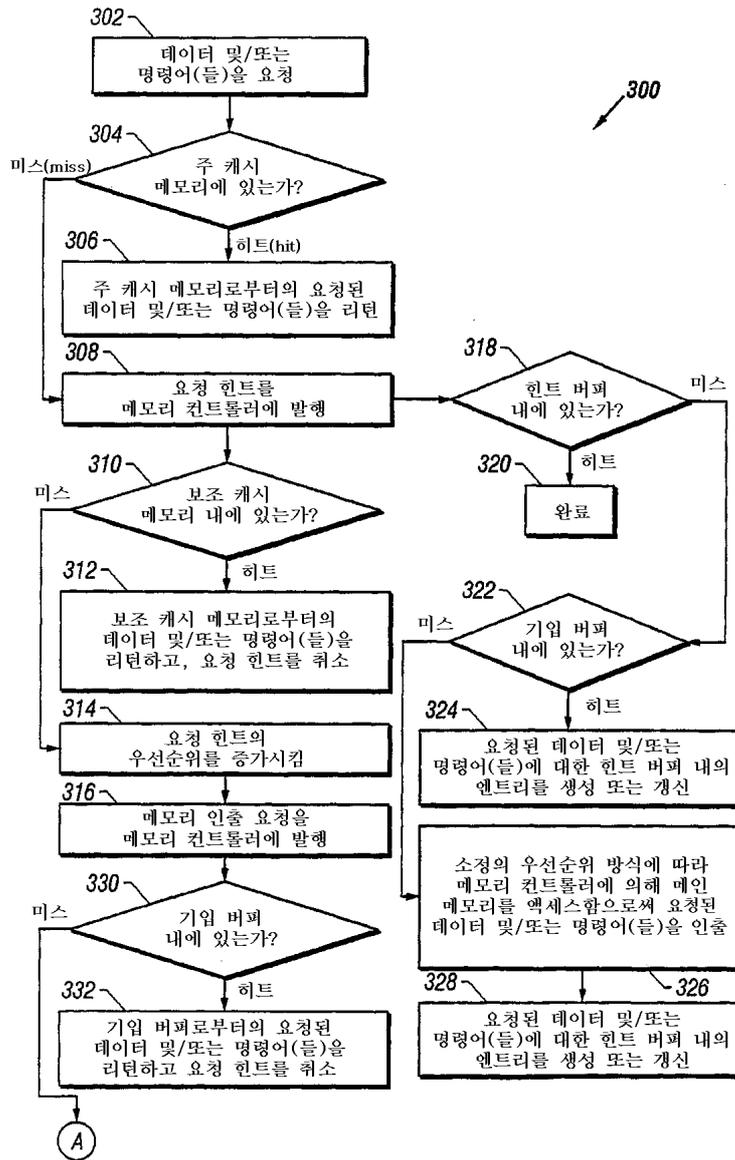
14 20. ,

14 21. ,

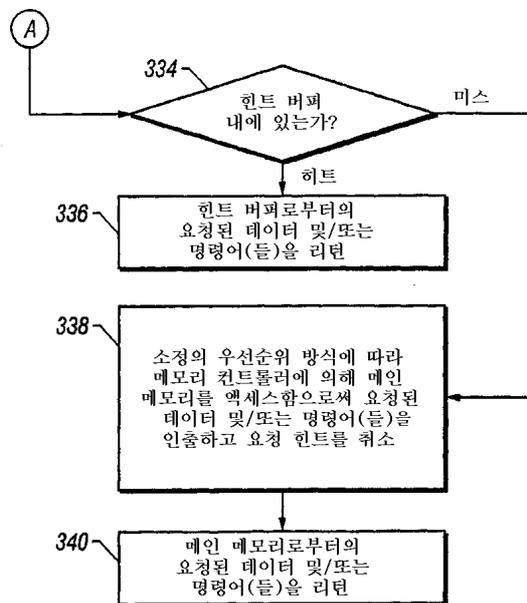
14 22. ,



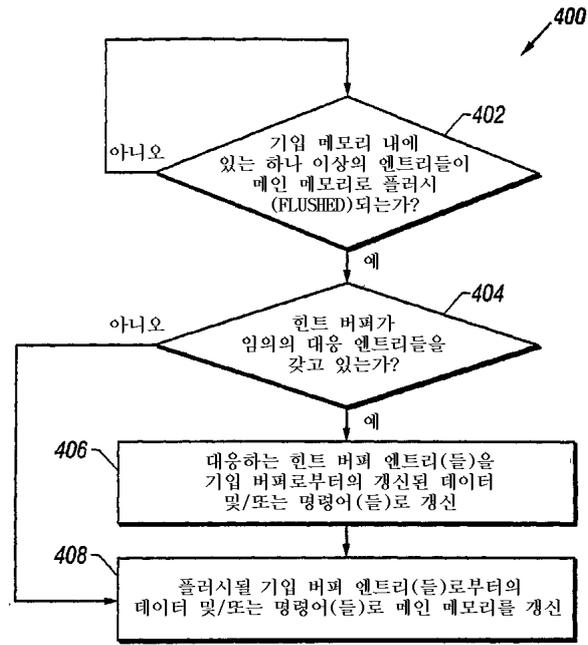
3A



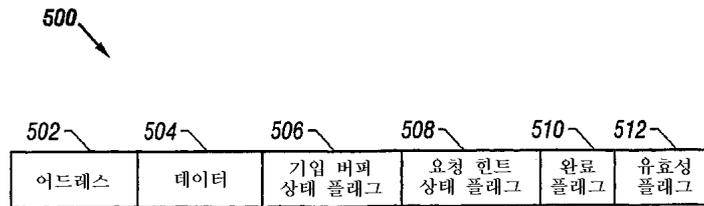
3B



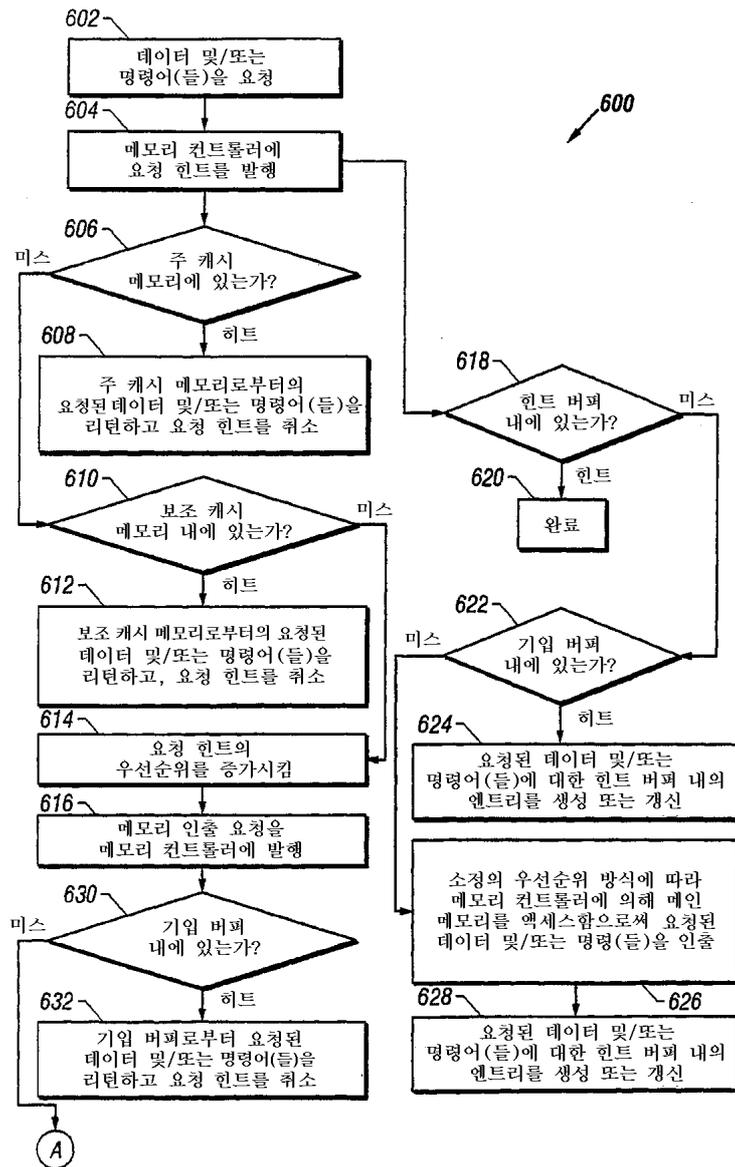
4



5



6A



6B

