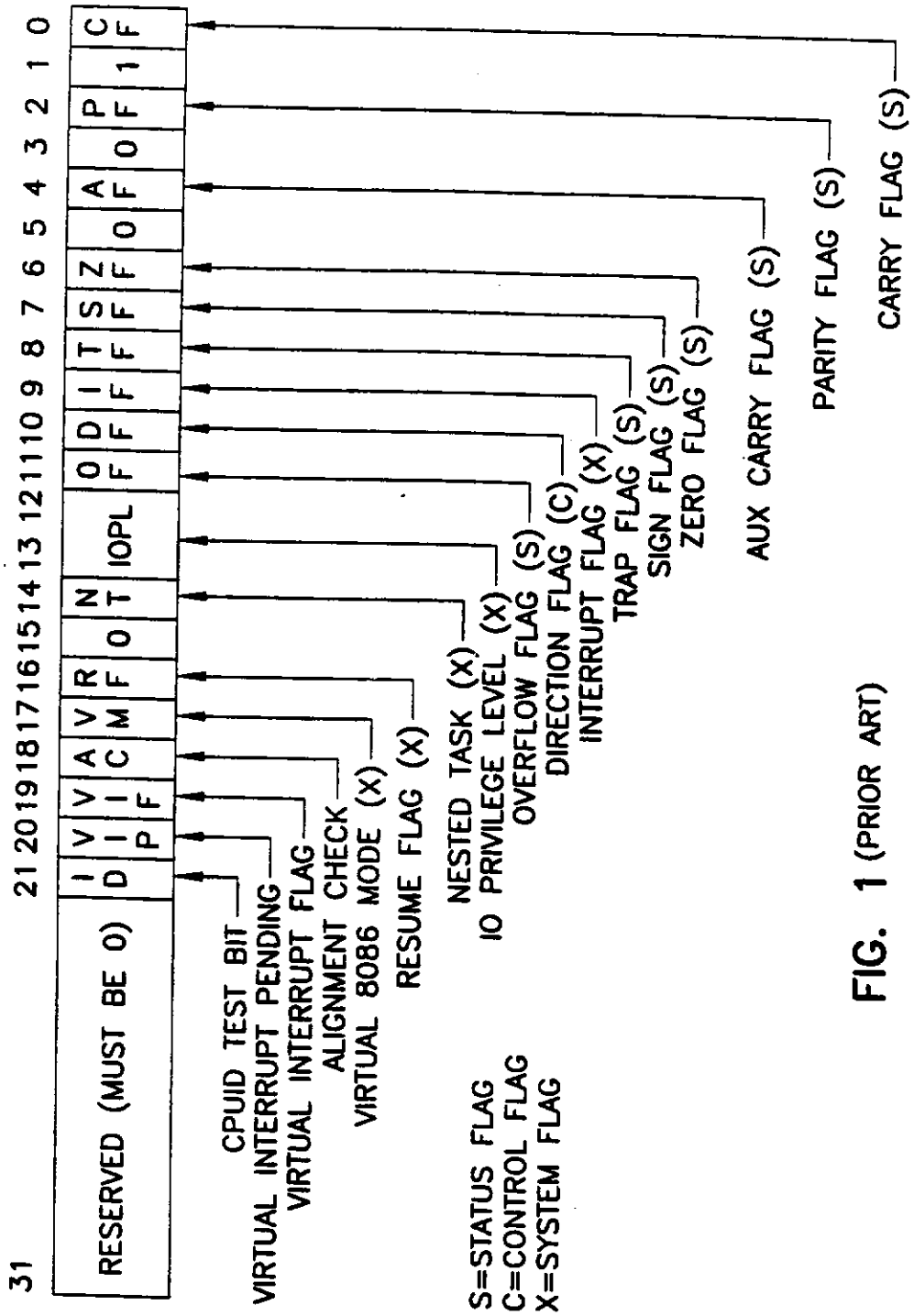


FIG. 1 (PRIOR ART)

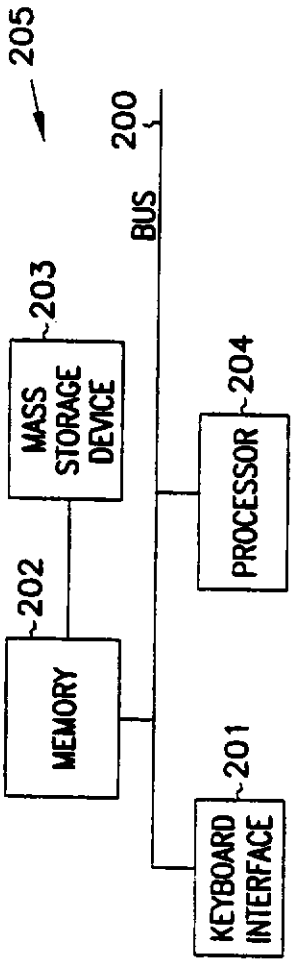

205
200
BUS
203
MASS STORAGE DEVICE
204
PROCESSOR
202
MEMORY
201
KEYBOARD INTERFACE

FIG. 2

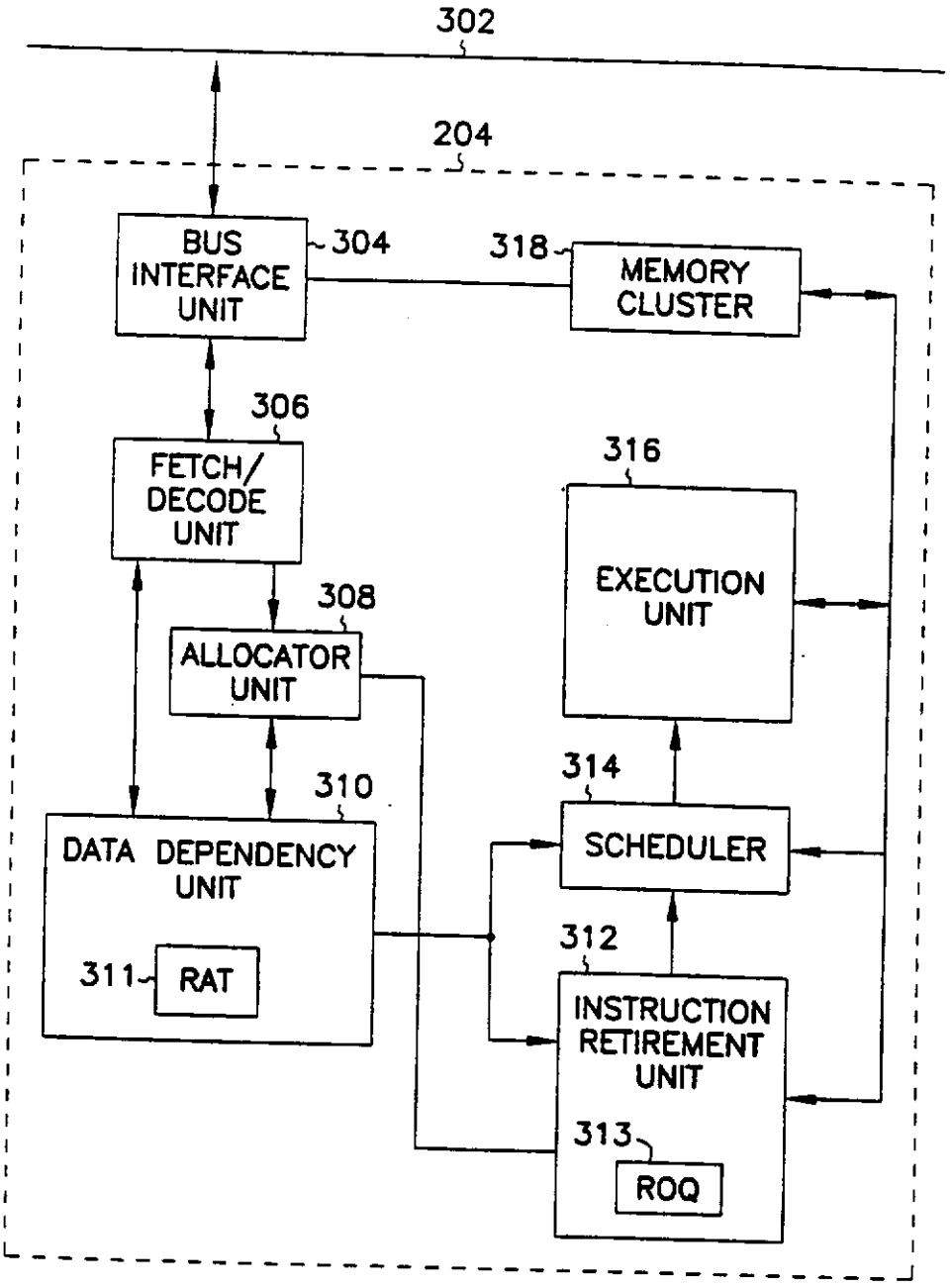

302
204
BUS INTERFACE UNIT
304
318
MEMORY CLUSTER
306
FETCH/ DECODE UNIT
316
EXECUTION UNIT
308
ALLOCATOR UNIT
314
310
DATA DEPENDENCY UNIT
SCHEDULER
312
311
RAT
INSTRUCTION RETIREMENT UNIT
313
ROQ

FIG. 3

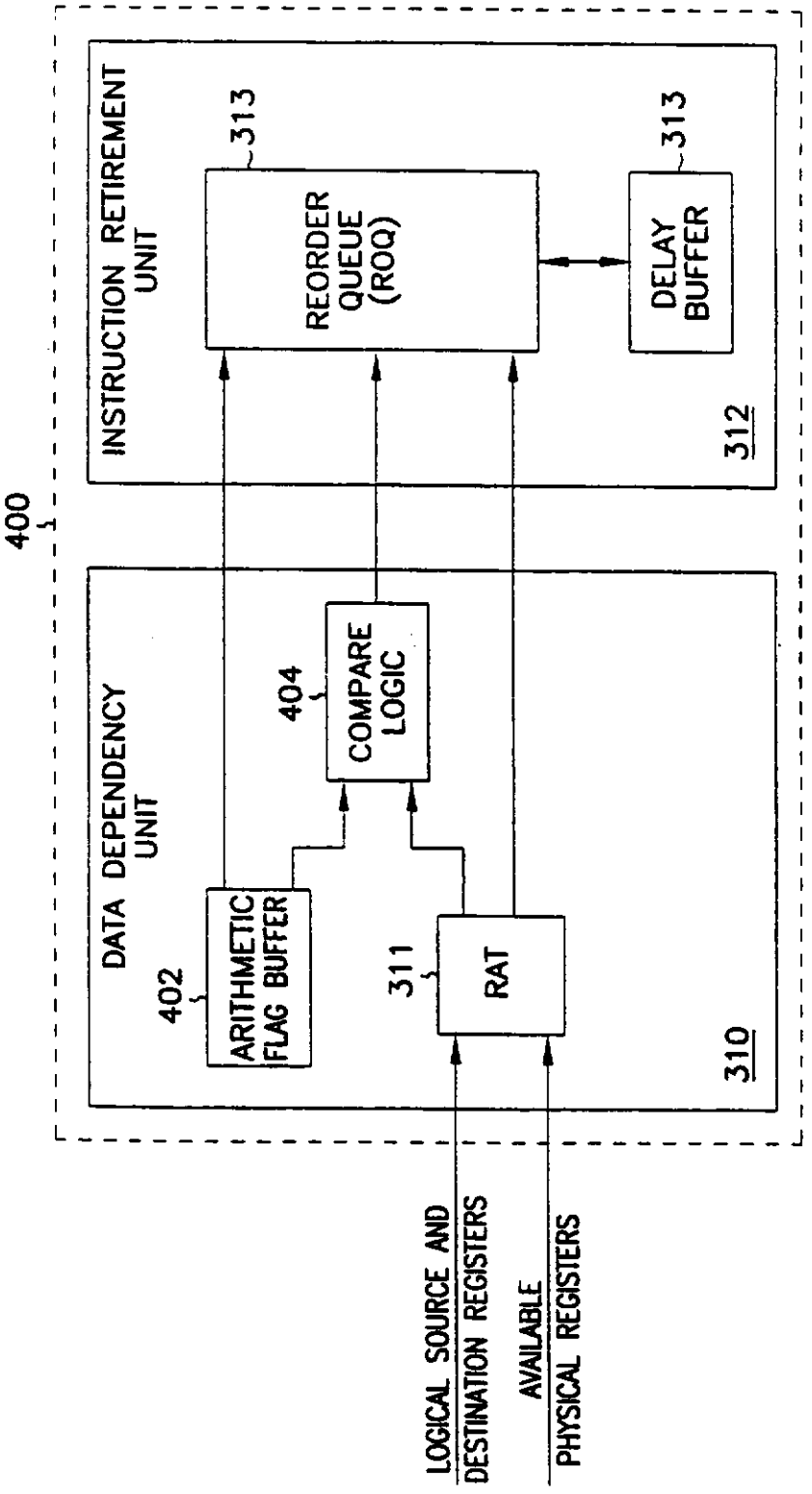
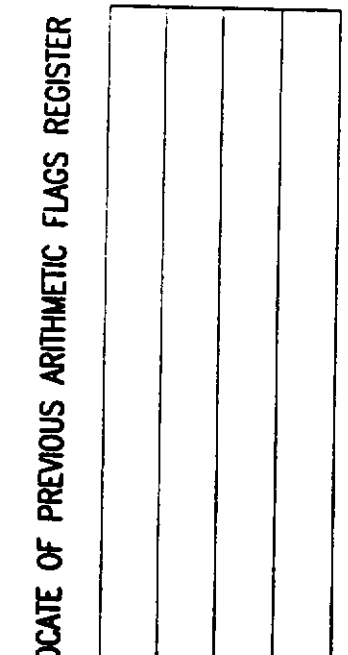

400
INSTRUCTION RETIREMENT UNIT
313
REORDER QUEUE (ROQ)
313
DELAY BUFFER
312
DATA DEPENDENCY UNIT
404
COMPARE LOGIC
402
ARITHMETIC FLAG BUFFER
311
RAT
310
LOGICAL SOURCE AND DESTINATION REGISTERS
AVAILABLE PHYSICAL REGISTERS

FIG. 4



AFFECT OF INSTRUCTION ON ARITHMETIC FLAGS REGISTER	DELAY DEALLOCATE OF PREVIOUS ARITHMETIC FLAGS REGISTER
EXPLICIT UPDATE	NO
IMPLICIT DATE	NO
DOES NOT UPDATE AND DOES NOT DEALLOCATE REGISTER	NO
DOES NOT UPDATE AND DEALLOCATES REGISTER	YES

FIG. 5

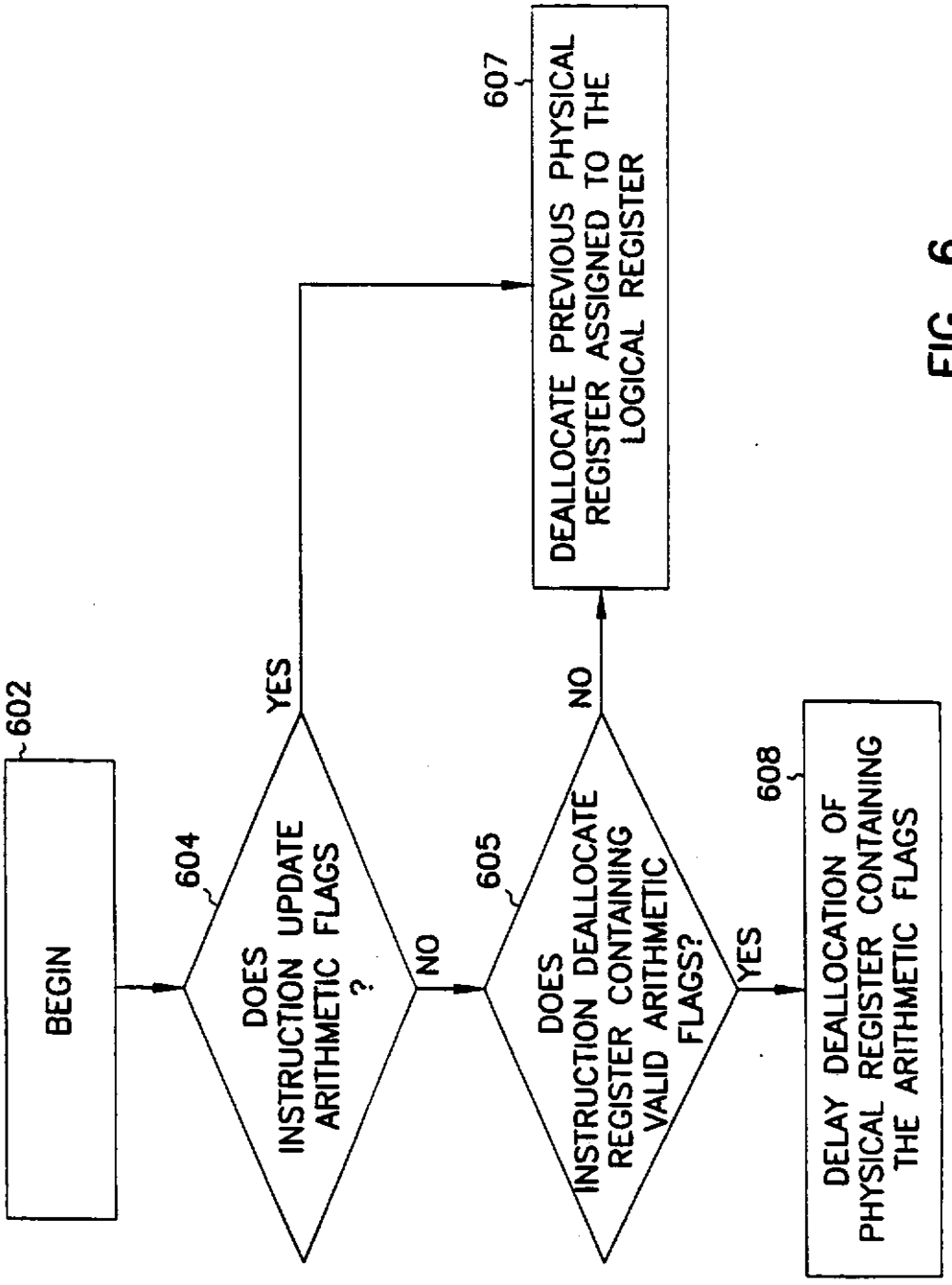

602
BEGIN
604
DOES INSTRUCTION UPDATE ARITHMETIC FLAGS ?
YES
NO
605
DOES INSTRUCTION DEALLOCATE REGISTER CONTAINING VALID ARITHMETIC FLAGS?
NO
YES
607
DEALLOCATE PREVIOUS PHYSICAL REGISTER ASSIGNED TO THE LOGICAL REGISTER
608
DELAY DEALLOCATION OF PHYSICAL REGISTER CONTAINING THE ARITHMETIC FLAGS

FIG. 6

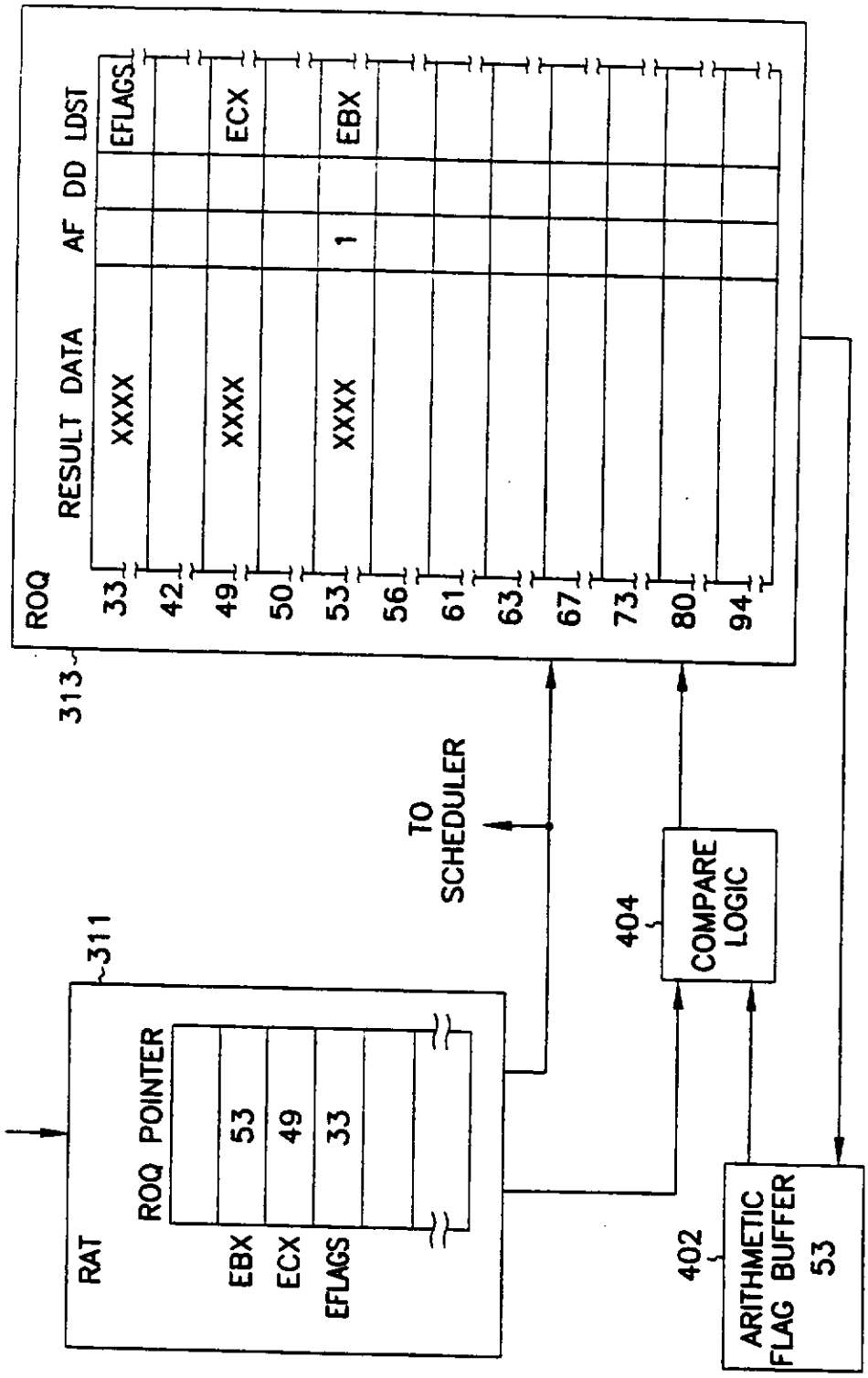

ROQ
313
RESULT DATA
AF
DD
LDST
EFLAGS
ECX
EBX
XXXX
1
33
42
49
50
53
56
61
63
67
73
80
94
TO SCHEDULER
404
COMPARE LOGIC
311
ROQ POINTER
53
49
33
RAT
EBX
ECX
EFLAGS
402
ARITHMETIC FLAG BUFFER 53

FIG. 7A

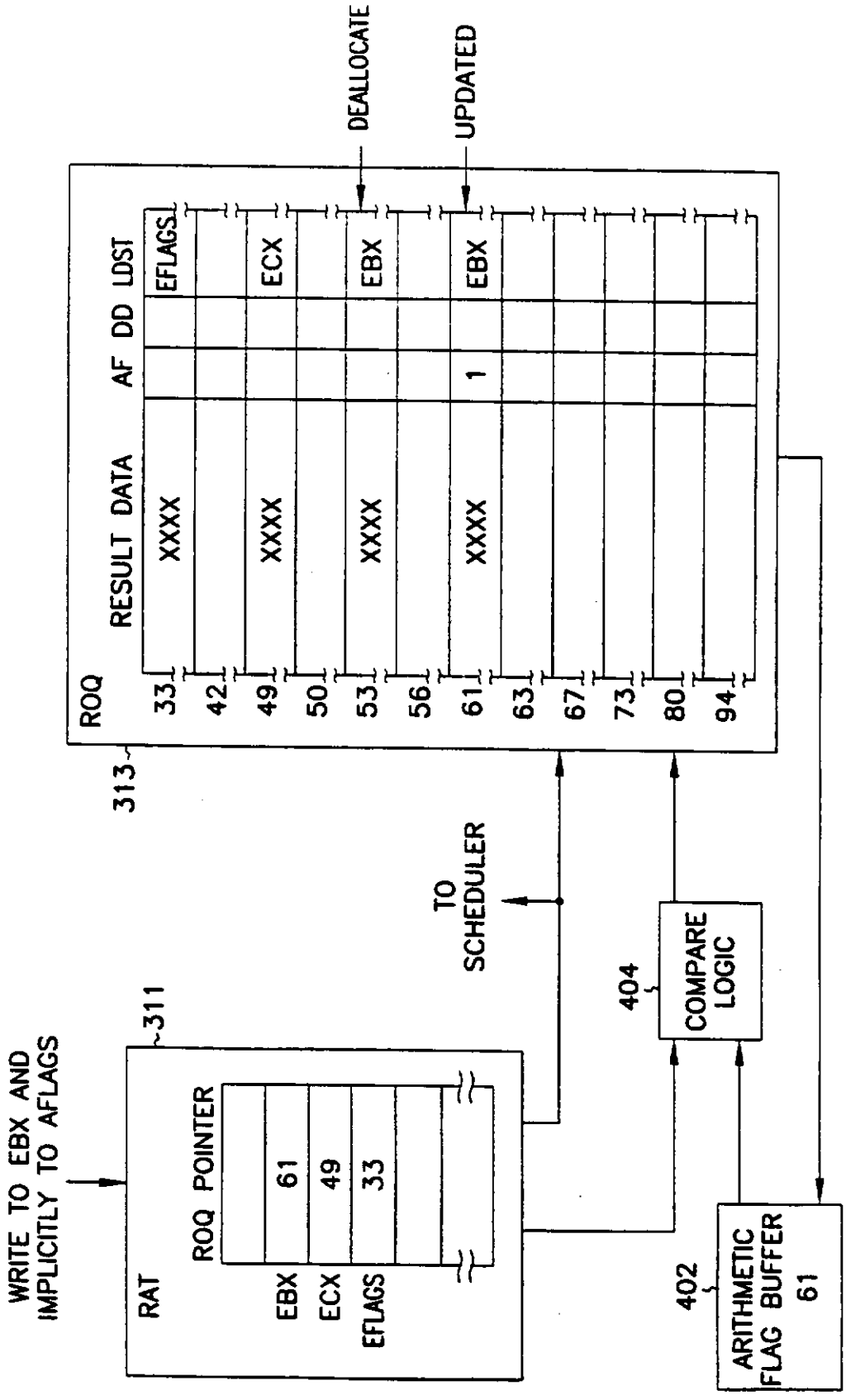

DEALLOCATE
UPDATED
ROQ
313
RESULT DATA
AF
DD
LDST
EFLAGS
ECX
EBX
EBX
XXXX
XXXX
XXXX
XXXX
1
33
42
49
50
53
56
61
63
67
73
80
94
TO SCHEDULER
404
COMPARE LOGIC
311
WRITE TO EBX AND IMPLICITLY TO AFLAGS
RAT
ROQ POINTER
61
49
33
EBX
ECX
EFLAGS
402
ARITHMETIC FLAG BUFFER 61

FIG. 7B

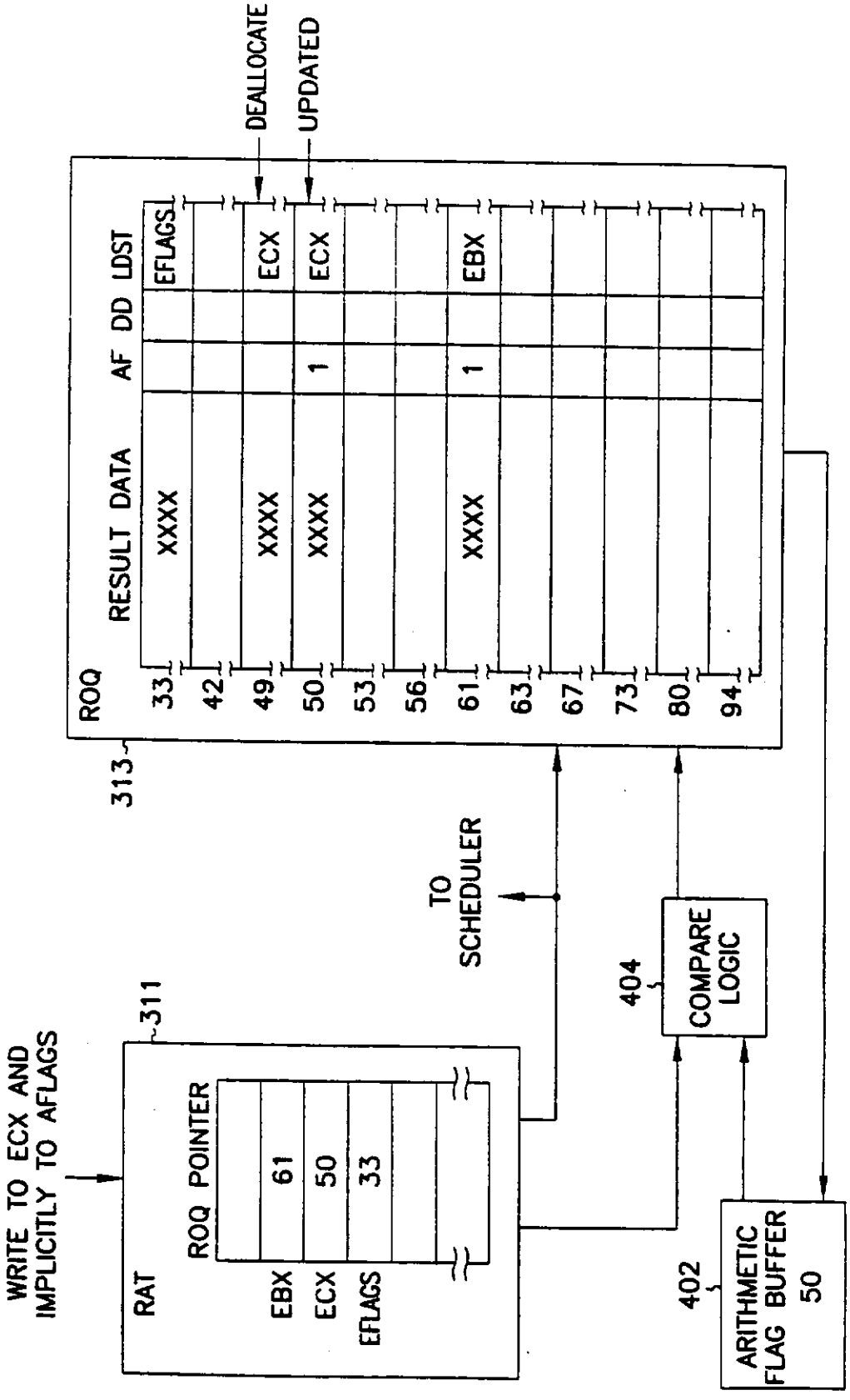

DEALLOCATE
UPDATED
ROQ
RESULT DATA
AF
DD
LDST
EFLAGS
ECX
ECX
EBX
XXXX
XXXX
XXXX
XXXX
1
1
33
42
49
50
53
56
61
63
67
73
80
94
313
TO SCHEDULER
404
COMPARE LOGIC
311
ROQ POINTER
61
50
33
EBX
ECX
EFLAGS
RAT
WRITE TO ECX AND IMPLICITLY TO AFLAGS
402
ARITHMETIC FLAG BUFFER 50

FIG. 7C

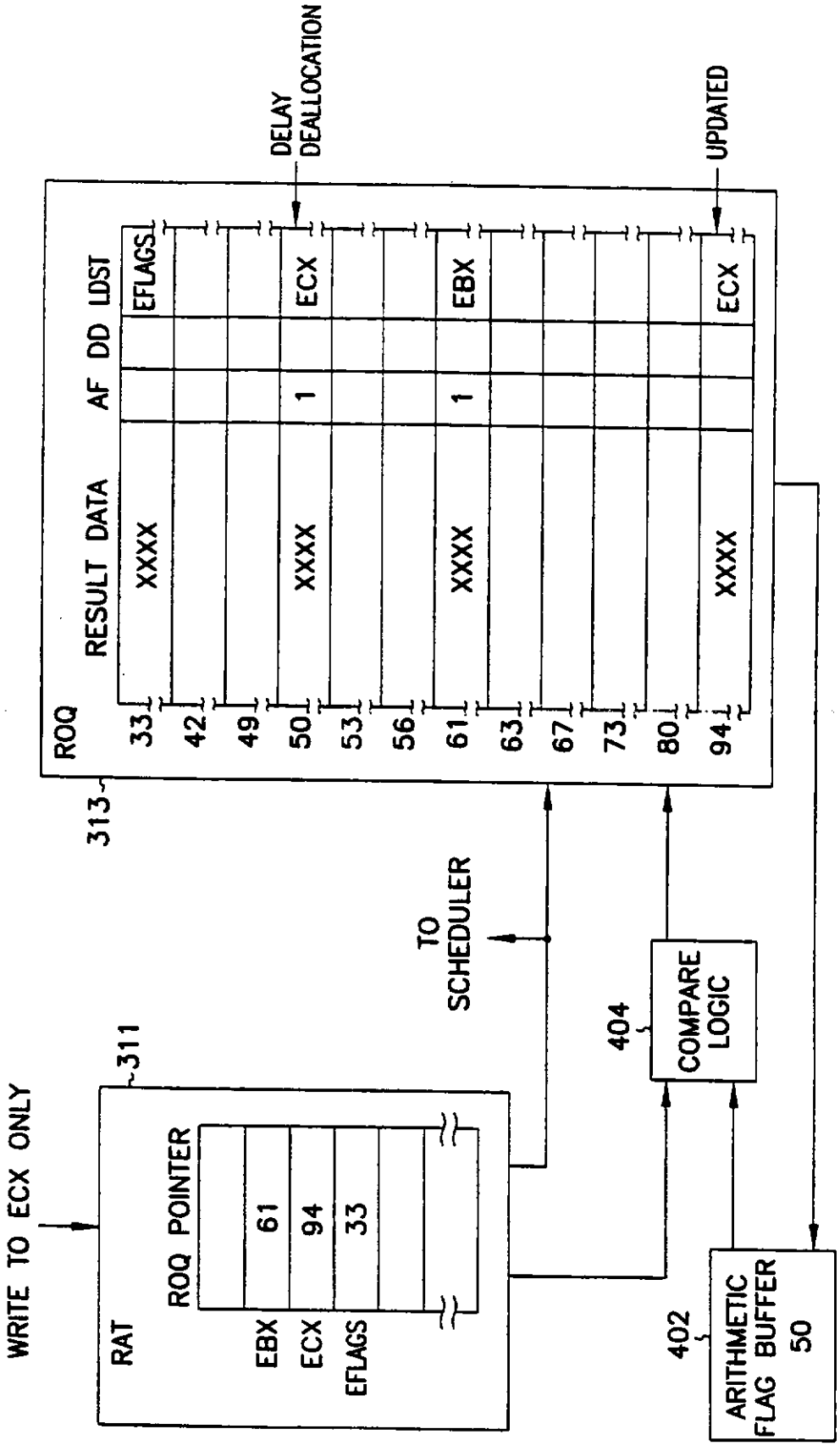

DELAY DEALLOCATION
UPDATED
ROQ
313
RESULT DATA
AF
DD
LDST
EFLAGS
ECX
EBX
ECX
XXXX
1
33
42
49
50
53
56
61
63
67
73
80
94
TO SCHEDULER
404
COMPARE LOGIC
311
WRITE TO ECX ONLY
RAT
ROQ POINTER
61
94
33
EBX
ECX
EFLAGS
402
ARITHMETIC FLAG BUFFER 50

FIG. 7D

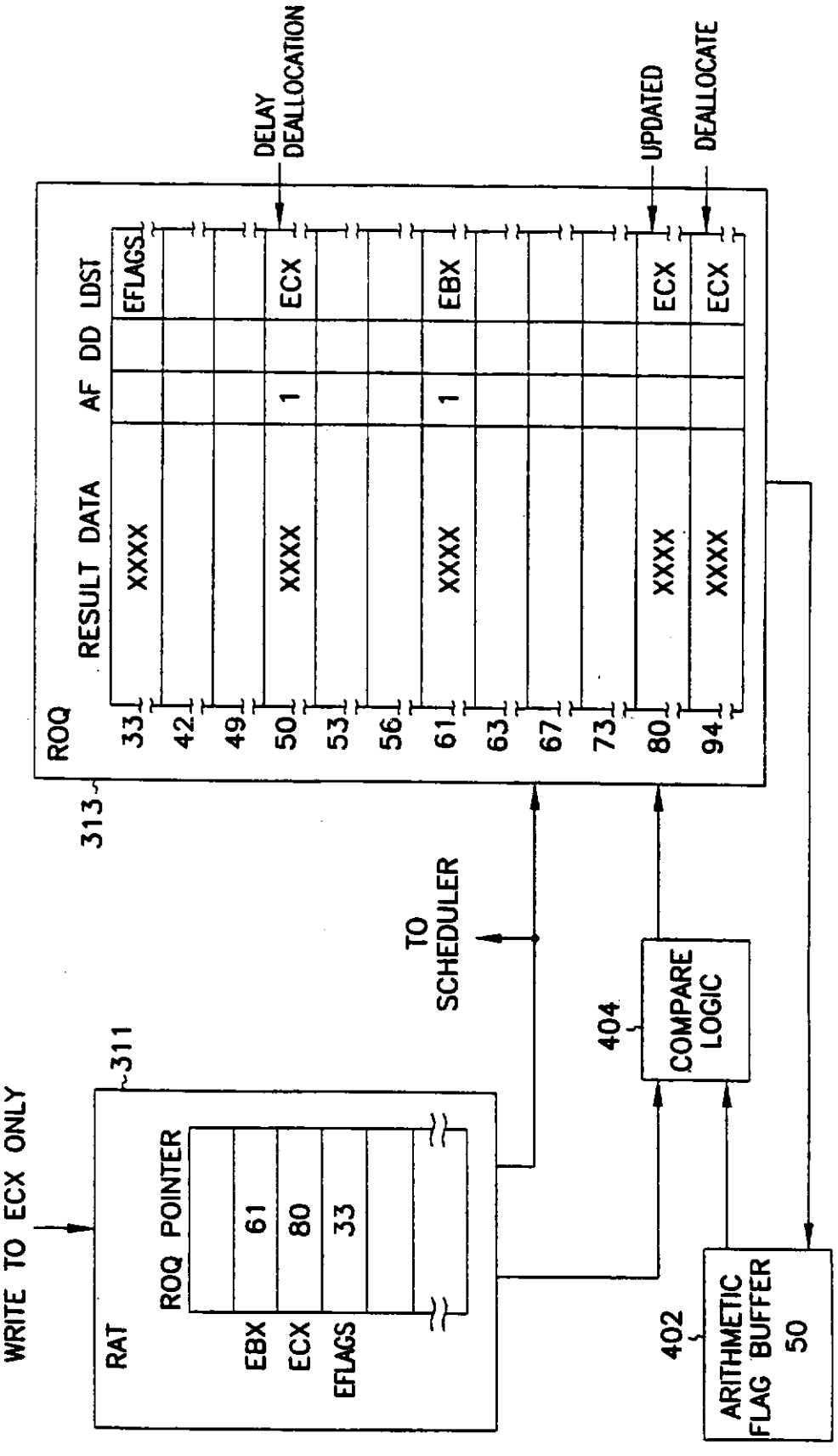

DELAY DEALLOCATION
UPDATED
DEALLOCATE
ROQ
RESULT DATA
AF
DD
LDST
EFLAGS
ECX
EBX
XXXX
1
33
42
49
50
53
56
61
63
67
73
80
94
313
TO SCHEDULER
404
COMPARE LOGIC
311
WRITE TO ECX ONLY
RAT
ROQ POINTER
61
80
33
EBX
ECX
EFLAGS
402
ARITHMETIC FLAG BUFFER 50

FIG. 7E

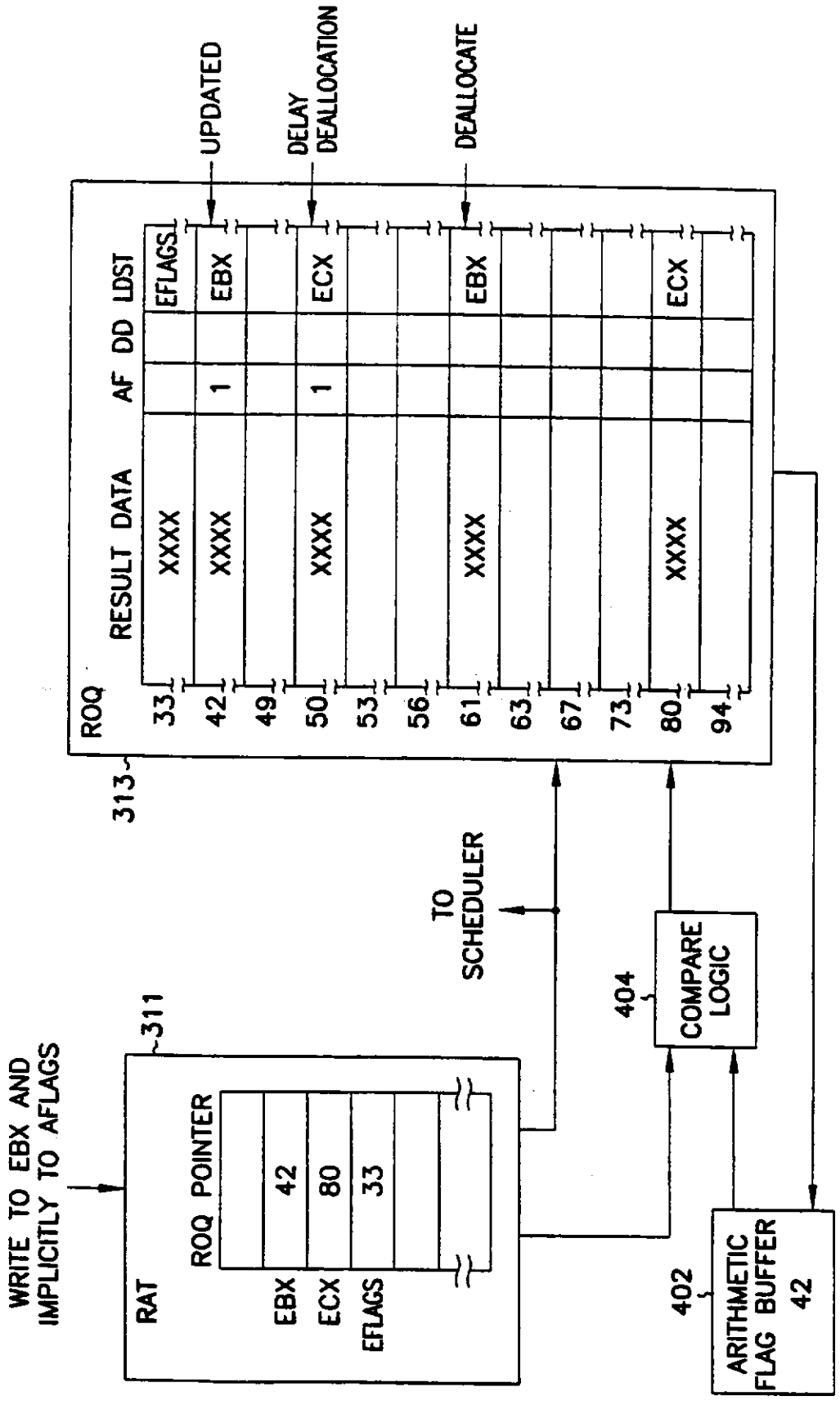

UPDATED
DELAY DEALLOCATION
DEALLOCATE
ROQ
RESULT DATA
AF
DD
LDST
EFLAGS
EBX
ECX
XXXX
1
33
42
49
50
53
56
61
63
67
73
80
94
313
TO SCHEDULER
404
COMPARE LOGIC
311
WRITE TO EBX AND IMPLICITLY TO AFLAGS
RAT
ROQ POINTER
42
80
33
EBX
ECX
EFLAGS
402
ARITHMETIC FLAG BUFFER 42

FIG. 7F

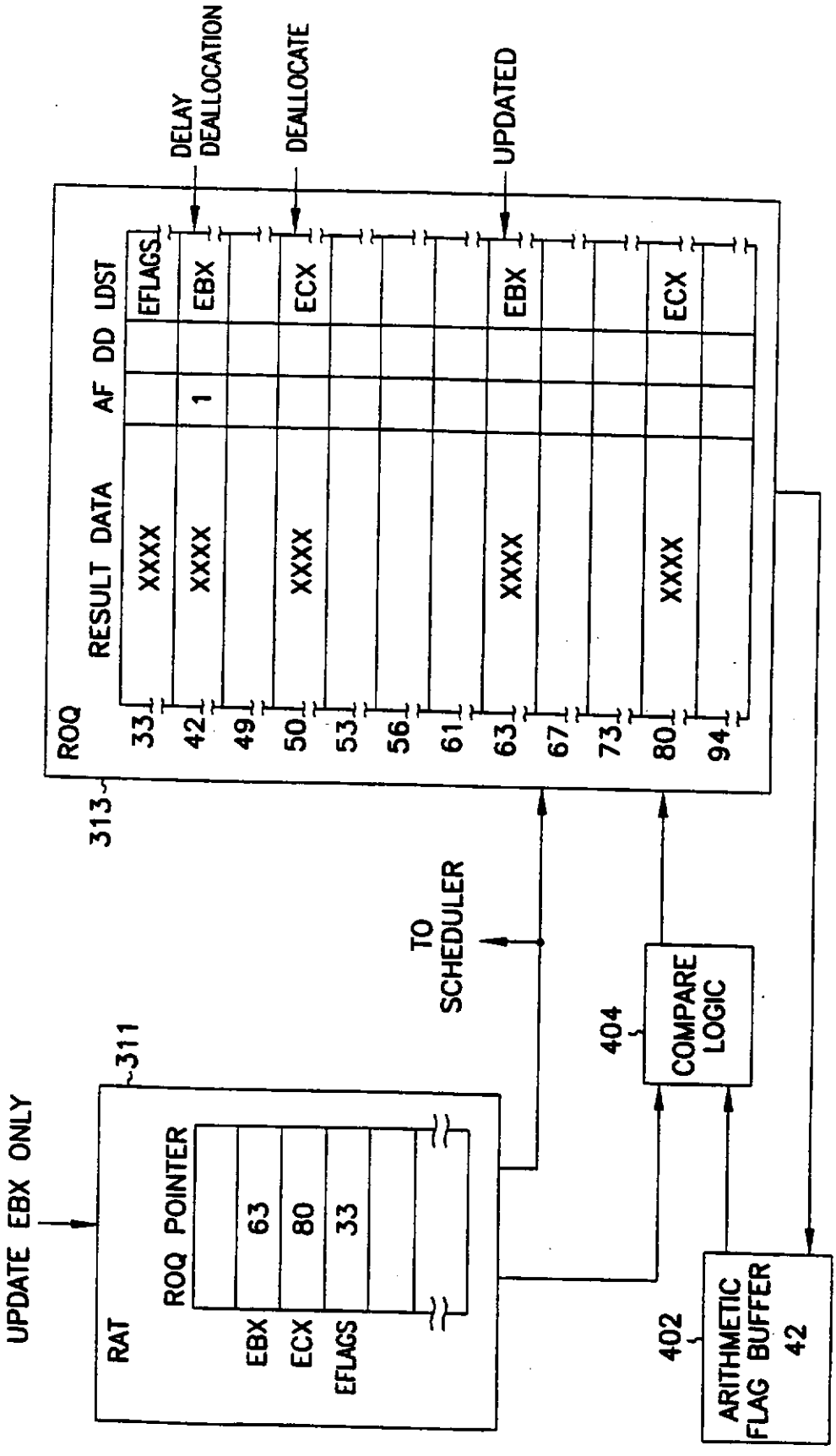

DELAY DEALLOCATION
DEALLOCATE
UPDATED
ROQ
313
RESULT DATA
AF
DD
LDST
EFLAGS
EBX
ECX
XXXX
1
33
42
49
50
53
56
61
63
67
73
80
94
TO SCHEDULER
COMPARE LOGIC
404
311
UPDATE EBX ONLY
RAT
ROQ POINTER
63
80
33
EBX
ECX
EFLAGS
402
ARITHMETIC FLAG BUFFER 42

FIG. 7G

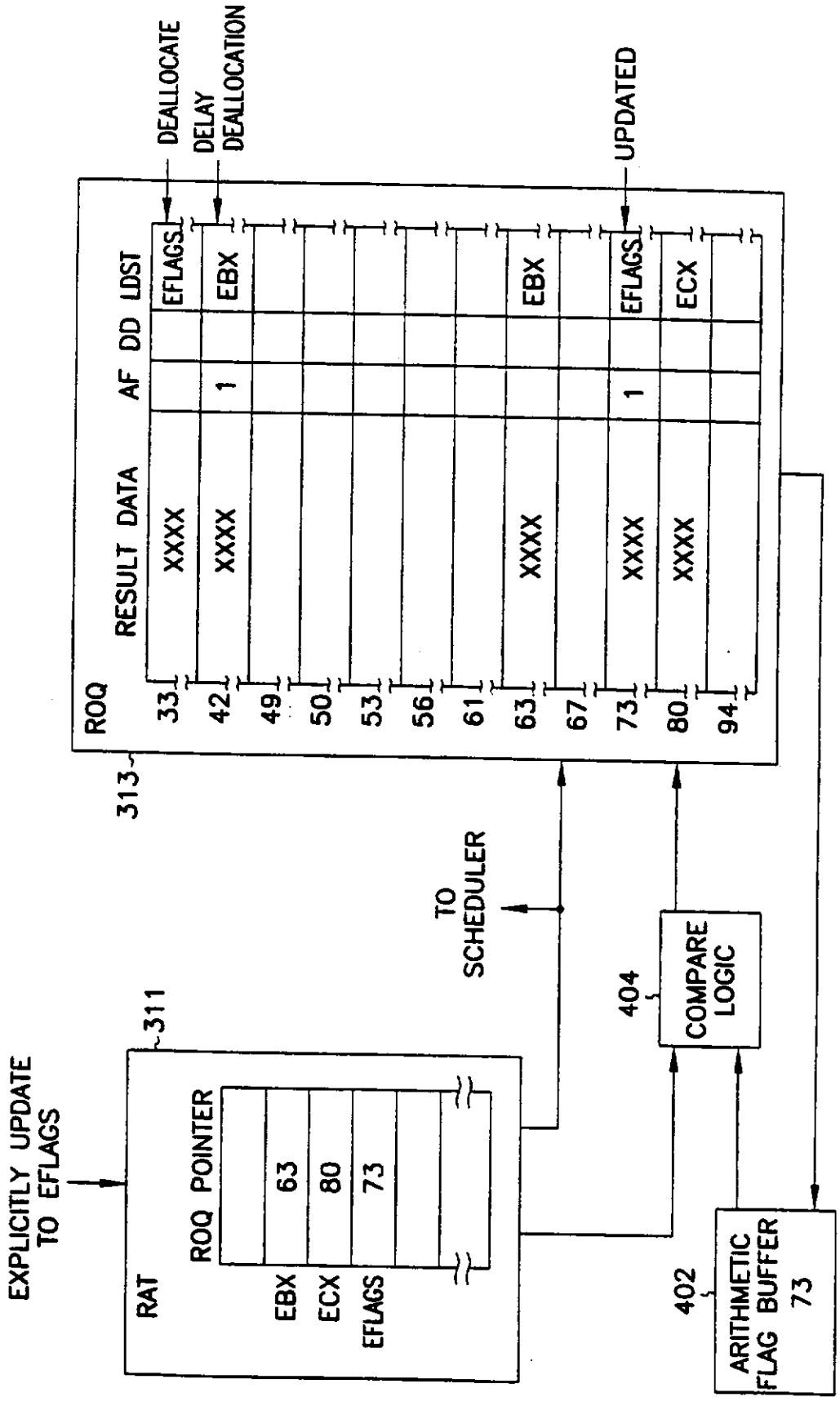

DEALLOCATE
DELAY DEALLOCATION
UPDATED
ROQ
313
RESULT DATA
AF
DD
LDST
EFLAGS
EBX
ECX
XXXX
1
33
42
49
50
53
56
61
63
67
73
80
94
TO SCHEDULER
404
COMPARE LOGIC
311
EXPLICITLY UPDATE TO EFLAGS
RAT
ROQ POINTER
63
80
73
EBX
ECX
EFLAGS
402
ARITHMETIC FLAG BUFFER 73

FIG. 7H

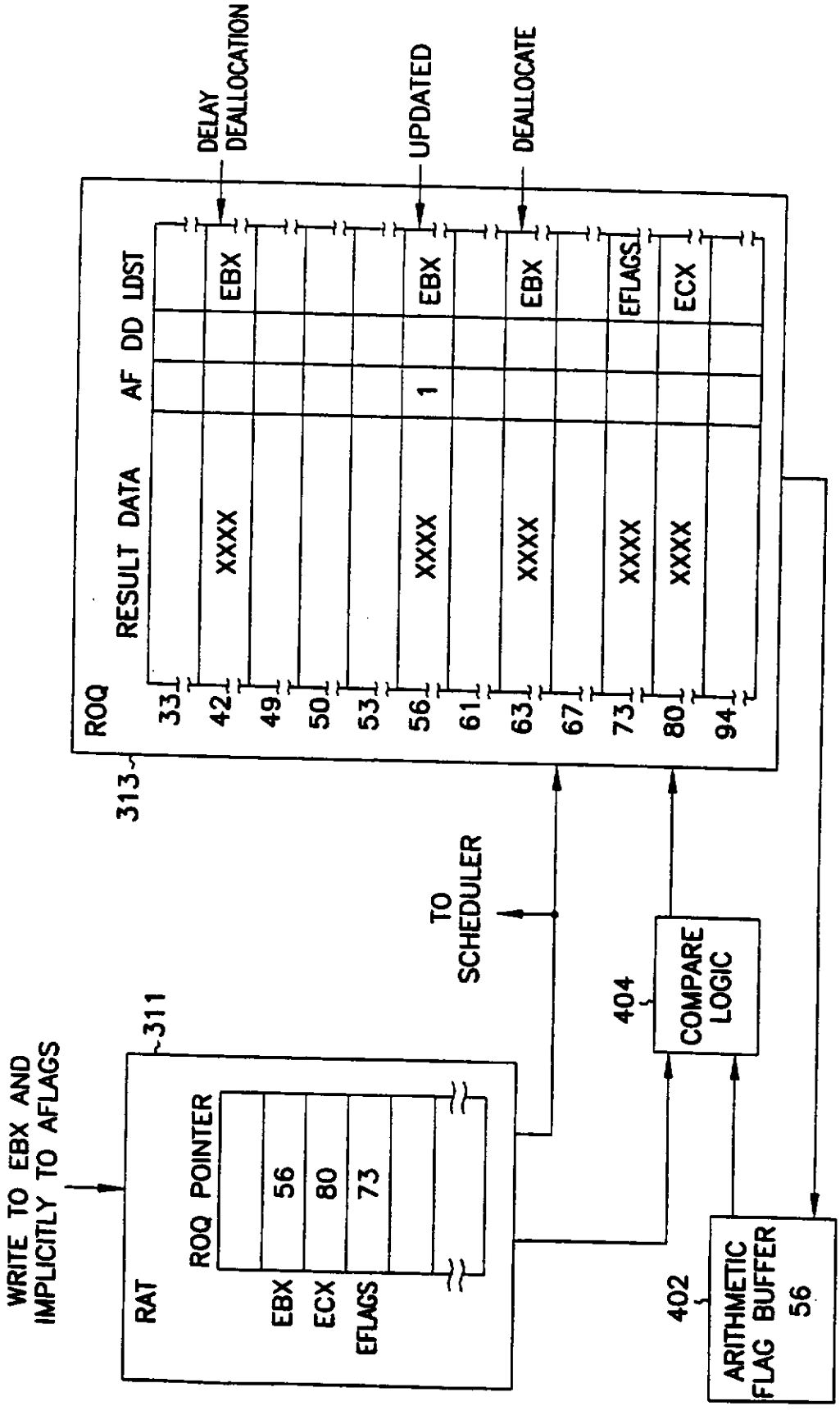

DELAY DEALLOCATION
UPDATED
DEALLOCATE
ROQ
RESULT DATA
AF
DD
LDST
EBX
XXXX
1
EFLAGS
ECX
33
42
49
50
53
56
61
63
67
73
80
94
313
TO SCHEDULER
404
COMPARE LOGIC
311
WRITE TO EBX AND IMPLICITLY TO AFLAGS
RAT
ROQ POINTER
56
80
73
EBX
ECX
EFLAGS
402
ARITHMETIC FLAG BUFFER
56

FIG. 71

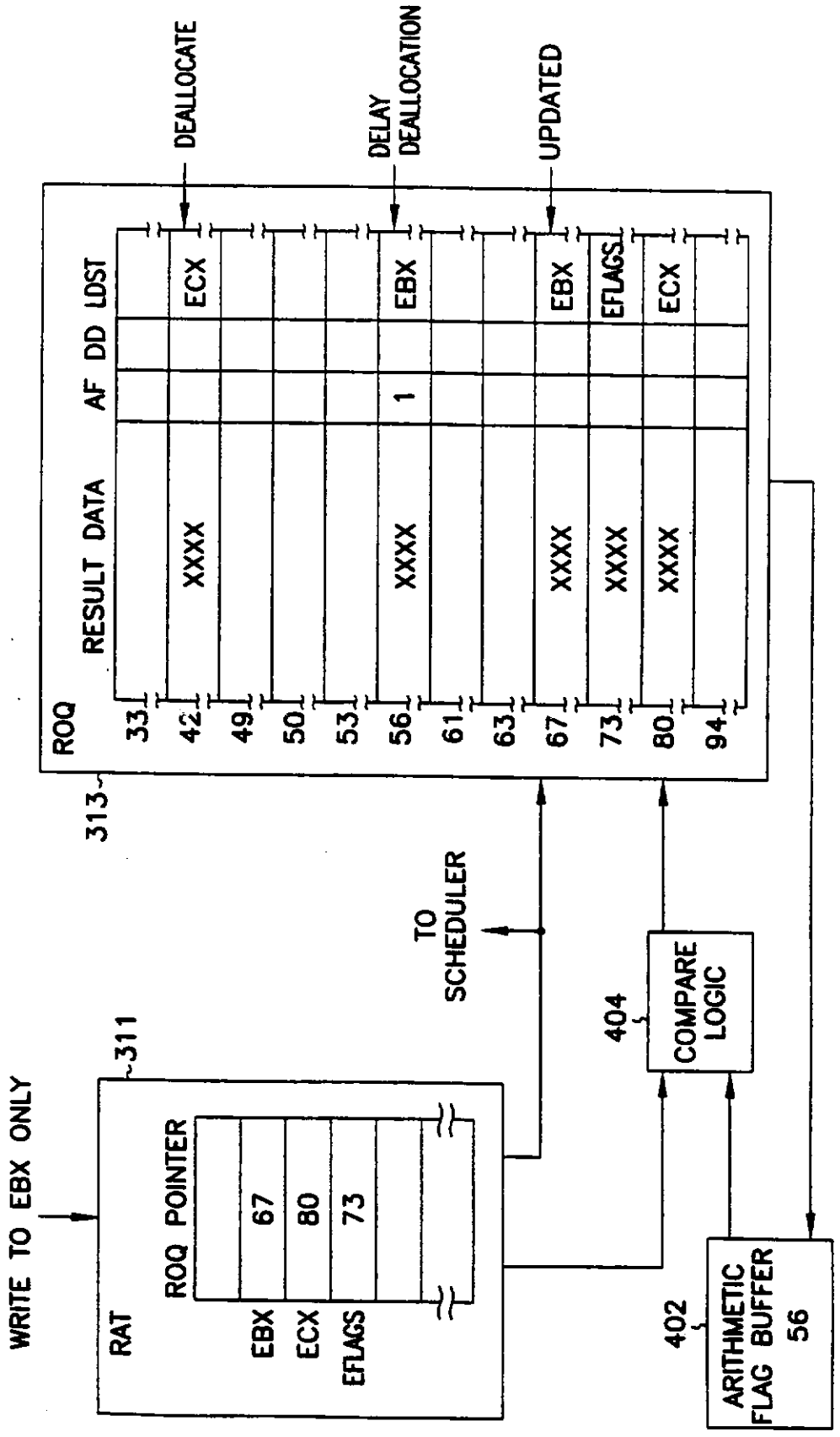

DEALLOCATE
DELAY DEALLOCATION
UPDATED
ROQ
RESULT DATA
AF
DD
LDST
ECX
XXXX
EBX
1
EBX
EFLAGS
ECX
33
42
49
50
53
56
61
63
67
73
80
94
313
TO SCHEDULER
404
COMPARE LOGIC
311
WRITE TO EBX ONLY
ROQ POINTER
67
80
73
RAT
EBX
ECX
EFLAGS
402
ARITHMETIC FLAG BUFFER 56

FIG. 7J

INSTRUCTION	UPDATE	UPDATE TO AFLAGS	NEW PHYSICAL DESTINATION	OLD PHYSICAL DESTINATION	AFLAGS	EBX	ECX	EFLAGS	REGISTER TO DEALLOCATE	DELAY DEALLOCATION?
INSTRUCTION 1	EBX <-	IMPLICIT	61	53	61	61	49	33	53	NO
INSTRUCTION 2	ECX <-	IMPLICIT	50	49	50	61	50	33	49	NO
INSTRUCTION 3	ECX <-	NONE	94	50	50	61	94	33	50	YES
INSTRUCTION 4	ECX <-	NONE	80	94	50	61	80	33	94	NO
INSTRUCTION 5	EBX <-	IMPLICIT	42	61	42	42	80	33	61	NO
INSTRUCTION 6	EBX <-	NONE	63	42	42	63	80	33	42	YES -> DEALLOCATE 50
INSTRUCTION 7	EFLAGS <-	EXPLICIT	73	33	73	63	80	73	33	NO
INSTRUCTION 8	EBX <-	IMPLICIT	56	63	56	56	80	73	63	NO
INSTRUCTION 9	EBX <-	NONE	67	56	56	67	80	73	56	YES -> DEALLOCATE 42

FIG. 8