FIG. 1

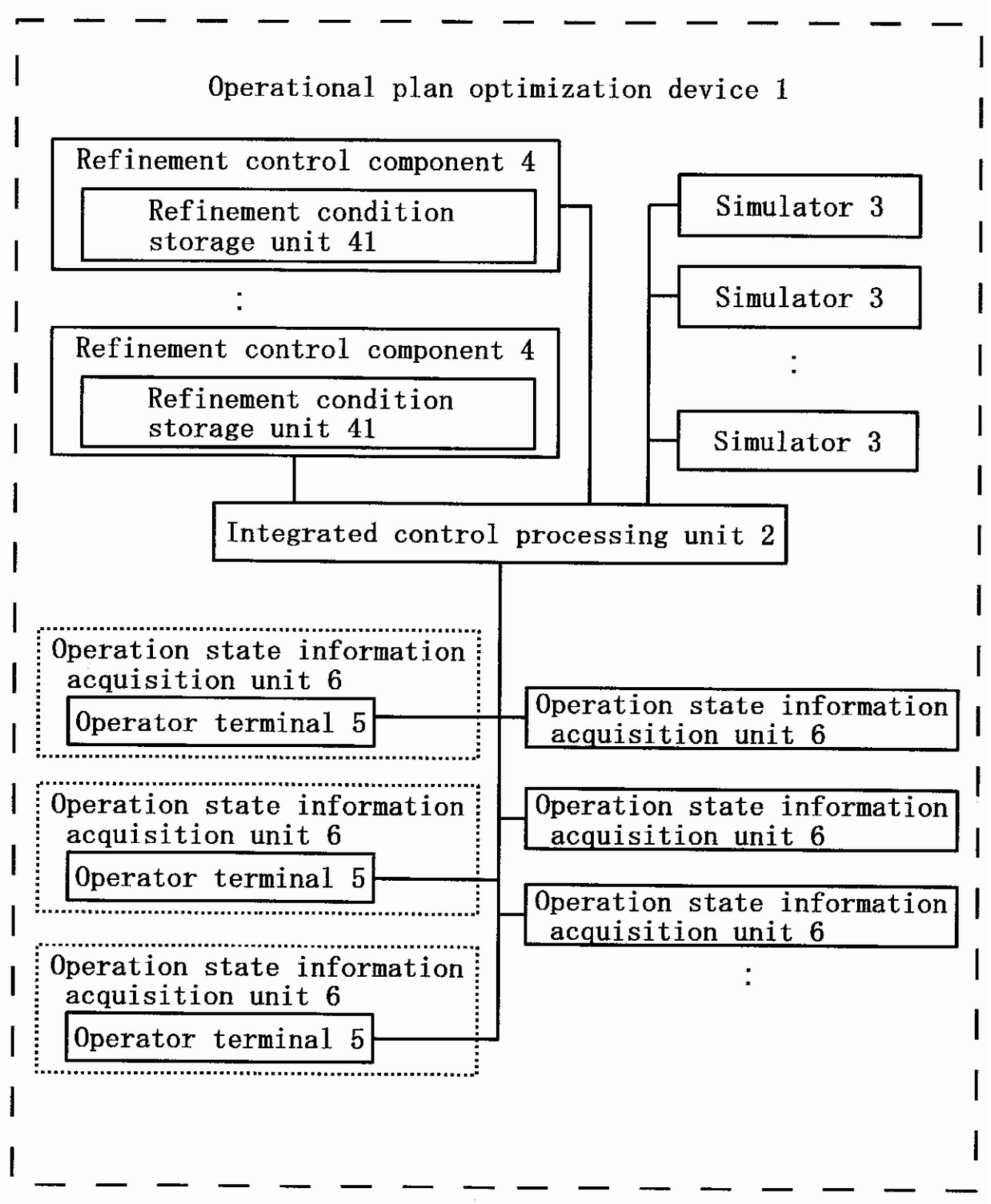

Operational plan optimization device 1
Refinement control component 4
Refinement condition storage unit 41
Refinement control component 4
Refinement condition storage unit 41
Simulator 3
Simulator 3
Simulator 3
Integrated control processing unit 2
Operation state information acquisition unit 6
Operator terminal 5
Operation state information acquisition unit 6
Operation state information acquisition unit 6
Operator terminal 5
Operation state information acquisition unit 6
Operation state information acquisition unit 6
Operation state information acquisition unit 6
Operator terminal 5

FIG. 2

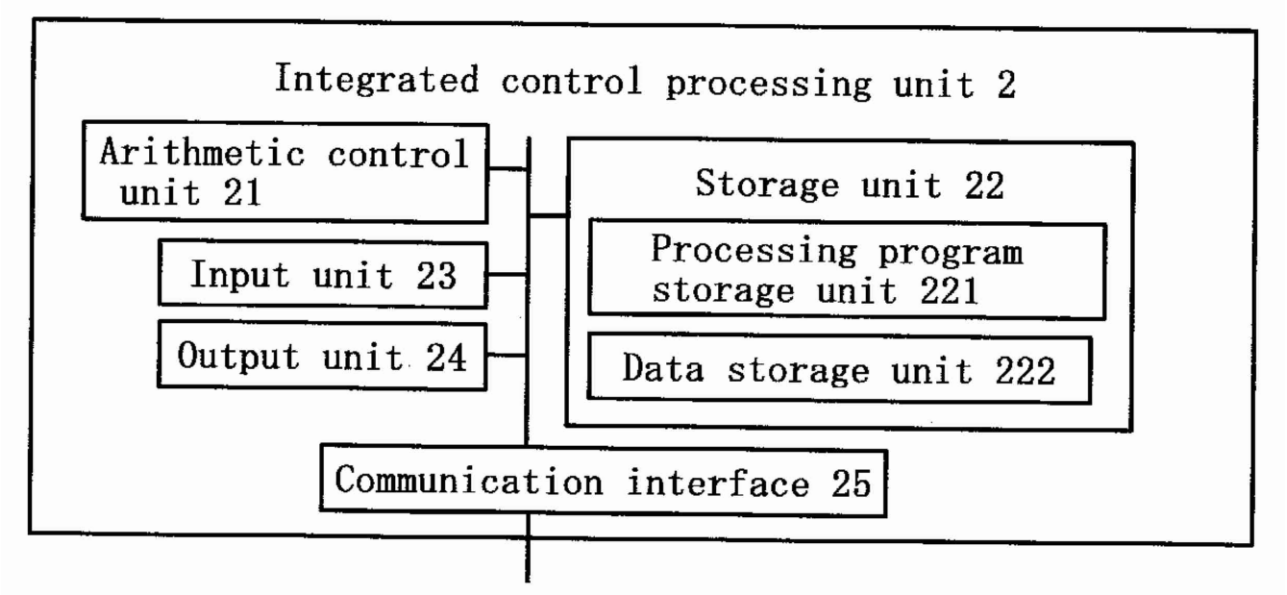

Integrated control processing unit 2
Arithmetic control unit 21
Input unit 23
Output unit 24
Storage unit 22
Processing program storage unit 221
Data storage unit 222
Communication interface 25

FIG. 3

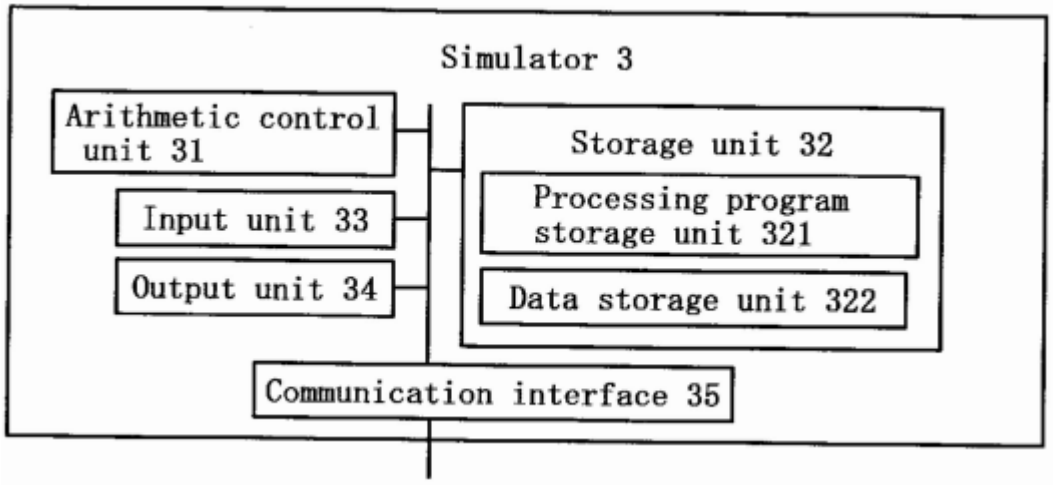

Simulator 3
Arithmetic control unit 31
Input unit 33
Output unit 34
Storage unit 32
Processing program storage unit 321
Data storage unit 322
Communication interface 35

FIG. 4

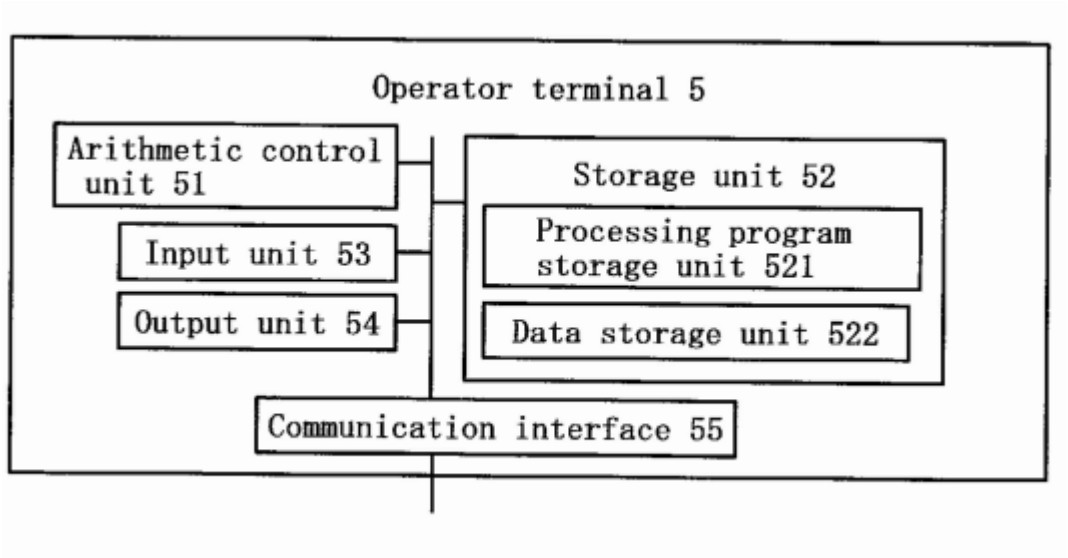
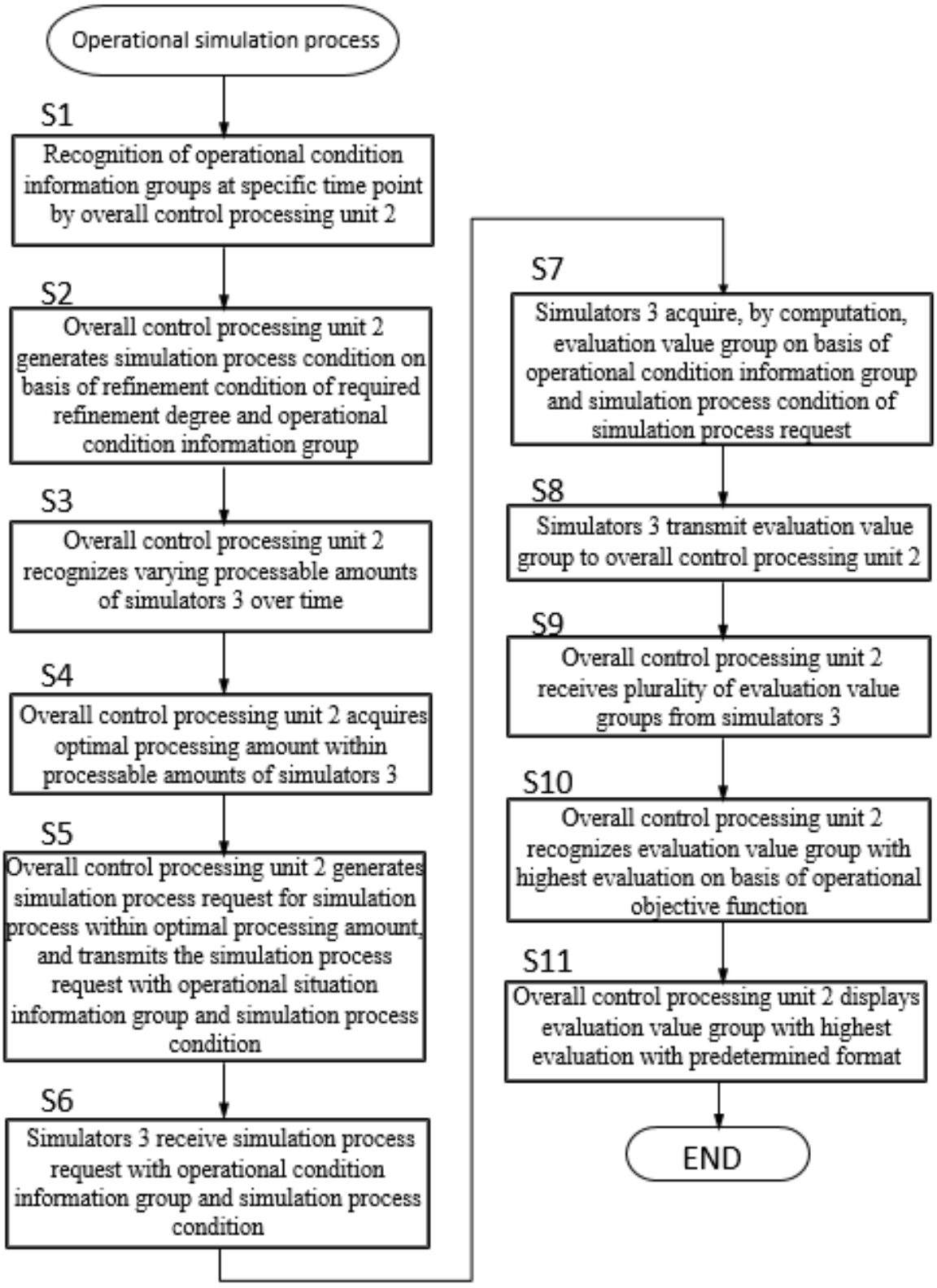

Operator terminal 5
Arithmetic control unit 51
Input unit 53
Output unit 54
Storage unit 52
Processing program storage unit 521
Data storage unit 522
Communication interface 55

FIG. 5


Operational simulation process
S1
Recognition of operational condition information groups at specific time point by overall control processing unit 2
S2
Overall control processing unit 2 generates simulation process condition on basis of refinement condition of required refinement degree and operational condition information group
S3
Overall control processing unit 2 recognizes varying processable amounts of simulators 3 over time
S4
Overall control processing unit 2 acquires optimal processing amount within processable amounts of simulators 3
S5
Overall control processing unit 2 generates simulation process request for simulation process within optimal processing amount, and transmits the simulation process request with operational situation information group and simulation process condition
S6
Simulators 3 receive simulation process request with operational condition information group and simulation process condition
S7
Simulators 3 acquire, by computation, evaluation value group on basis of operational condition information group and simulation process condition of simulation process request
S8
Simulators 3 transmit evaluation value group to overall control processing unit 2
S9
Overall control processing unit 2 receives plurality of evaluation value groups from simulators 3
S10
Overall control processing unit 2 recognizes evaluation value group with highest evaluation on basis of operational objective function
S11
Overall control processing unit 2 displays evaluation value group with highest evaluation with predetermined format
END

	SC_{i1}	SC_{i2}	SC_{i3}	SC_{i4}	…	SC_{im}
SC1	Production order 1 : P6	Route of production order 1 : R11	Production order 2 : P7	Route of production order 2 : R11	…	…
SC2	Production order 1 : P6	Route of production order 1 : R11	Production order 2 : P7	Route of production order 2 : R12	…	…
SC3	Production order 1 : P6	Route of production order 1 : R11	Production order 2 : P7	Route of production order 2 : R13	…	…
:	:	:	:	:	…	…
SCi	Production order 1 : P6	Route of production order 1 : R11	Production order 2 : P8	Route of production order 2 : R11	…	…
:	:	:	:	:	…	…
SCn	Production order 1 : P6	Route of production order 1 : R11	Production order 2 : P9	Route of production order 2 : R14	…	…

FIG. 6

FIG. 7

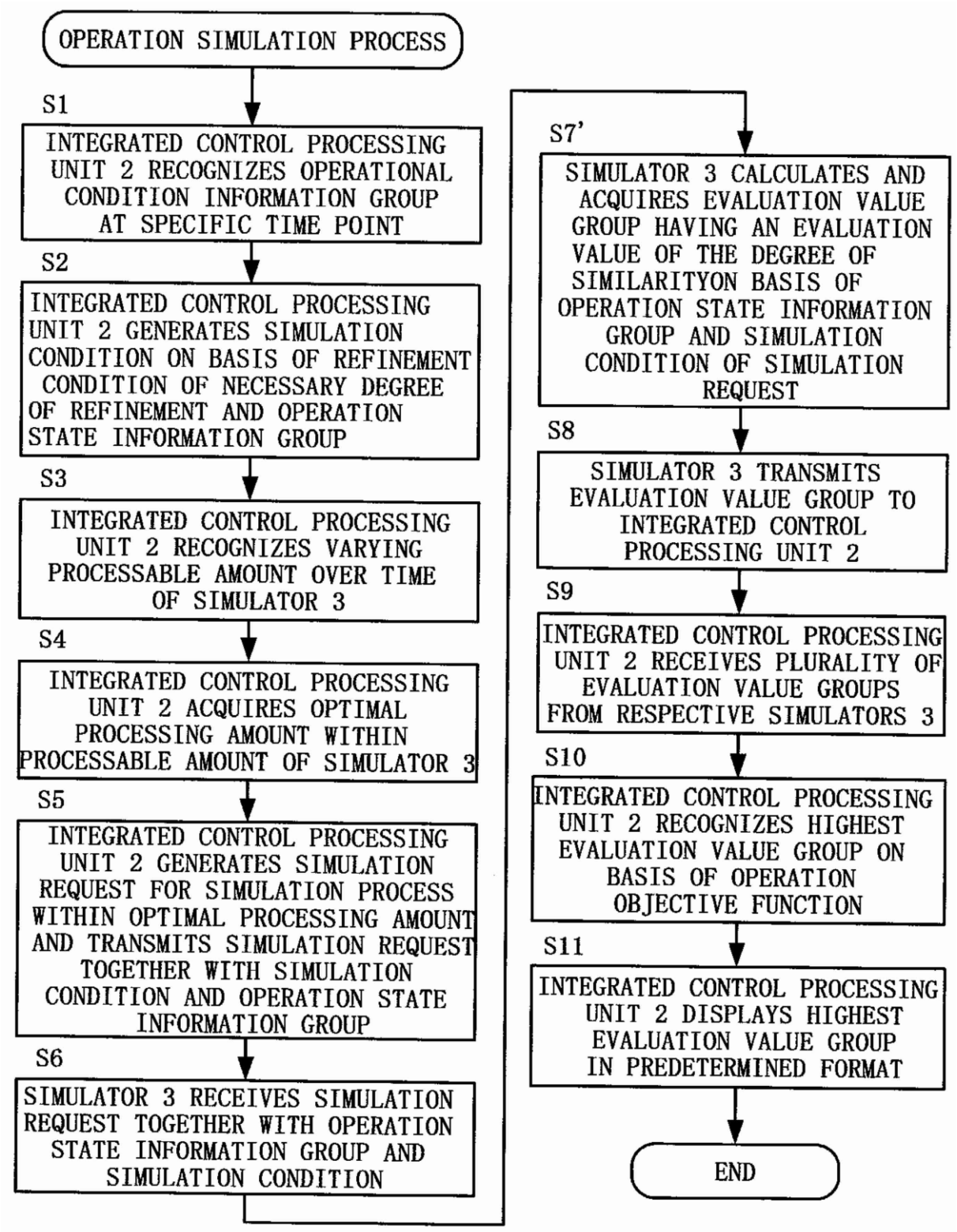

OPERATION SIMULATION PROCESS
S1
INTEGRATED CONTROL PROCESSING UNIT 2 RECOGNIZES OPERATIONAL CONDITION INFORMATION GROUP AT SPECIFIC TIME POINT
S2
INTEGRATED CONTROL PROCESSING UNIT 2 GENERATES SIMULATION CONDITION ON BASIS OF REFINEMENT CONDITION OF NECESSARY DEGREE OF REFINEMENT AND OPERATION STATE INFORMATION GROUP
S3
INTEGRATED CONTROL PROCESSING UNIT 2 RECOGNIZES VARYING PROCESSABLE AMOUNT OVER TIME OF SIMULATOR 3
S4
INTEGRATED CONTROL PROCESSING UNIT 2 ACQUIRES OPTIMAL PROCESSING AMOUNT WITHIN PROCESSABLE AMOUNT OF SIMULATOR 3
S5
INTEGRATED CONTROL PROCESSING UNIT 2 GENERATES SIMULATION REQUEST FOR SIMULATION PROCESS WITHIN OPTIMAL PROCESSING AMOUNT AND TRANSMITS SIMULATION REQUEST TOGETHER WITH SIMULATION CONDITION AND OPERATION STATE INFORMATION GROUP
S6
SIMULATOR 3 RECEIVES SIMULATION REQUEST TOGETHER WITH OPERATION STATE INFORMATION GROUP AND SIMULATION CONDITION
S7'
SIMULATOR 3 CALCULATES AND ACQUIRES EVALUATION VALUE GROUP HAVING AN EVALUATION VALUE OF THE DEGREE OF SIMILARITYON BASIS OF OPERATION STATE INFORMATION GROUP AND SIMULATION CONDITION OF SIMULATION REQUEST
S8
SIMULATOR 3 TRANSMITS EVALUATION VALUE GROUP TO INTEGRATED CONTROL PROCESSING UNIT 2
S9
INTEGRATED CONTROL PROCESSING UNIT 2 RECEIVES PLURALITY OF EVALUATION VALUE GROUPS FROM RESPECTIVE SIMULATORS 3
S10
INTEGRATED CONTROL PROCESSING UNIT 2 RECOGNIZES HIGHEST EVALUATION VALUE GROUP ON BASIS OF OPERATION OBJECTIVE FUNCTION
S11
INTEGRATED CONTROL PROCESSING UNIT 2 DISPLAYS HIGHEST EVALUATION VALUE GROUP IN PREDETERMINED FORMAT
END

FIG. 8

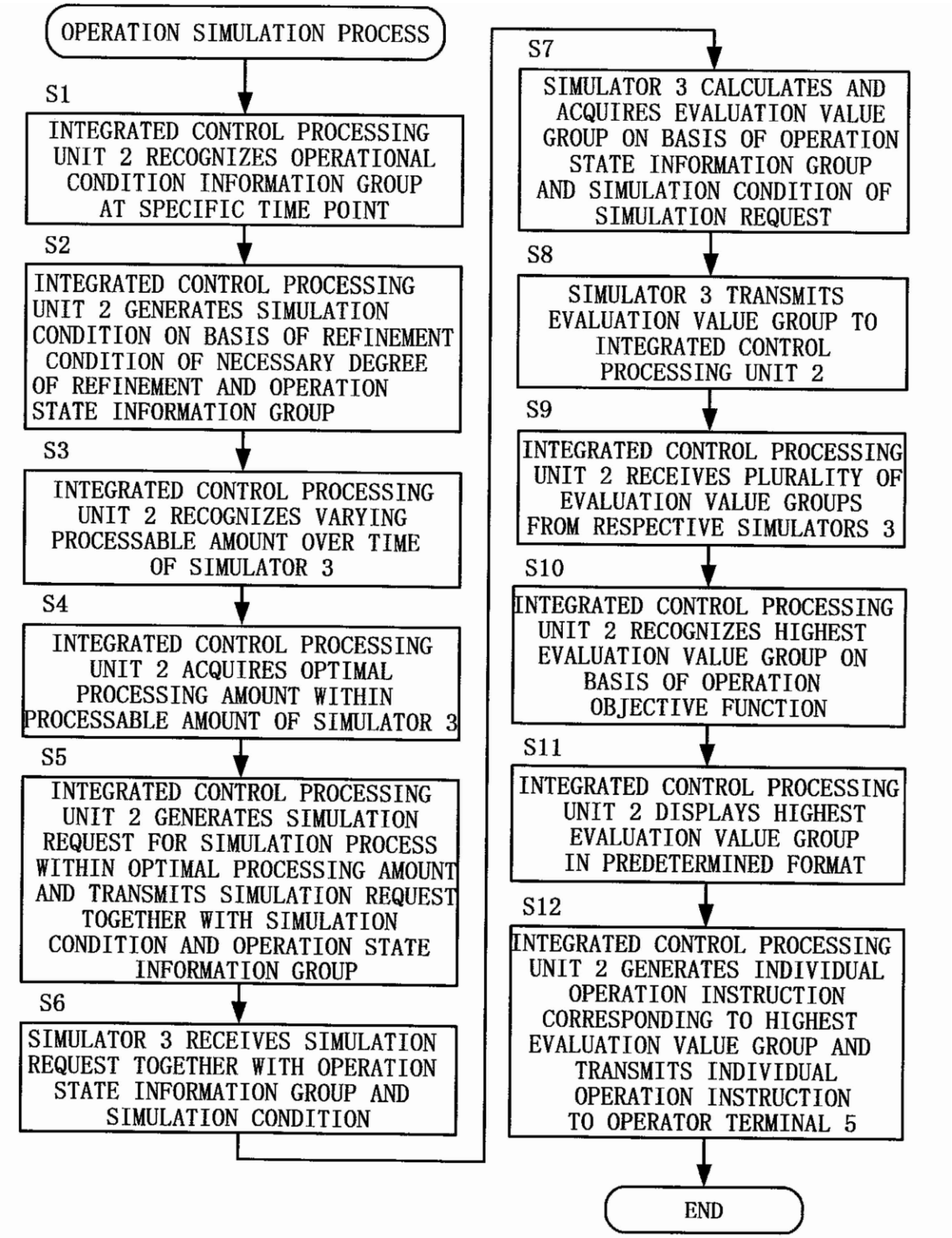

OPERATION SIMULATION PROCESS
S1
INTEGRATED CONTROL PROCESSING UNIT 2 RECOGNIZES OPERATIONAL CONDITION INFORMATION GROUP AT SPECIFIC TIME POINT
S2
INTEGRATED CONTROL PROCESSING UNIT 2 GENERATES SIMULATION CONDITION ON BASIS OF REFINEMENT CONDITION OF NECESSARY DEGREE OF REFINEMENT AND OPERATION STATE INFORMATION GROUP
S3
INTEGRATED CONTROL PROCESSING UNIT 2 RECOGNIZES VARYING PROCESSABLE AMOUNT OVER TIME OF SIMULATOR 3
S4
INTEGRATED CONTROL PROCESSING UNIT 2 ACQUIRES OPTIMAL PROCESSING AMOUNT WITHIN PROCESSABLE AMOUNT OF SIMULATOR 3
S5
INTEGRATED CONTROL PROCESSING UNIT 2 GENERATES SIMULATION REQUEST FOR SIMULATION PROCESS WITHIN OPTIMAL PROCESSING AMOUNT AND TRANSMITS SIMULATION REQUEST TOGETHER WITH SIMULATION CONDITION AND OPERATION STATE INFORMATION GROUP
S6
SIMULATOR 3 RECEIVES SIMULATION REQUEST TOGETHER WITH OPERATION STATE INFORMATION GROUP AND SIMULATION CONDITION
S7
SIMULATOR 3 CALCULATES AND ACQUIRES EVALUATION VALUE GROUP ON BASIS OF OPERATION STATE INFORMATION GROUP AND SIMULATION CONDITION OF SIMULATION REQUEST
S8
SIMULATOR 3 TRANSMITS EVALUATION VALUE GROUP TO INTEGRATED CONTROL PROCESSING UNIT 2
S9
INTEGRATED CONTROL PROCESSING UNIT 2 RECEIVES PLURALITY OF EVALUATION VALUE GROUPS FROM RESPECTIVE SIMULATORS 3
S10
INTEGRATED CONTROL PROCESSING UNIT 2 RECOGNIZES HIGHEST EVALUATION VALUE GROUP ON BASIS OF OPERATION OBJECTIVE FUNCTION
S11
INTEGRATED CONTROL PROCESSING UNIT 2 DISPLAYS HIGHEST EVALUATION VALUE GROUP IN PREDETERMINED FORMAT
S12
INTEGRATED CONTROL PROCESSING UNIT 2 GENERATES INDIVIDUAL OPERATION INSTRUCTION CORRESPONDING TO HIGHEST EVALUATION VALUE GROUP AND TRANSMITS INDIVIDUAL OPERATION INSTRUCTION TO OPERATOR TERMINAL 5
END

FIG. 9

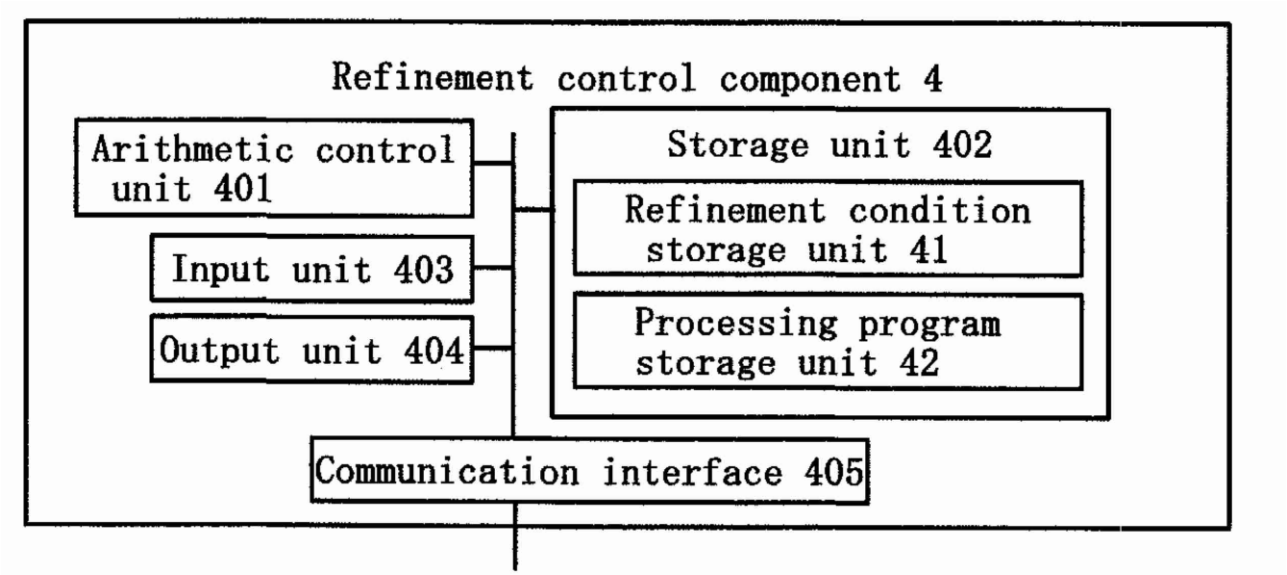

Refinement control component 4
Arithmetic control unit 401
Input unit 403
Output unit 404
Storage unit 402
Refinement condition storage unit 41
Processing program storage unit 42
Communication interface 405

FIG. 10

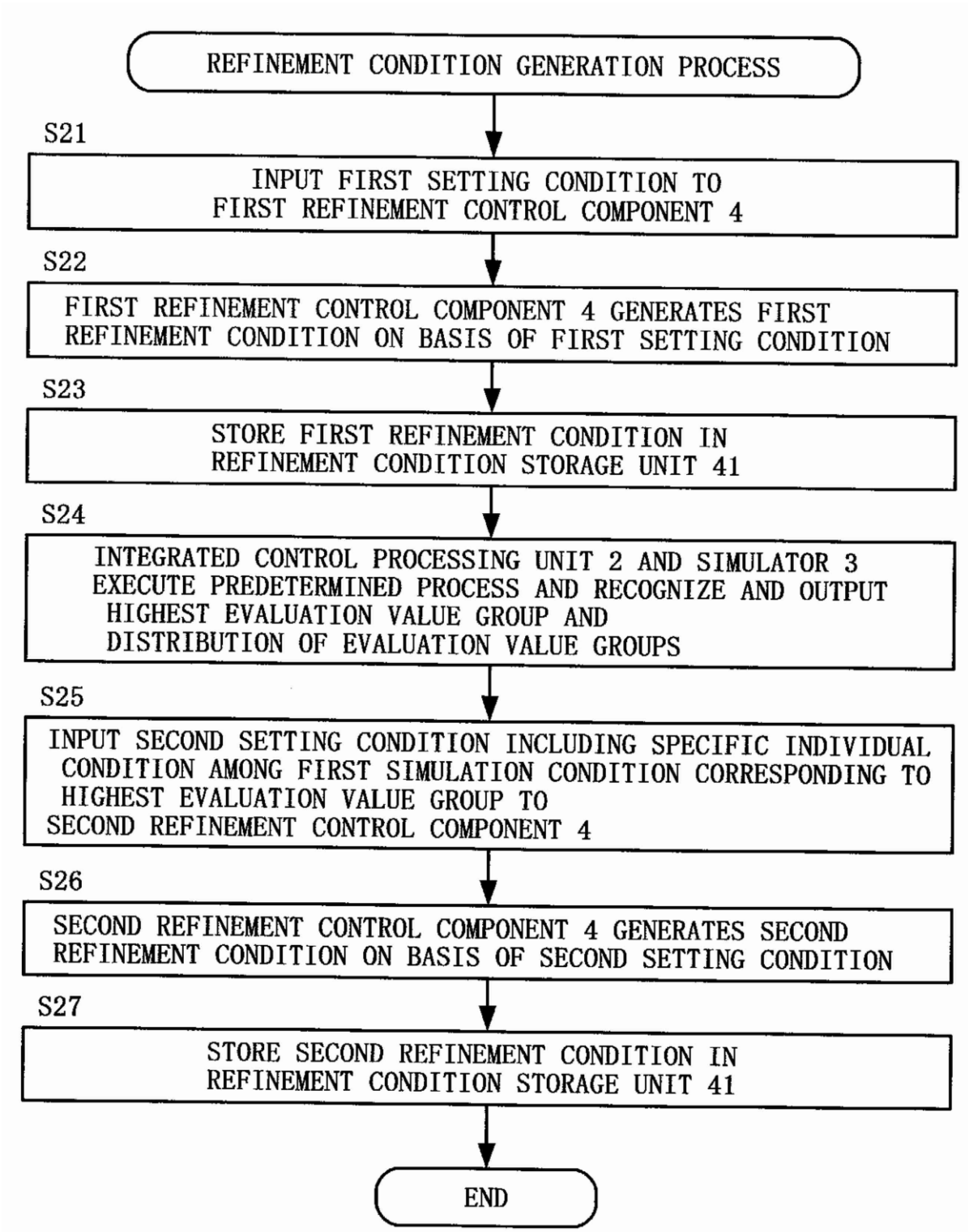

REFINEMENT CONDITION GENERATION PROCESS
S21
INPUT FIRST SETTING CONDITION TO FIRST REFINEMENT CONTROL COMPONENT 4
S22
FIRST REFINEMENT CONTROL COMPONENT 4 GENERATES FIRST REFINEMENT CONDITION ON BASIS OF FIRST SETTING CONDITION
S23
STORE FIRST REFINEMENT CONDITION IN REFINEMENT CONDITION STORAGE UNIT 41
S24
INTEGRATED CONTROL PROCESSING UNIT 2 AND SIMULATOR 3 EXECUTE PREDETERMINED PROCESS AND RECOGNIZE AND OUTPUT HIGHEST EVALUATION VALUE GROUP AND DISTRIBUTION OF EVALUATION VALUE GROUPS
S25
INPUT SECOND SETTING CONDITION INCLUDING SPECIFIC INDIVIDUAL CONDITION AMONG FIRST SIMULATION CONDITION CORRESPONDING TO HIGHEST EVALUATION VALUE GROUP TO SECOND REFINEMENT CONTROL COMPONENT 4
S26
SECOND REFINEMENT CONTROL COMPONENT 4 GENERATES SECOND REFINEMENT CONDITION ON BASIS OF SECOND SETTING CONDITION
S27
STORE SECOND REFINEMENT CONDITION IN REFINEMENT CONDITION STORAGE UNIT 41
END

FIG. 11

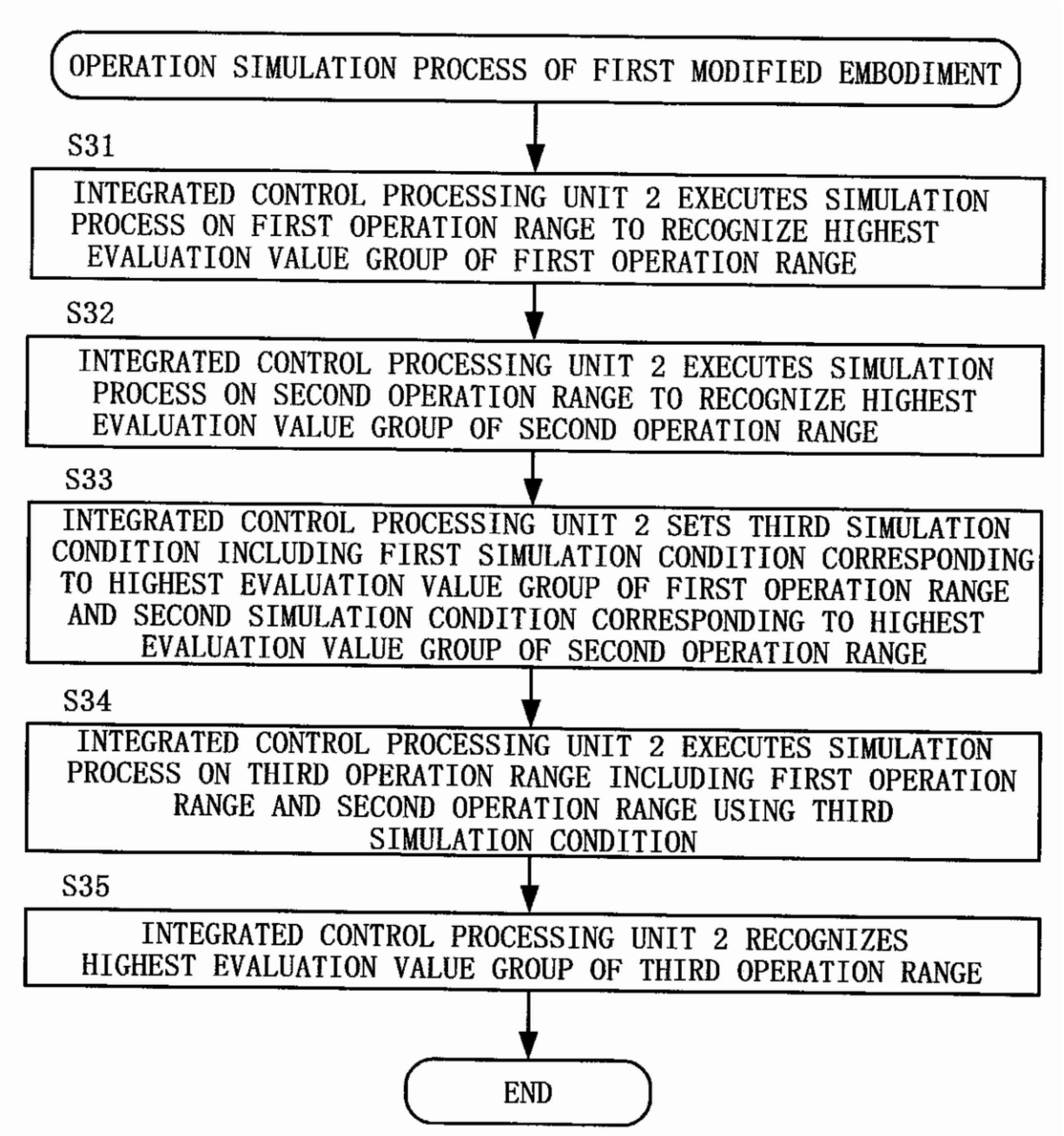

OPERATION SIMULATION PROCESS OF FIRST MODIFIED EMBODIMENT
S31
INTEGRATED CONTROL PROCESSING UNIT 2 EXECUTES SIMULATION PROCESS ON FIRST OPERATION RANGE TO RECOGNIZE HIGHEST EVALUATION VALUE GROUP OF FIRST OPERATION RANGE
S32
INTEGRATED CONTROL PROCESSING UNIT 2 EXECUTES SIMULATION PROCESS ON SECOND OPERATION RANGE TO RECOGNIZE HIGHEST EVALUATION VALUE GROUP OF SECOND OPERATION RANGE
S33
INTEGRATED CONTROL PROCESSING UNIT 2 SETS THIRD SIMULATION CONDITION INCLUDING FIRST SIMULATION CONDITION CORRESPONDING TO HIGHEST EVALUATION VALUE GROUP OF FIRST OPERATION RANGE AND SECOND SIMULATION CONDITION CORRESPONDING TO HIGHEST EVALUATION VALUE GROUP OF SECOND OPERATION RANGE
S34
INTEGRATED CONTROL PROCESSING UNIT 2 EXECUTES SIMULATION PROCESS ON THIRD OPERATION RANGE INCLUDING FIRST OPERATION RANGE AND SECOND OPERATION RANGE USING THIRD SIMULATION CONDITION
S35
INTEGRATED CONTROL PROCESSING UNIT 2 RECOGNIZES HIGHEST EVALUATION VALUE GROUP OF THIRD OPERATION RANGE
END

FIG. 12

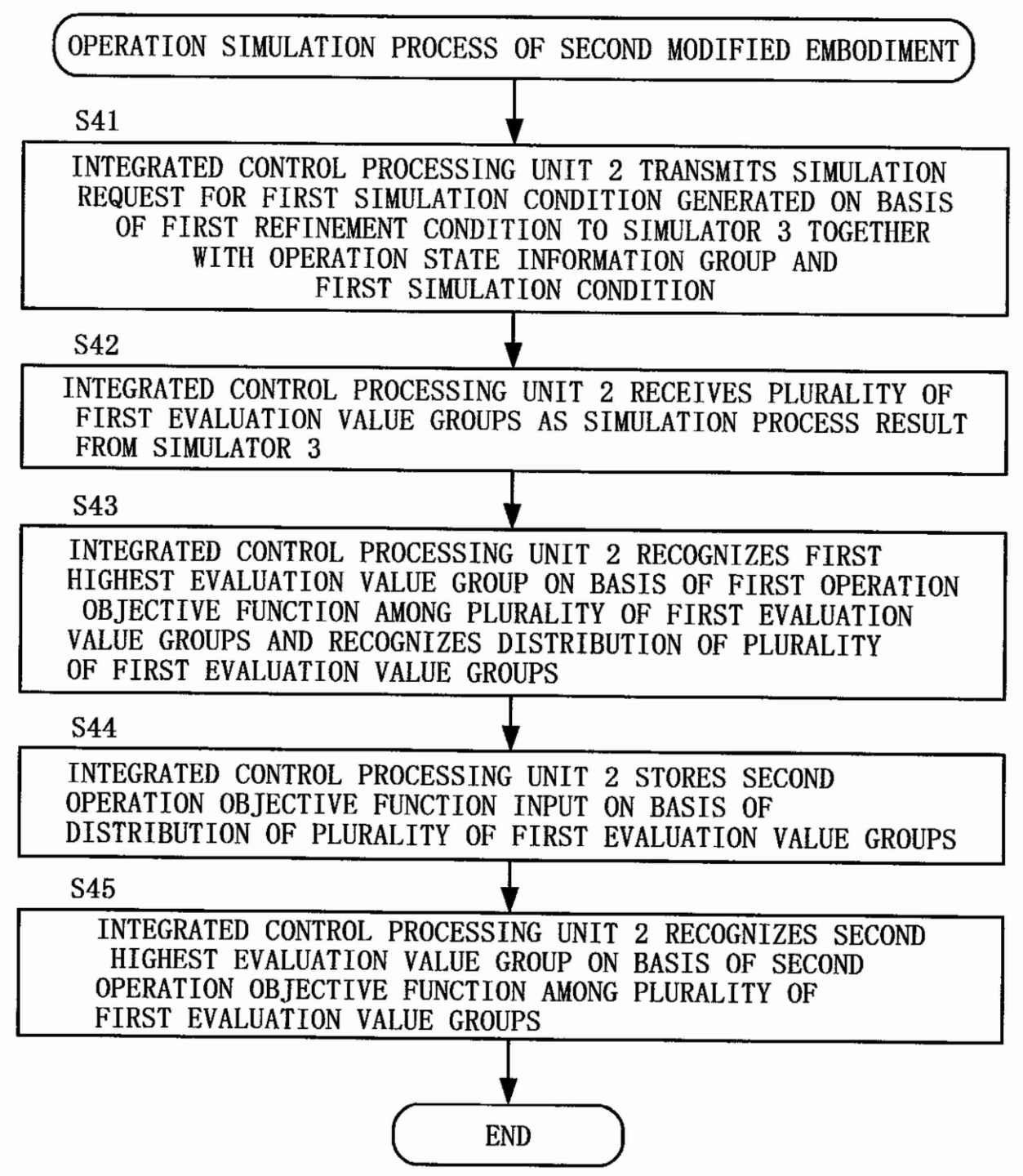
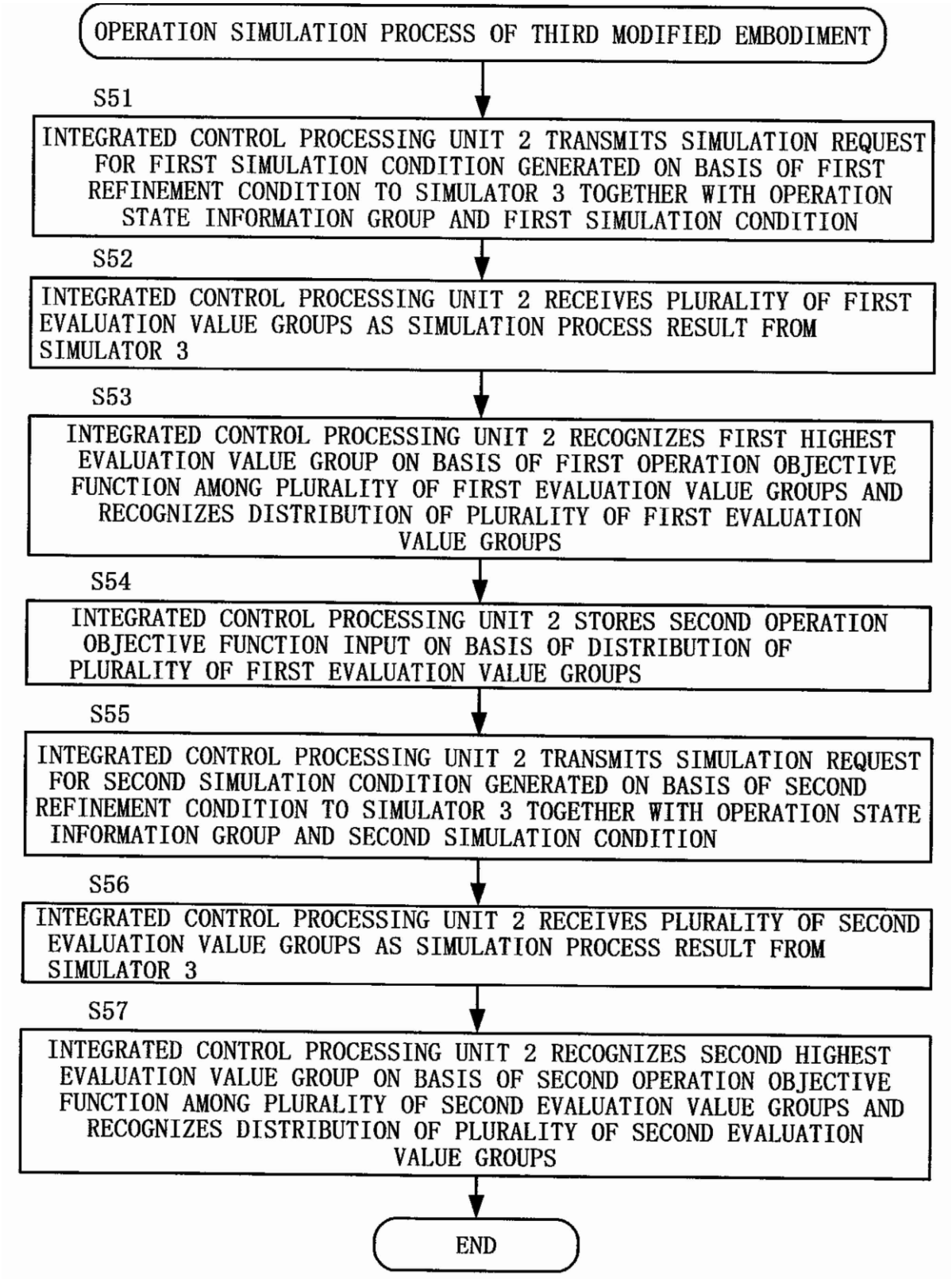

OPERATION SIMULATION PROCESS OF SECOND MODIFIED EMBODIMENT
S41
INTEGRATED CONTROL PROCESSING UNIT 2 TRANSMITS SIMULATION REQUEST FOR FIRST SIMULATION CONDITION GENERATED ON BASIS OF FIRST REFINEMENT CONDITION TO SIMULATOR 3 TOGETHER WITH OPERATION STATE INFORMATION GROUP AND FIRST SIMULATION CONDITION
S42
INTEGRATED CONTROL PROCESSING UNIT 2 RECEIVES PLURALITY OF FIRST EVALUATION VALUE GROUPS AS SIMULATION PROCESS RESULT FROM SIMULATOR 3
S43
INTEGRATED CONTROL PROCESSING UNIT 2 RECOGNIZES FIRST HIGHEST EVALUATION VALUE GROUP ON BASIS OF FIRST OPERATION OBJECTIVE FUNCTION AMONG PLURALITY OF FIRST EVALUATION VALUE GROUPS AND RECOGNIZES DISTRIBUTION OF PLURALITY OF FIRST EVALUATION VALUE GROUPS
S44
INTEGRATED CONTROL PROCESSING UNIT 2 STORES SECOND OPERATION OBJECTIVE FUNCTION INPUT ON BASIS OF DISTRIBUTION OF PLURALITY OF FIRST EVALUATION VALUE GROUPS
S45
INTEGRATED CONTROL PROCESSING UNIT 2 RECOGNIZES SECOND HIGHEST EVALUATION VALUE GROUP ON BASIS OF SECOND OPERATION OBJECTIVE FUNCTION AMONG PLURALITY OF FIRST EVALUATION VALUE GROUPS
END

FIG. 13


OPERATION SIMULATION PROCESS OF THIRD MODIFIED EMBODIMENT
S51
INTEGRATED CONTROL PROCESSING UNIT 2 TRANSMITS SIMULATION REQUEST FOR FIRST SIMULATION CONDITION GENERATED ON BASIS OF FIRST REFINEMENT CONDITION TO SIMULATOR 3 TOGETHER WITH OPERATION STATE INFORMATION GROUP AND FIRST SIMULATION CONDITION
S52
INTEGRATED CONTROL PROCESSING UNIT 2 RECEIVES PLURALITY OF FIRST EVALUATION VALUE GROUPS AS SIMULATION PROCESS RESULT FROM SIMULATOR 3
S53
INTEGRATED CONTROL PROCESSING UNIT 2 RECOGNIZES FIRST HIGHEST EVALUATION VALUE GROUP ON BASIS OF FIRST OPERATION OBJECTIVE FUNCTION AMONG PLURALITY OF FIRST EVALUATION VALUE GROUPS AND RECOGNIZES DISTRIBUTION OF PLURALITY OF FIRST EVALUATION VALUE GROUPS
S54
INTEGRATED CONTROL PROCESSING UNIT 2 STORES SECOND OPERATION OBJECTIVE FUNCTION INPUT ON BASIS OF DISTRIBUTION OF PLURALITY OF FIRST EVALUATION VALUE GROUPS
S55
INTEGRATED CONTROL PROCESSING UNIT 2 TRANSMITS SIMULATION REQUEST FOR SECOND SIMULATION CONDITION GENERATED ON BASIS OF SECOND REFINEMENT CONDITION TO SIMULATOR 3 TOGETHER WITH OPERATION STATE INFORMATION GROUP AND SECOND SIMULATION CONDITION
S56
INTEGRATED CONTROL PROCESSING UNIT 2 RECEIVES PLURALITY OF SECOND EVALUATION VALUE GROUPS AS SIMULATION PROCESS RESULT FROM SIMULATOR 3
S57
INTEGRATED CONTROL PROCESSING UNIT 2 RECOGNIZES SECOND HIGHEST EVALUATION VALUE GROUP ON BASIS OF SECOND OPERATION OBJECTIVE FUNCTION AMONG PLURALITY OF SECOND EVALUATION VALUE GROUPS AND RECOGNIZES DISTRIBUTION OF PLURALITY OF SECOND EVALUATION VALUE GROUPS
END

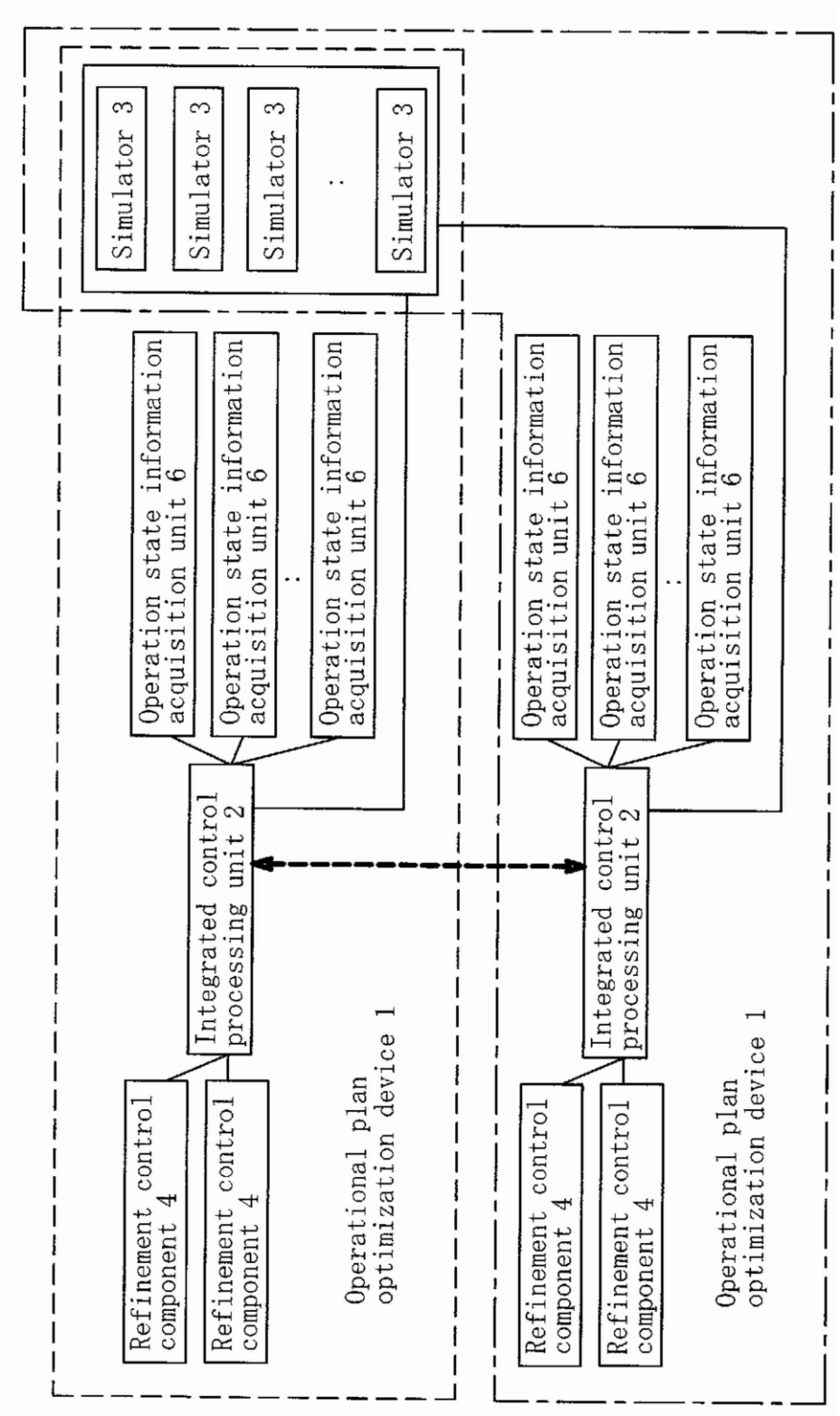
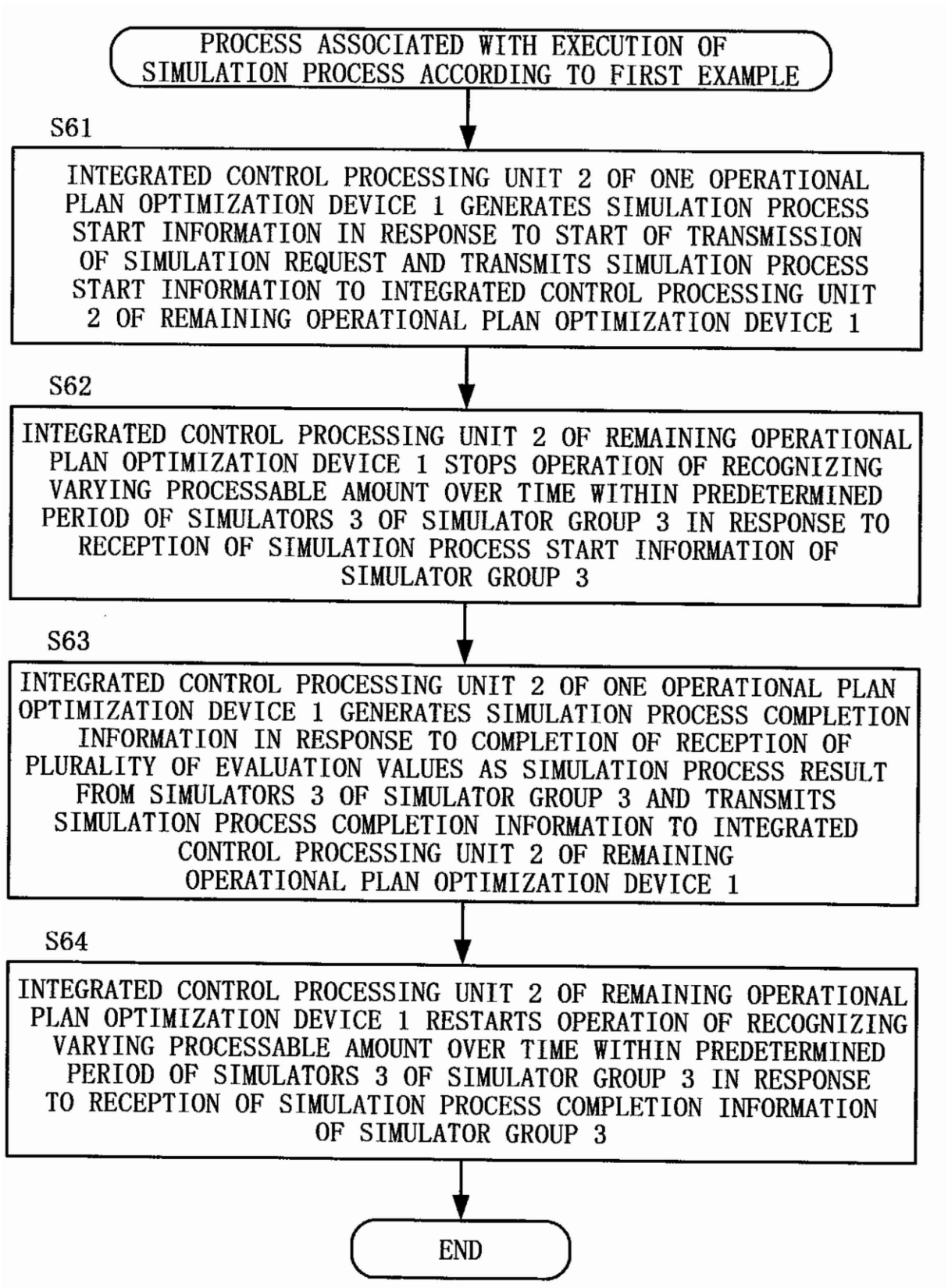

Simulator 3
Simulator 3
Simulator 3
:
Simulator 3
Operation state information acquisition unit 6
Operation state information acquisition unit 6
:
Operation state information acquisition unit 6
Integrated control processing unit 2
Refinement control component 4
Refinement control component 4
Operational plan optimization device 1
Operation state information acquisition unit 6
Operation state information acquisition unit 6
:
Operation state information acquisition unit 6
Integrated control processing unit 2
Refinement control component 4
Refinement control component 4
Operational plan optimization device 1

FIG. 14

FIG. 15


PROCESS ASSOCIATED WITH EXECUTION OF SIMULATION PROCESS ACCORDING TO FIRST EXAMPLE
S61
INTEGRATED CONTROL PROCESSING UNIT 2 OF ONE OPERATIONAL PLAN OPTIMIZATION DEVICE 1 GENERATES SIMULATION PROCESS START INFORMATION IN RESPONSE TO START OF TRANSMISSION OF SIMULATION REQUEST AND TRANSMITS SIMULATION PROCESS START INFORMATION TO INTEGRATED CONTROL PROCESSING UNIT 2 OF REMAINING OPERATIONAL PLAN OPTIMIZATION DEVICE 1
S62
INTEGRATED CONTROL PROCESSING UNIT 2 OF REMAINING OPERATIONAL PLAN OPTIMIZATION DEVICE 1 STOPS OPERATION OF RECOGNIZING VARYING PROCESSABLE AMOUNT OVER TIME WITHIN PREDETERMINED PERIOD OF SIMULATORS 3 OF SIMULATOR GROUP 3 IN RESPONSE TO RECEPTION OF SIMULATION PROCESS START INFORMATION OF SIMULATOR GROUP 3
S63
INTEGRATED CONTROL PROCESSING UNIT 2 OF ONE OPERATIONAL PLAN OPTIMIZATION DEVICE 1 GENERATES SIMULATION PROCESS COMPLETION INFORMATION IN RESPONSE TO COMPLETION OF RECEPTION OF PLURALITY OF EVALUATION VALUES AS SIMULATION PROCESS RESULT FROM SIMULATORS 3 OF SIMULATOR GROUP 3 AND TRANSMITS SIMULATION PROCESS COMPLETION INFORMATION TO INTEGRATED CONTROL PROCESSING UNIT 2 OF REMAINING OPERATIONAL PLAN OPTIMIZATION DEVICE 1
S64
INTEGRATED CONTROL PROCESSING UNIT 2 OF REMAINING OPERATIONAL PLAN OPTIMIZATION DEVICE 1 RESTARTS OPERATION OF RECOGNIZING VARYING PROCESSABLE AMOUNT OVER TIME WITHIN PREDETERMINED PERIOD OF SIMULATORS 3 OF SIMULATOR GROUP 3 IN RESPONSE TO RECEPTION OF SIMULATION PROCESS COMPLETION INFORMATION OF SIMULATOR GROUP 3
END

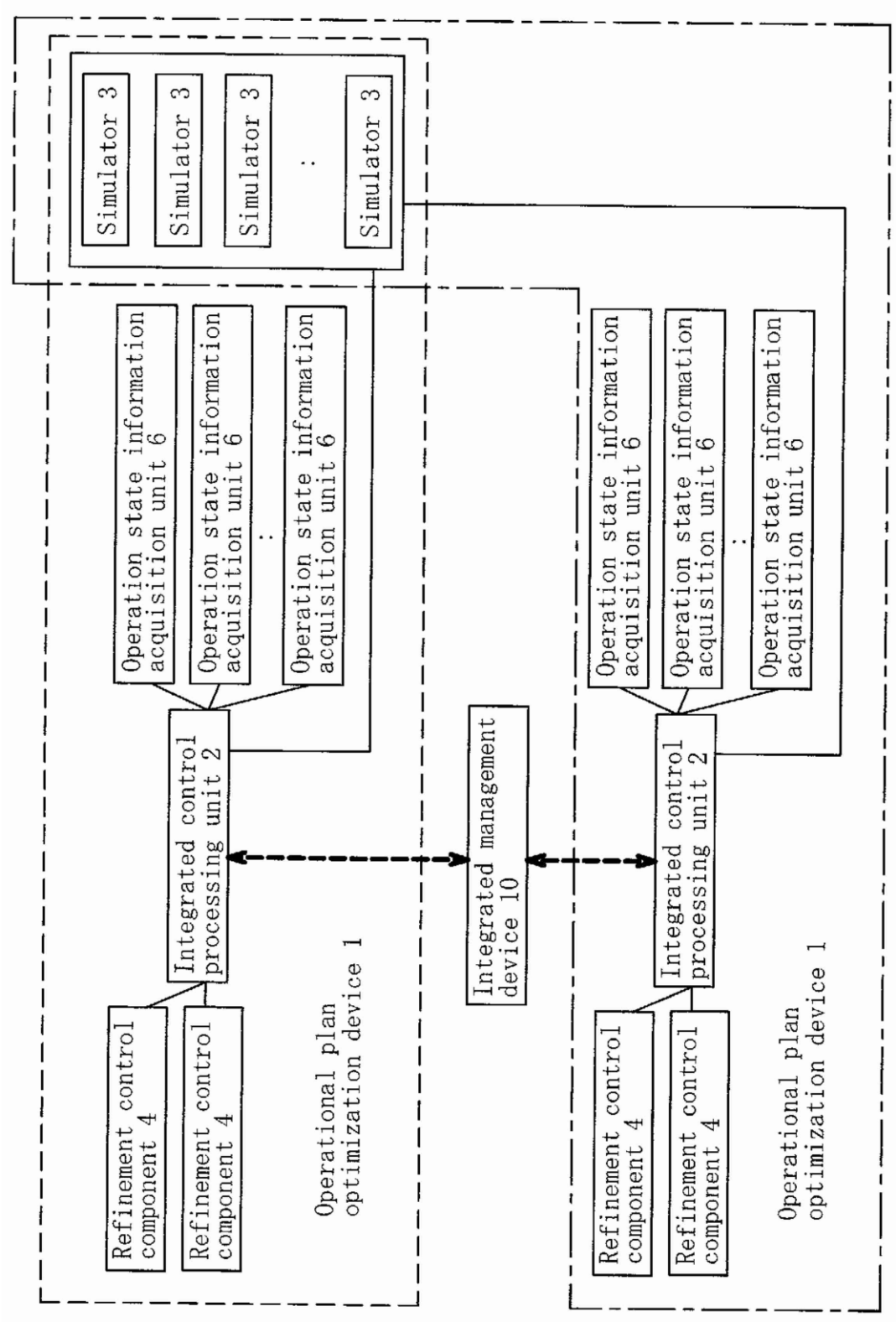
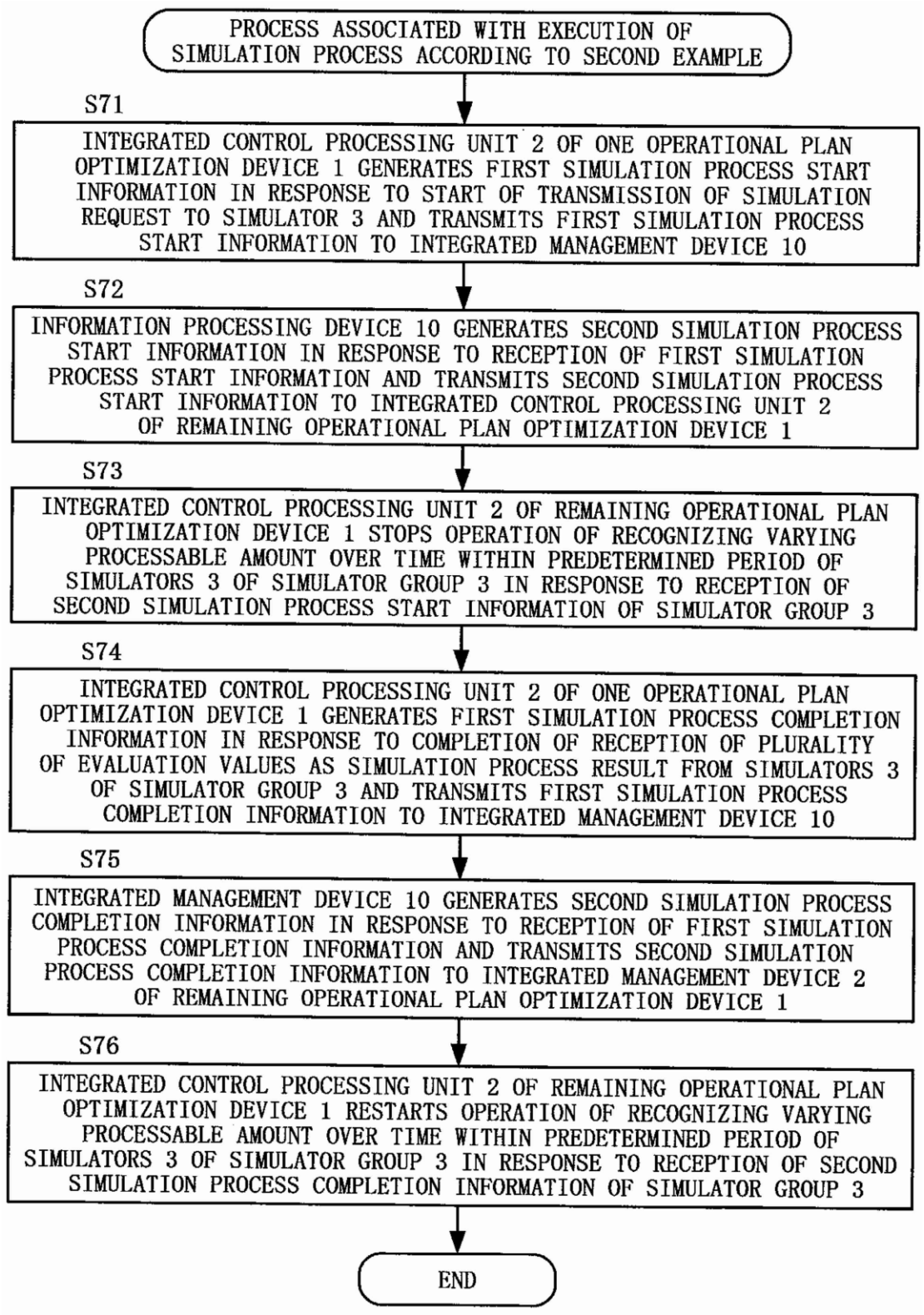

Simulator 3
Simulator 3
Simulator 3
:
Simulator 3
Operation state information acquisition unit 6
Operation state information acquisition unit 6
:
Operation state information acquisition unit 6
Integrated control processing unit 2
Refinement control component 4
Refinement control component 4
Operational plan optimization device 1
Integrated management device 10
Operation state information acquisition unit 6
Operation state information acquisition unit 6
:
Operation state information acquisition unit 6
Integrated control processing unit 2
Refinement control component 4
Refinement control component 4
Operational plan optimization device 1

FIG. 16

FIG. 17


PROCESS ASSOCIATED WITH EXECUTION OF SIMULATION PROCESS ACCORDING TO SECOND EXAMPLE
S71
INTEGRATED CONTROL PROCESSING UNIT 2 OF ONE OPERATIONAL PLAN OPTIMIZATION DEVICE 1 GENERATES FIRST SIMULATION PROCESS START INFORMATION IN RESPONSE TO START OF TRANSMISSION OF SIMULATION REQUEST TO SIMULATOR 3 AND TRANSMITS FIRST SIMULATION PROCESS START INFORMATION TO INTEGRATED MANAGEMENT DEVICE 10
S72
INFORMATION PROCESSING DEVICE 10 GENERATES SECOND SIMULATION PROCESS START INFORMATION IN RESPONSE TO RECEPTION OF FIRST SIMULATION PROCESS START INFORMATION AND TRANSMITS SECOND SIMULATION PROCESS START INFORMATION TO INTEGRATED CONTROL PROCESSING UNIT 2 OF REMAINING OPERATIONAL PLAN OPTIMIZATION DEVICE 1
S73
INTEGRATED CONTROL PROCESSING UNIT 2 OF REMAINING OPERATIONAL PLAN OPTIMIZATION DEVICE 1 STOPS OPERATION OF RECOGNIZING VARYING PROCESSABLE AMOUNT OVER TIME WITHIN PREDETERMINED PERIOD OF SIMULATORS 3 OF SIMULATOR GROUP 3 IN RESPONSE TO RECEPTION OF SECOND SIMULATION PROCESS START INFORMATION OF SIMULATOR GROUP 3
S74
INTEGRATED CONTROL PROCESSING UNIT 2 OF ONE OPERATIONAL PLAN OPTIMIZATION DEVICE 1 GENERATES FIRST SIMULATION PROCESS COMPLETION INFORMATION IN RESPONSE TO COMPLETION OF RECEPTION OF PLURALITY OF EVALUATION VALUES AS SIMULATION PROCESS RESULT FROM SIMULATORS 3 OF SIMULATOR GROUP 3 AND TRANSMITS FIRST SIMULATION PROCESS COMPLETION INFORMATION TO INTEGRATED MANAGEMENT DEVICE 10
S75
INTEGRATED MANAGEMENT DEVICE 10 GENERATES SECOND SIMULATION PROCESS COMPLETION INFORMATION IN RESPONSE TO RECEPTION OF FIRST SIMULATION PROCESS COMPLETION INFORMATION AND TRANSMITS SECOND SIMULATION PROCESS COMPLETION INFORMATION TO INTEGRATED MANAGEMENT DEVICE 2 OF REMAINING OPERATIONAL PLAN OPTIMIZATION DEVICE 1
S76
INTEGRATED CONTROL PROCESSING UNIT 2 OF REMAINING OPERATIONAL PLAN OPTIMIZATION DEVICE 1 RESTARTS OPERATION OF RECOGNIZING VARYING PROCESSABLE AMOUNT OVER TIME WITHIN PREDETERMINED PERIOD OF SIMULATORS 3 OF SIMULATOR GROUP 3 IN RESPONSE TO RECEPTION OF SECOND SIMULATION PROCESS COMPLETION INFORMATION OF SIMULATOR GROUP 3
END