FIG.1

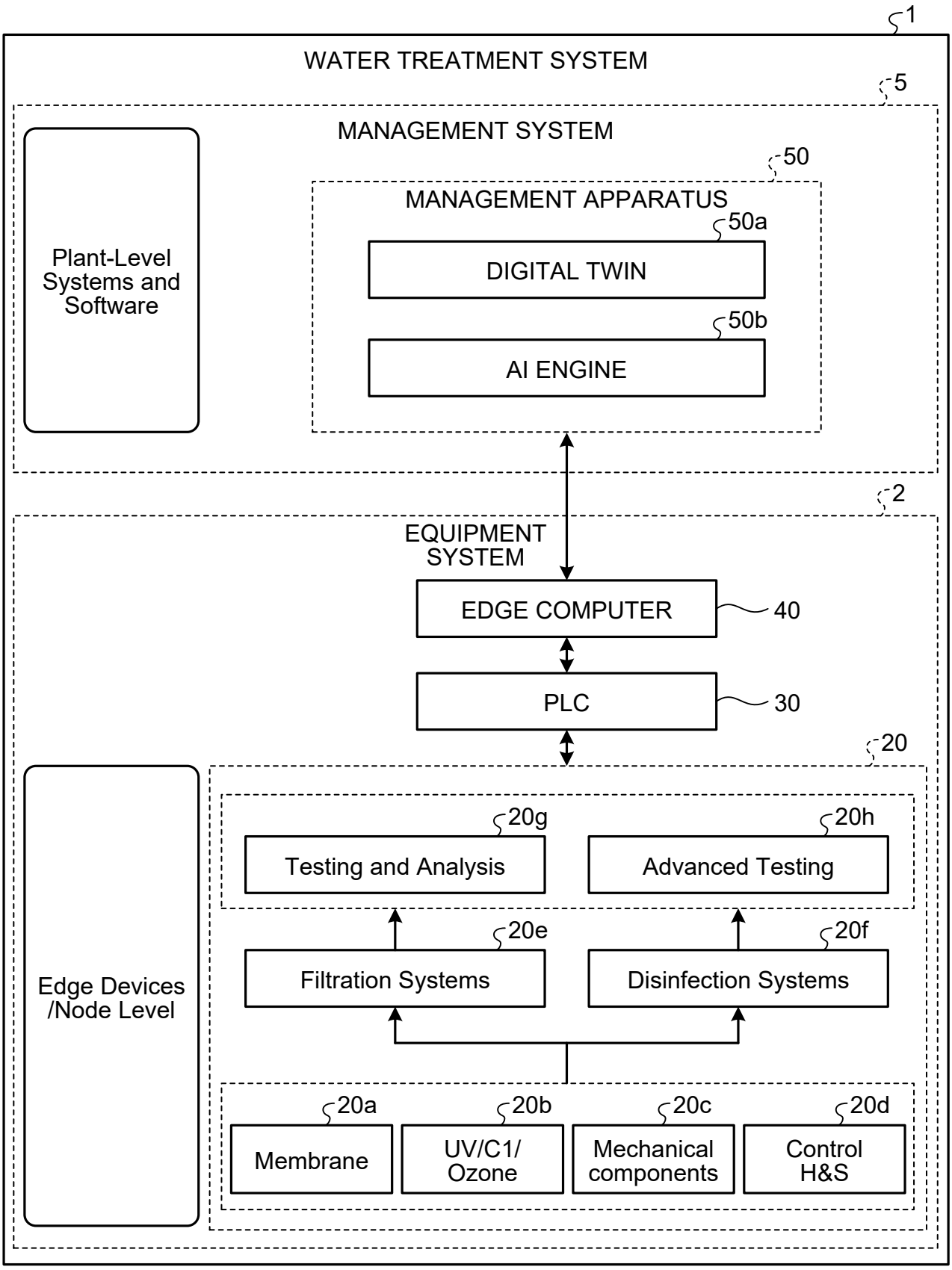

1
WATER TREATMENT SYSTEM
5
MANAGEMENT SYSTEM
Plant-Level Systems and Software
50
MANAGEMENT APPARATUS
50a
DIGITAL TWIN
50b
AI ENGINE
2
EQUIPMENT SYSTEM
EDGE COMPUTER
40
PLC
30
20
Edge Devices /Node Level
20g
Testing and Analysis
20h
Advanced Testing
20e
Filtration Systems
20f
Disinfection Systems
20a
Membrane
20b
UV/C1/ Ozone
20c
Mechanical components
20d
Control H&S

FIG.2

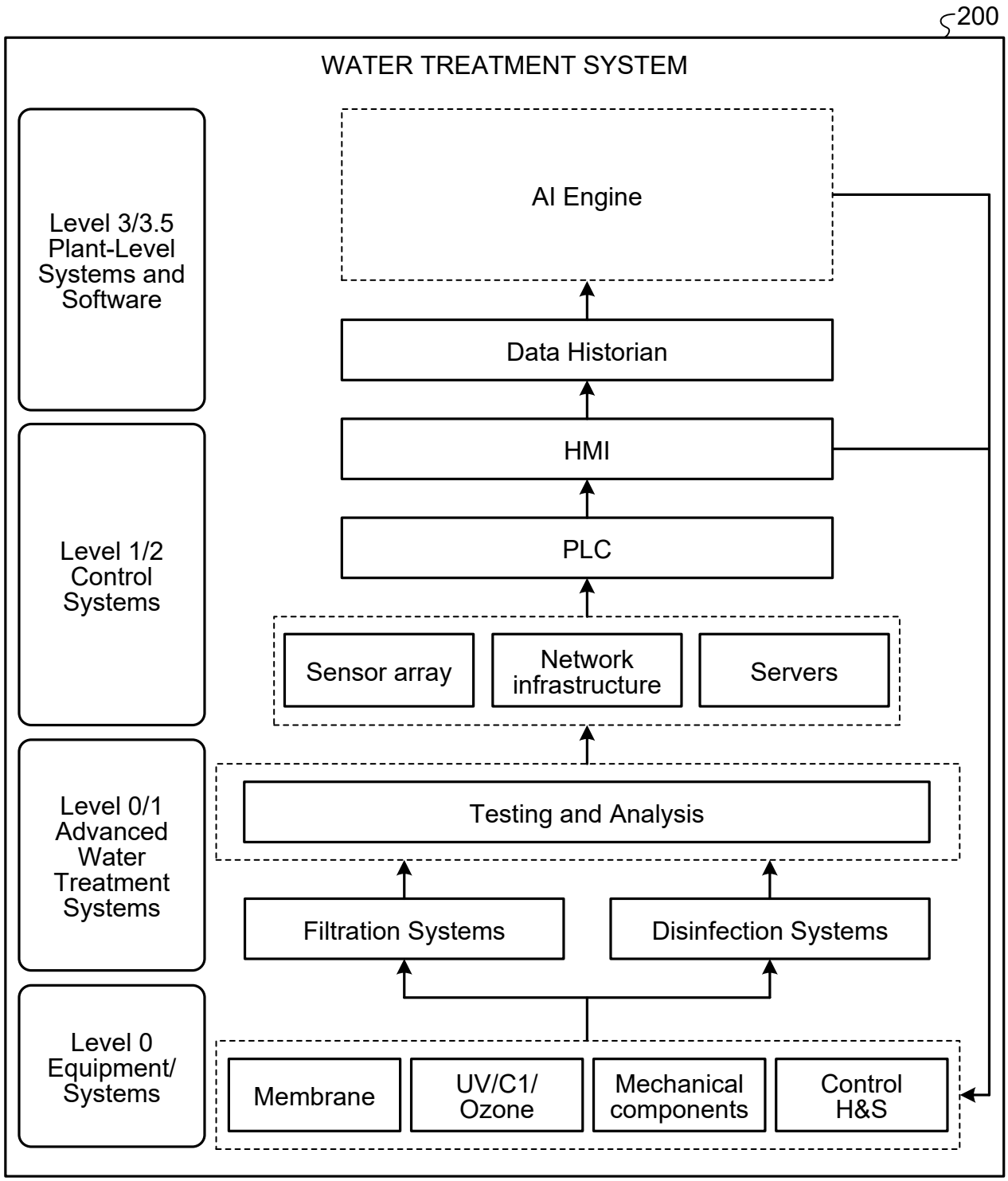

200
WATER TREATMENT SYSTEM
Level 3/3.5 Plant-Level Systems and Software
Level 1/2 Control Systems
Level 0/1 Advanced Water Treatment Systems
Level 0 Equipment/ Systems
AI Engine
Data Historian
HMI
PLC
Sensor array
Network infrastructure
Servers
Testing and Analysis
Filtration Systems
Disinfection Systems
Membrane
UV/C1/ Ozone
Mechanical components
Control H&S

FIG.3

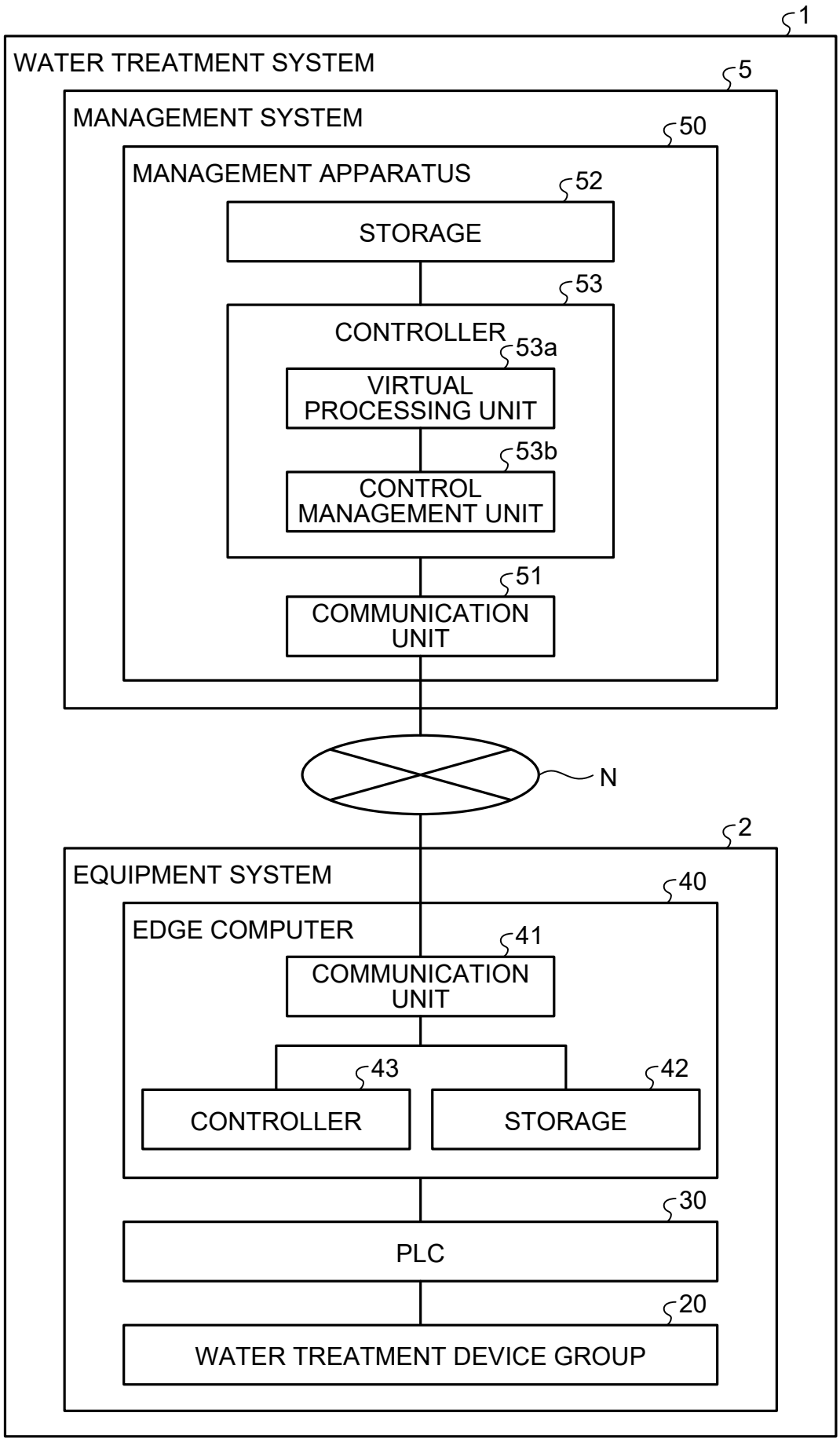

1
WATER TREATMENT SYSTEM
5
MANAGEMENT SYSTEM
50
MANAGEMENT APPARATUS
52
STORAGE
53
CONTROLLER
53a
VIRTUAL PROCESSING UNIT
53b
CONTROL MANAGEMENT UNIT
51
COMMUNICATION UNIT
N
2
EQUIPMENT SYSTEM
40
EDGE COMPUTER
41
COMMUNICATION UNIT
43
CONTROLLER
42
STORAGE
30
PLC
20
WATER TREATMENT DEVICE GROUP

FIG.4

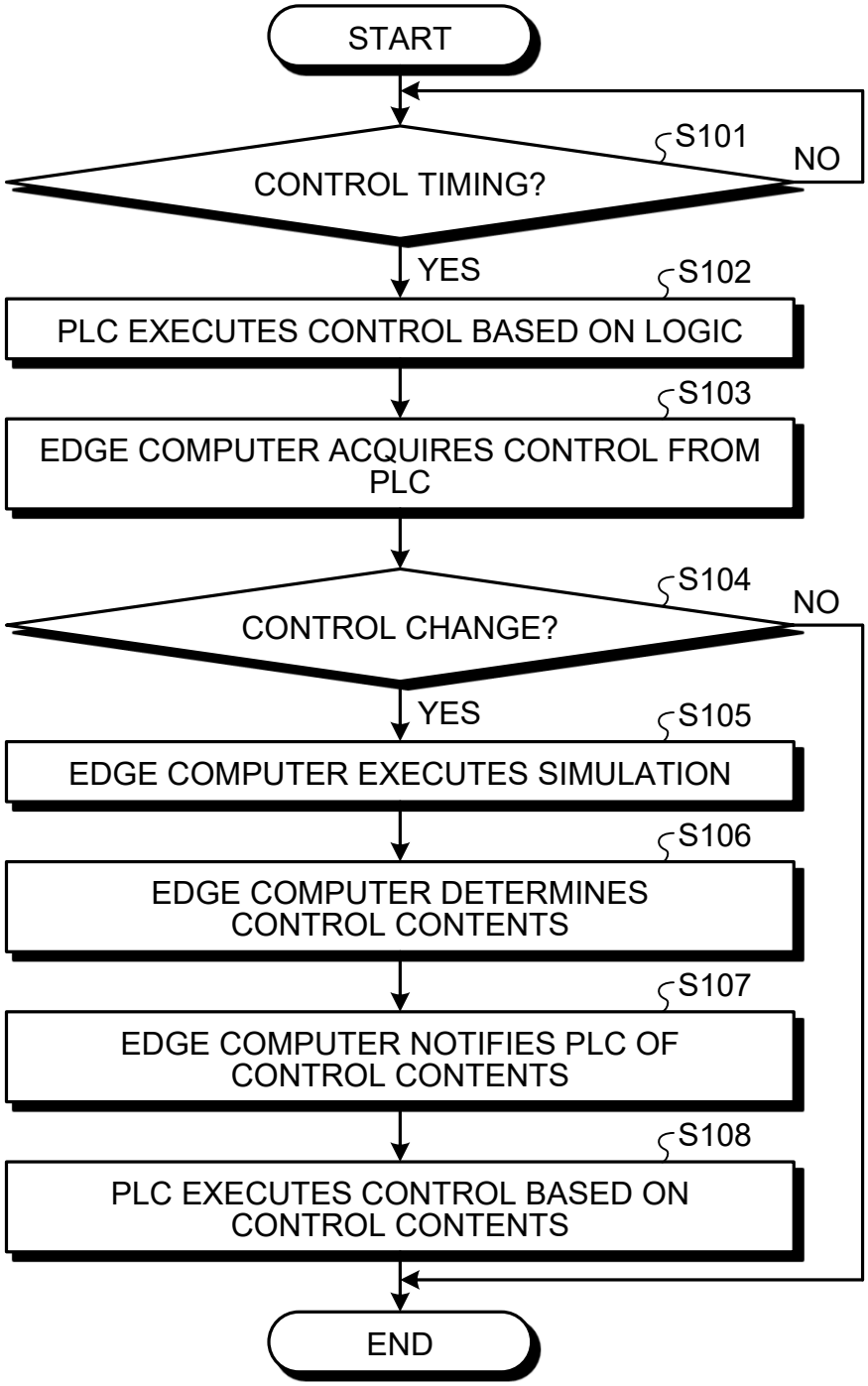

START
S101
CONTROL TIMING?
NO
YES
S102
PLC EXECUTES CONTROL BASED ON LOGIC
S103
EDGE COMPUTER ACQUIRES CONTROL FROM PLC
S104
CONTROL CHANGE?
NO
YES
S105
EDGE COMPUTER EXECUTES SIMULATION
S106
EDGE COMPUTER DETERMINES CONTROL CONTENTS
S107
EDGE COMPUTER NOTIFIES PLC OF CONTROL CONTENTS
S108
PLC EXECUTES CONTROL BASED ON CONTROL CONTENTS
END

FIG.5

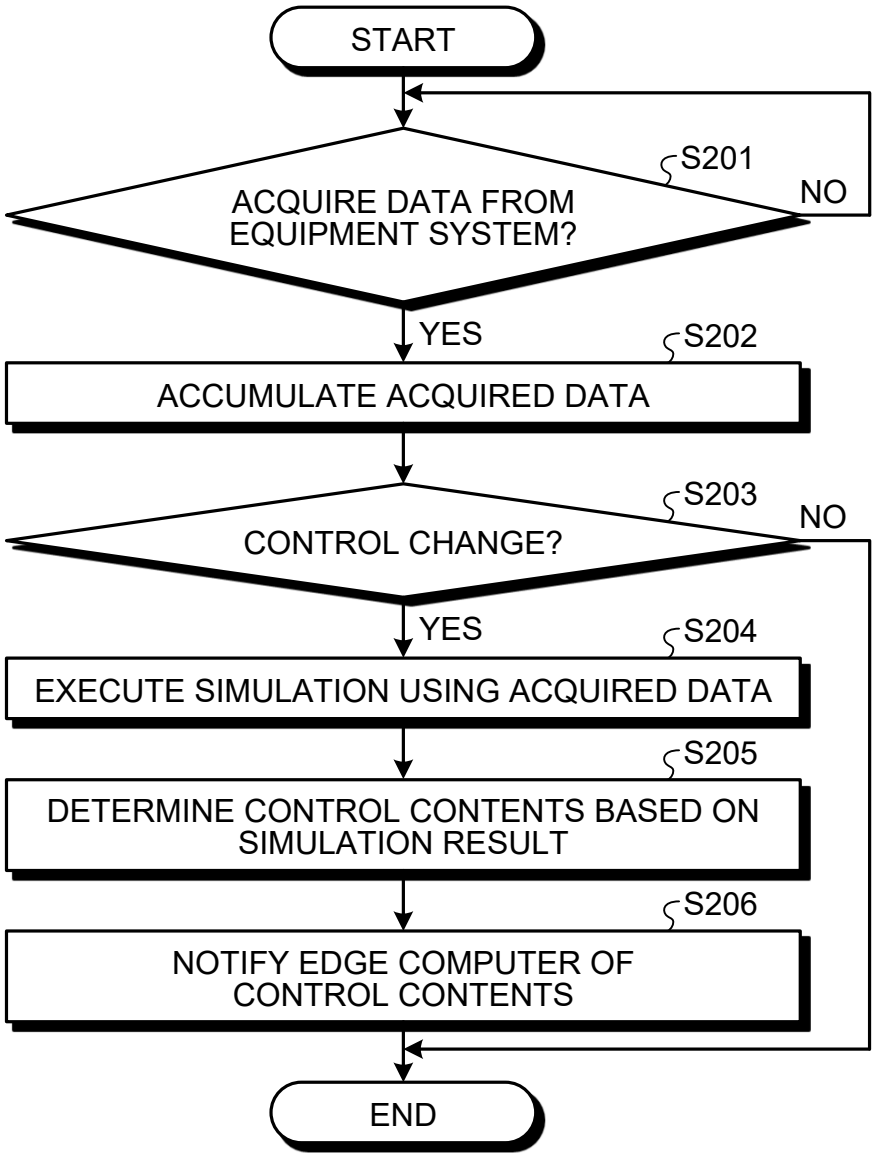

START
S201
ACQUIRE DATA FROM EQUIPMENT SYSTEM?
NO
YES
S202
ACCUMULATE ACQUIRED DATA
S203
CONTROL CHANGE?
NO
YES
S204
EXECUTE SIMULATION USING ACQUIRED DATA
S205
DETERMINE CONTROL CONTENTS BASED ON SIMULATION RESULT
S206
NOTIFY EDGE COMPUTER OF CONTROL CONTENTS
END

FIG.6

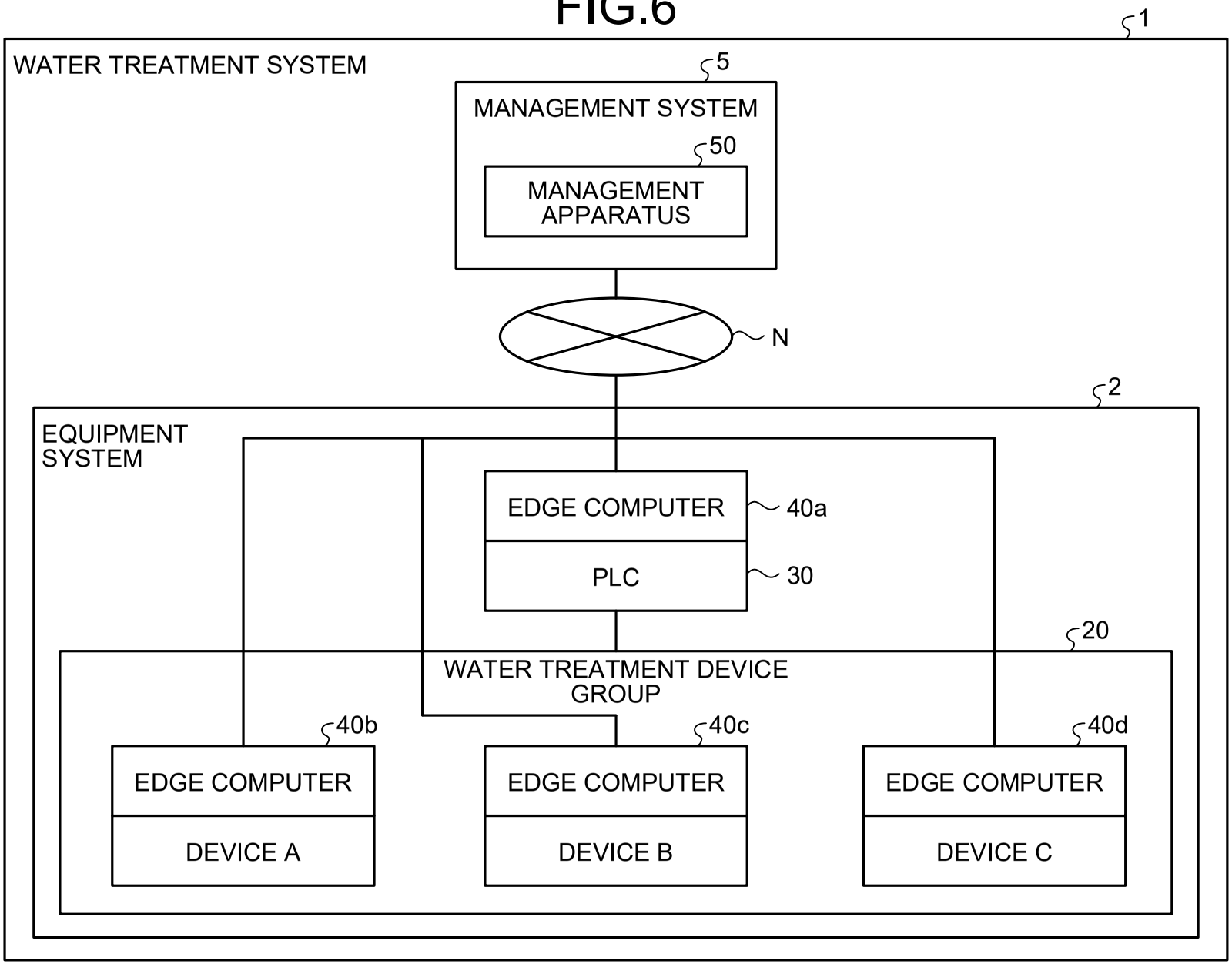

1
WATER TREATMENT SYSTEM
5
MANAGEMENT SYSTEM
50
MANAGEMENT APPARATUS
N
2
EQUIPMENT SYSTEM
EDGE COMPUTER
40a
PLC
30
20
WATER TREATMENT DEVICE GROUP
40b
EDGE COMPUTER
DEVICE A
40c
EDGE COMPUTER
DEVICE B
40d
EDGE COMPUTER
DEVICE C

FIG.7

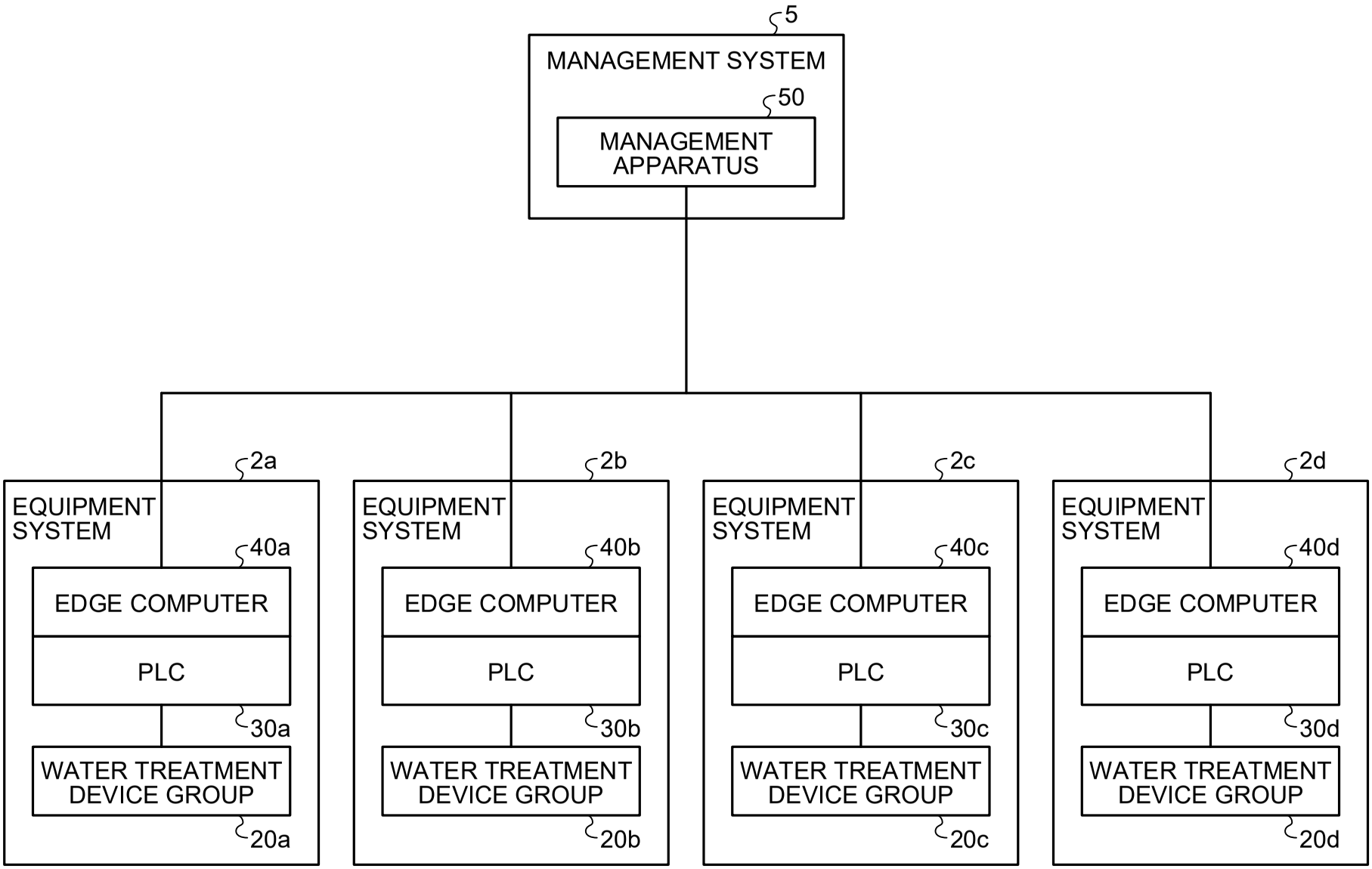
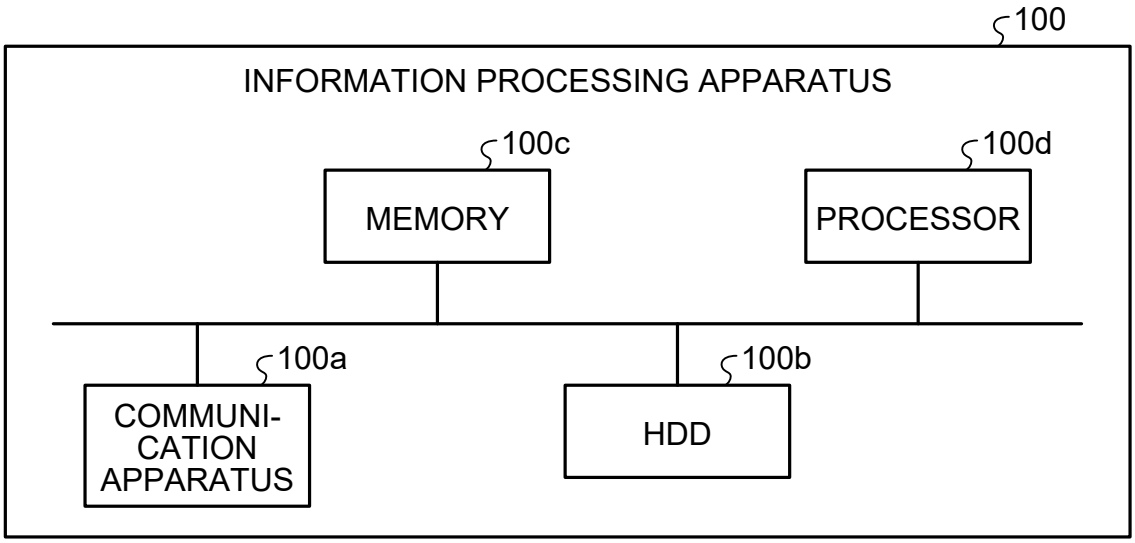

5
MANAGEMENT SYSTEM
50
MANAGEMENT APPARATUS
2a
EQUIPMENT SYSTEM
40a
EDGE COMPUTER
PLC
30a
WATER TREATMENT DEVICE GROUP
20a
2b
EQUIPMENT SYSTEM
40b
EDGE COMPUTER
PLC
30b
WATER TREATMENT DEVICE GROUP
20b
2c
EQUIPMENT SYSTEM
40c
EDGE COMPUTER
PLC
30c
WATER TREATMENT DEVICE GROUP
20c
2d
EQUIPMENT SYSTEM
40d
EDGE COMPUTER
PLC
30d
WATER TREATMENT DEVICE GROUP
20d

FIG.8


100
INFORMATION PROCESSING APPARATUS
100c
MEMORY
100d
PROCESSOR
100a
COMMUNI-
CATION
APPARATUS
100b
HDD