Fig. 1

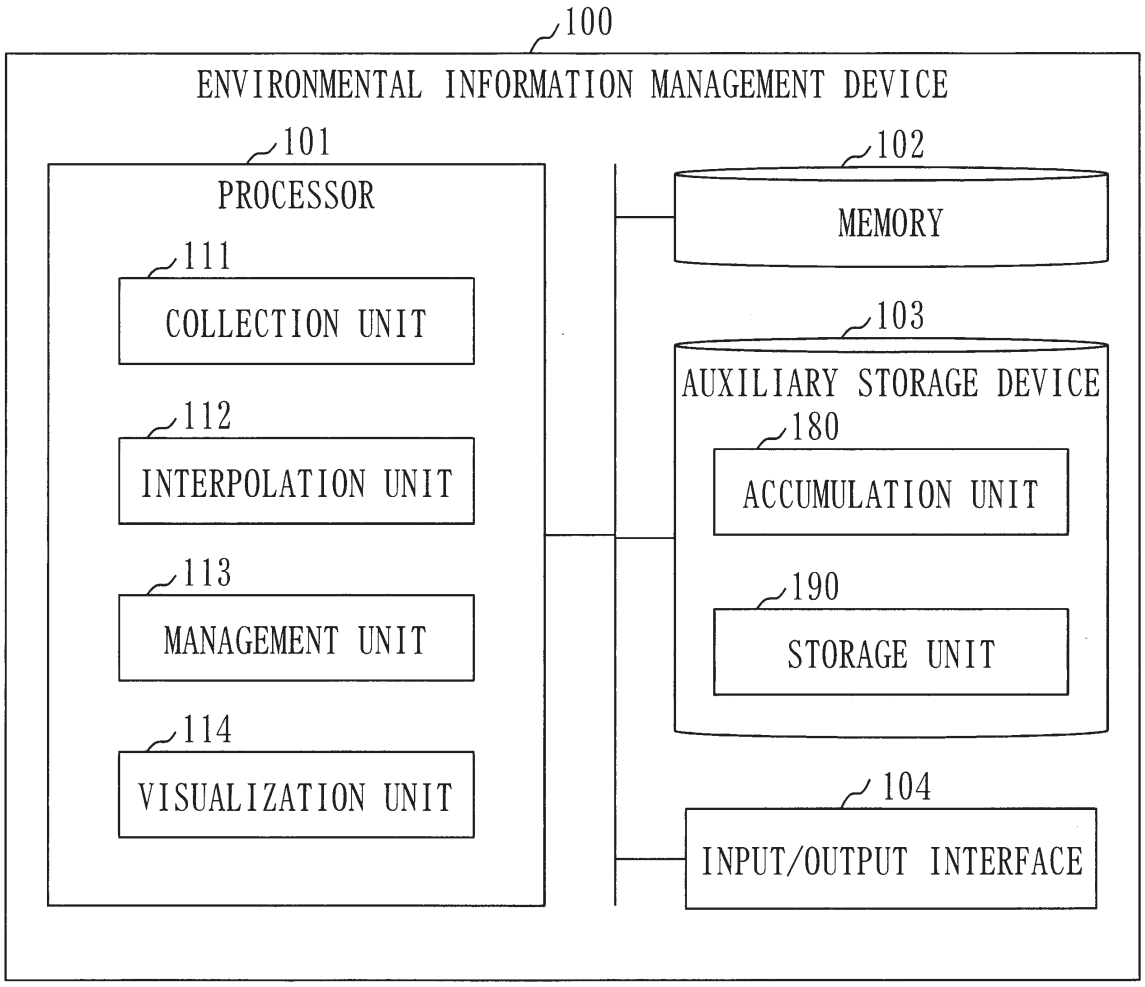

100
ENVIRONMENTAL INFORMATION MANAGEMENT DEVICE
101
PROCESSOR
111
COLLECTION UNIT
112
INTERPOLATION UNIT
113
MANAGEMENT UNIT
114
VISUALIZATION UNIT
102
MEMORY
103
AUXILIARY STORAGE DEVICE
180
ACCUMULATION UNIT
190
STORAGE UNIT
104
INPUT/OUTPUT INTERFACE

Fig. 2

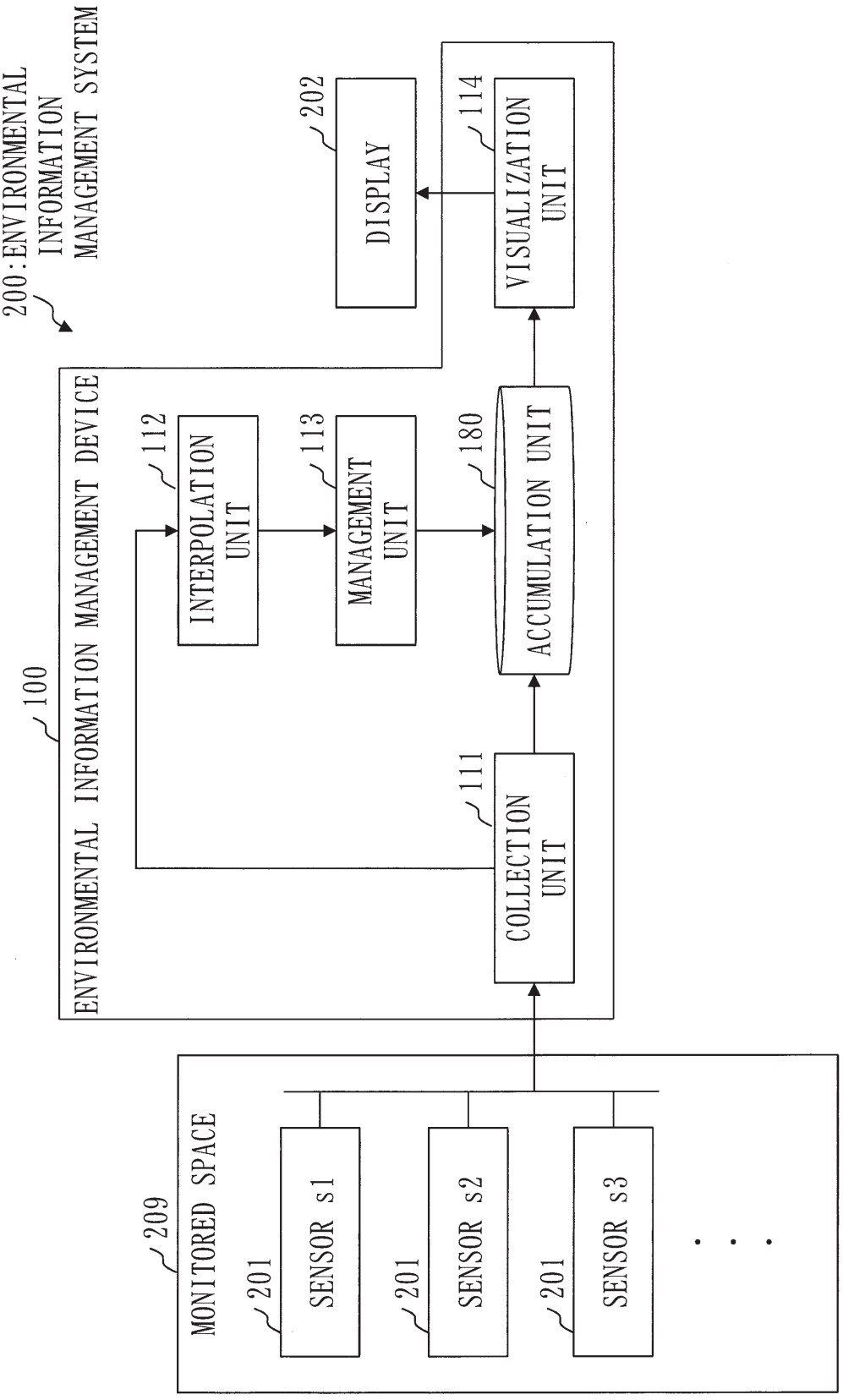

200:ENVIRONMENTAL INFORMATION MANAGEMENT SYSTEM
100
ENVIRONMENTAL INFORMATION MANAGEMENT DEVICE
112
INTERPOLATION UNIT
113
MANAGEMENT UNIT
180
ACCUMULATION UNIT
111
COLLECTION UNIT
202
DISPLAY
114
VISUALIZATION UNIT
209
MONITORED SPACE
201
SENSOR s1
201
SENSOR s2
201
SENSOR s3
. . .

Fig. 3

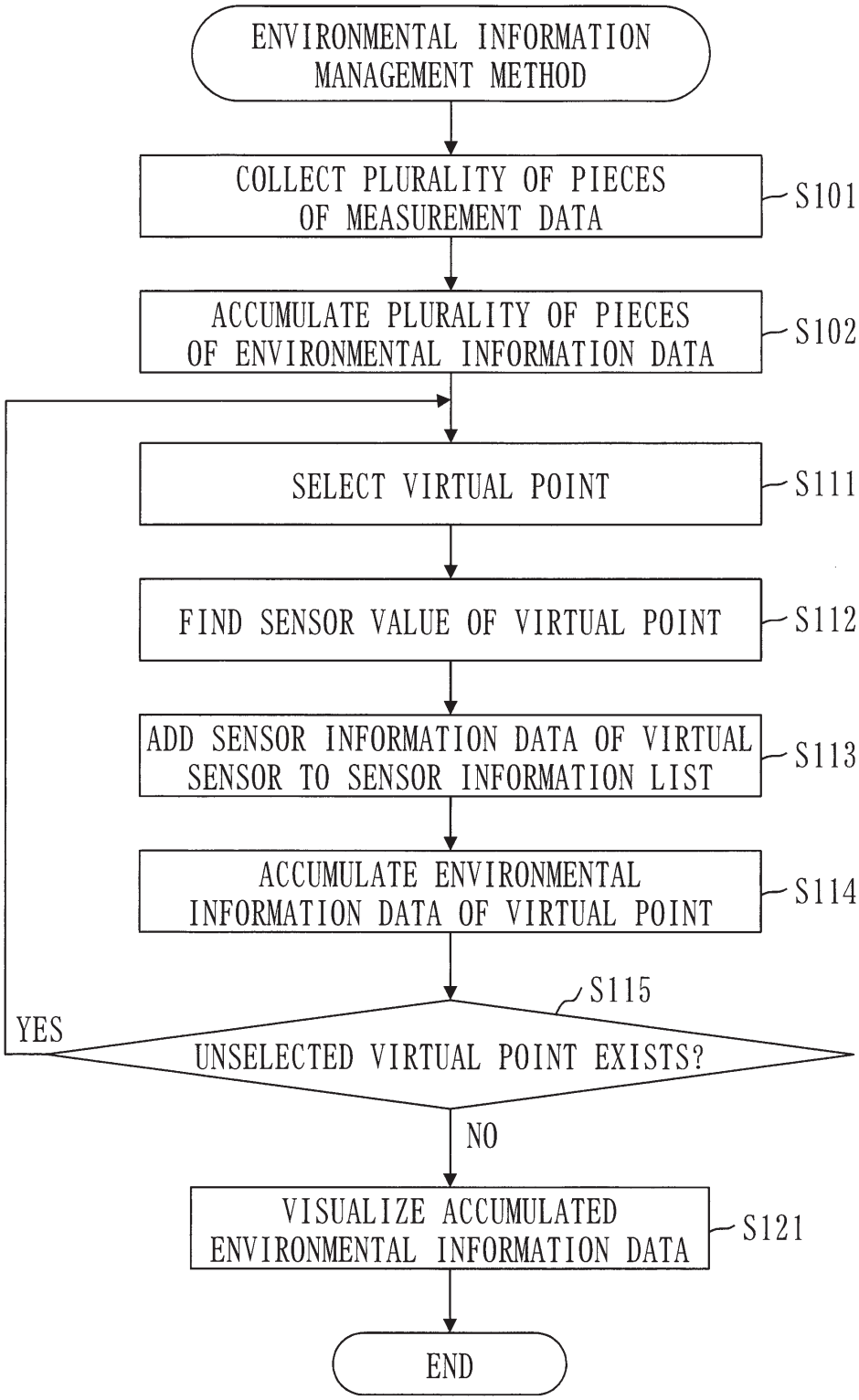

ENVIRONMENTAL INFORMATION MANAGEMENT METHOD
COLLECT PLURALITY OF PIECES OF MEASUREMENT DATA
S101
ACCUMULATE PLURALITY OF PIECES OF ENVIRONMENTAL INFORMATION DATA
S102
SELECT VIRTUAL POINT
S111
FIND SENSOR VALUE OF VIRTUAL POINT
S112
ADD SENSOR INFORMATION DATA OF VIRTUAL SENSOR TO SENSOR INFORMATION LIST
S113
ACCUMULATE ENVIRONMENTAL INFORMATION DATA OF VIRTUAL POINT
S114
S115
YES
UNSELECTED VIRTUAL POINT EXISTS?
NO
VISUALIZE ACCUMULATED ENVIRONMENTAL INFORMATION DATA
S121
END

Fig. 4

191B:SENSOR INFORMATION LIST

SENSOR IDENTIFIER	SENSOR COORDINATE VALUE	INFORMATION TYPE	SENSOR TYPE	
s1	(0, 1, 0)	TEMPERATURE	REAL	192
s2	(1, 2, 0)	TEMPERATURE	REAL	192
s3	(2, 1, 0)	TEMPERATURE	REAL	192
...	...	...	...	

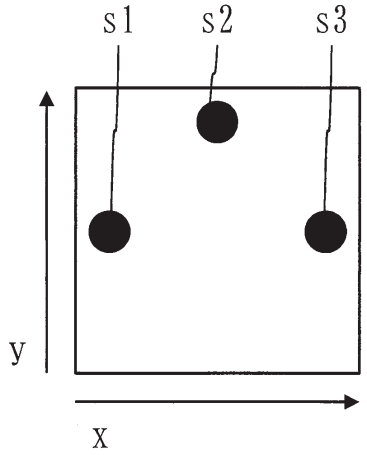


Fig. 5

180:ACCUMULATION UNIT

SENSOR COORDINATE VALUE	INFORMATION TYPE	SENSOR VALUE	TIME STAMP	
(0, 1, 0)	TEMPERATURE	22.0	2018-03-05 09:00:00	181
(1, 2, 0)	TEMPERATURE	23.0	2018-03-05 09:00:00	181
(2, 1, 0)	TEMPERATURE	21.5	2018-03-05 09:00:00	181
...	...	...	...	

Fig. 6

191A:SENSOR INFORMATION LIST

SENSOR IDENTIFIER	SENSOR COORDINATE VALUE	INFORMATION TYPE	SENSOR TYPE	
s1	(0, 1, 0)	TEMPERATURE	REAL	←192
s2	(1, 2, 0)	TEMPERATURE	REAL	←192
s3	(2, 1, 0)	TEMPERATURE	REAL	←192
v1	(1, 1, 0)	TEMPERATURE	VIRTUAL	←193
...	...	...	...	

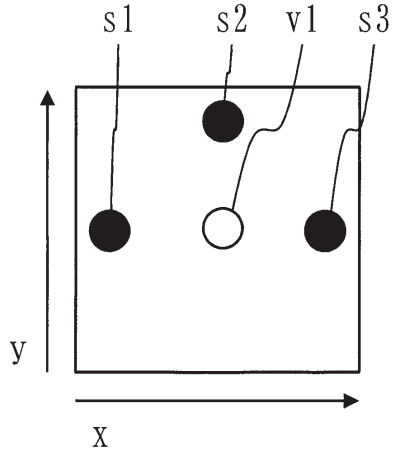


Fig. 7

180:ACCUMULATION UNIT

SENSOR COORDINATE VALUE	INFORMATION TYPE	SENSOR VALUE	TIME STAMP	
(0, 1, 0)	TEMPERATURE	22.0	2018-03-05 09:00:00	181
(1, 2, 0)	TEMPERATURE	23.0	2018-03-05 09:00:00	181
(2, 1, 0)	TEMPERATURE	21.5	2018-03-05 09:00:00	181
(1, 1, 0)	TEMPERATURE	22.2	2018-03-05 09:00:00	182
...	...	...	...	

Fig. 8

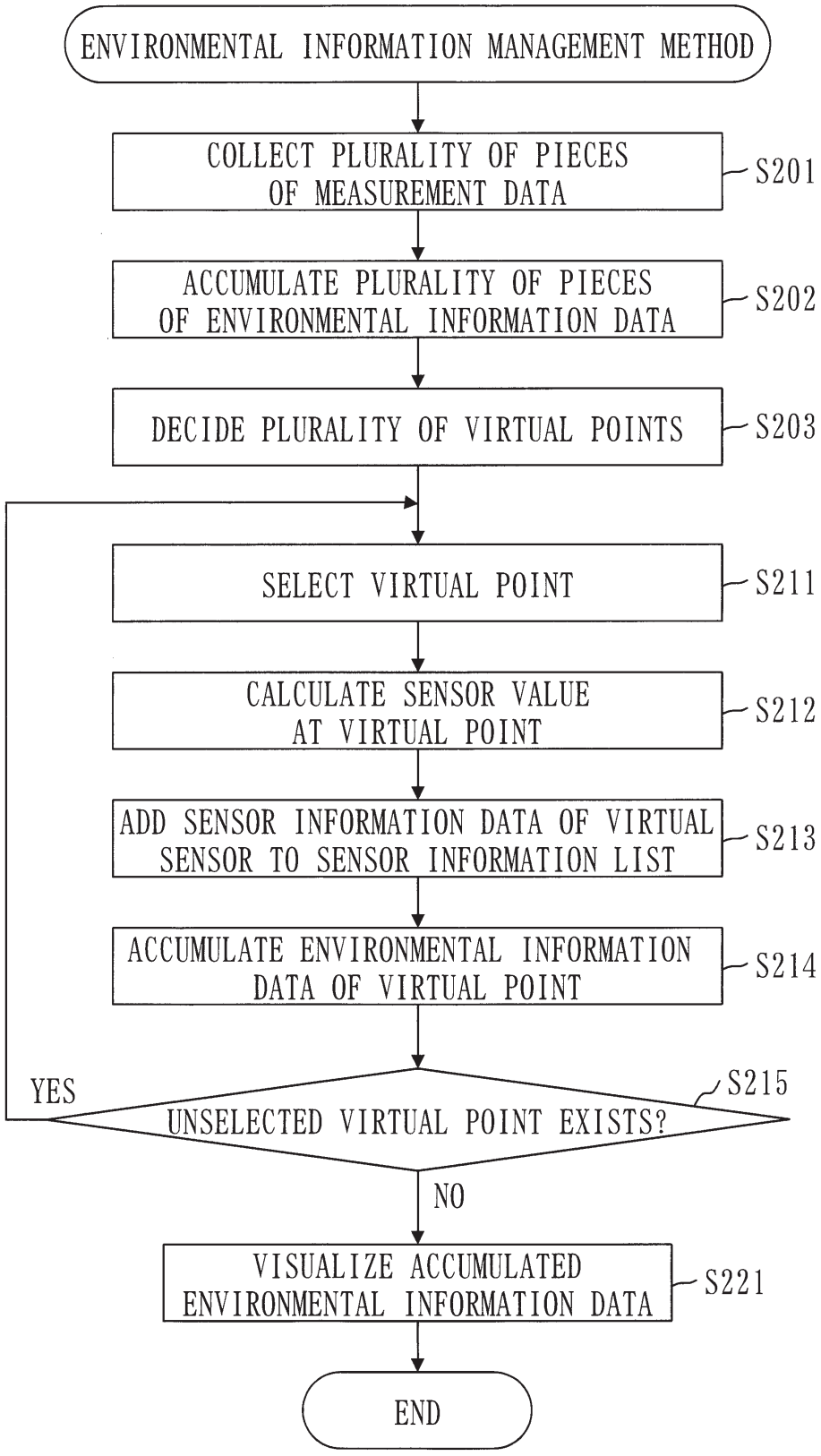

ENVIRONMENTAL INFORMATION MANAGEMENT METHOD
COLLECT PLURALITY OF PIECES OF MEASUREMENT DATA
S201
ACCUMULATE PLURALITY OF PIECES OF ENVIRONMENTAL INFORMATION DATA
S202
DECIDE PLURALITY OF VIRTUAL POINTS
S203
SELECT VIRTUAL POINT
S211
CALCULATE SENSOR VALUE AT VIRTUAL POINT
S212
ADD SENSOR INFORMATION DATA OF VIRTUAL SENSOR TO SENSOR INFORMATION LIST
S213
ACCUMULATE ENVIRONMENTAL INFORMATION DATA OF VIRTUAL POINT
S214
YES
UNSELECTED VIRTUAL POINT EXISTS?
S215
NO
VISUALIZE ACCUMULATED ENVIRONMENTAL INFORMATION DATA
S221
END

Fig. 9

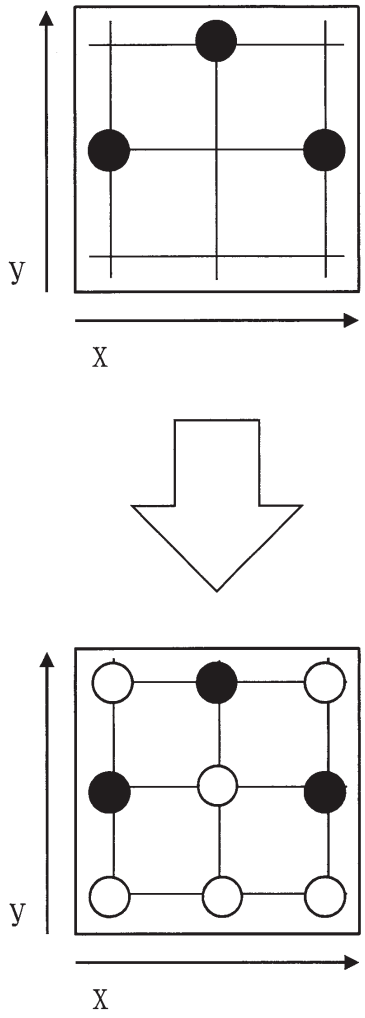


Fig.10

191:SENSOR INFORMATION LIST

SENSOR IDENTIFIER	SENSOR COORDINATE VALUE	INFORMATION TYPE	SENSOR TYPE	
0	(0, 0, 0)	TEMPERATURE	VIRTUAL	193
1	(0, 1, 0)	TEMPERATURE	REAL	192
2	(0, 2, 0)	TEMPERATURE	VIRTUAL	193
3	(1, 0, 0)	TEMPERATURE	VIRTUAL	193
4	(1, 1, 0)	TEMPERATURE	VIRTUAL	193
5	(1, 2, 0)	TEMPERATURE	REAL	192
6	(2, 0, 0)	TEMPERATURE	VIRTUAL	193
7	(2, 1, 0)	TEMPERATURE	REAL	192
8	(2, 2, 0)	TEMPERATURE	VIRTUAL	193
...	...	...	...	

Fig.11

180:ACCUMULATION UNIT

SENSOR COORDINATE VALUE	INFORMATION TYPE	SENSOR VALUE	TIME STAMP	
(0, 0, 0)	TEMPERATURE	22.0	2018-03-05 09:00:00	182
(0, 1, 0)	TEMPERATURE	22.0	2018-03-05 09:00:00	181
(0, 2, 0)	TEMPERATURE	22.5	2018-03-05 09:00:00	182
(1, 0, 0)	TEMPERATURE	22.8	2018-03-05 09:00:00	182
(1, 1, 0)	TEMPERATURE	22.0	2018-03-05 09:00:00	182
(1, 2, 0)	TEMPERATURE	23.0	2018-03-05 09:00:00	181
(2, 0, 0)	TEMPERATURE	21.5	2018-03-05 09:00:00	182
(2, 1, 0)	TEMPERATURE	21.5	2018-03-05 09:00:00	181
(2, 2, 0)	TEMPERATURE	22.3	2018-03-05 09:00:00	182
...	...	...	...	

Fig. 12

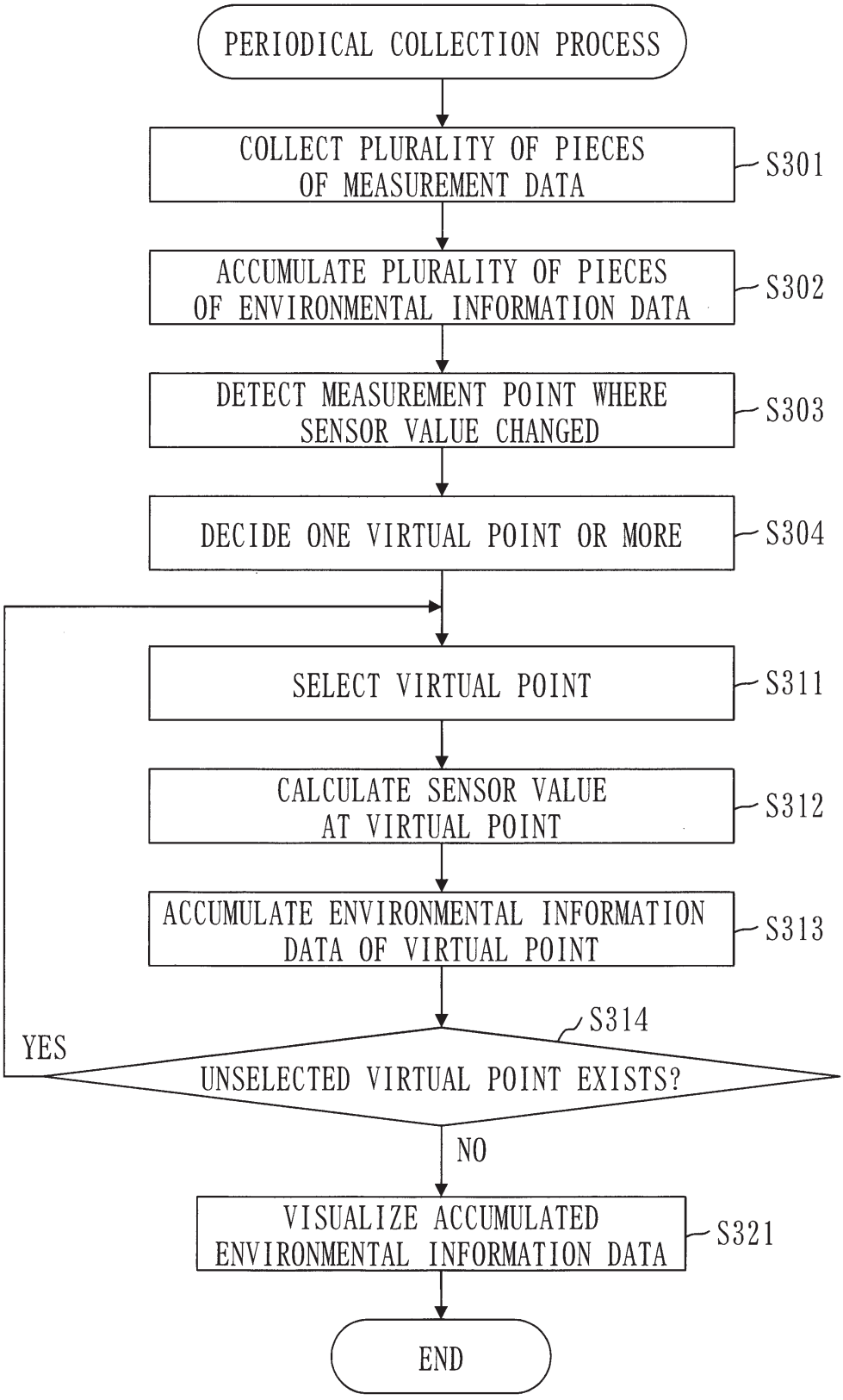

PERIODICAL COLLECTION PROCESS
COLLECT PLURALITY OF PIECES OF MEASUREMENT DATA
S301
ACCUMULATE PLURALITY OF PIECES OF ENVIRONMENTAL INFORMATION DATA
S302
DETECT MEASUREMENT POINT WHERE SENSOR VALUE CHANGED
S303
DECIDE ONE VIRTUAL POINT OR MORE
S304
SELECT VIRTUAL POINT
S311
CALCULATE SENSOR VALUE AT VIRTUAL POINT
S312
ACCUMULATE ENVIRONMENTAL INFORMATION DATA OF VIRTUAL POINT
S313
S314
YES
UNSELECTED VIRTUAL POINT EXISTS?
NO
VISUALIZE ACCUMULATED ENVIRONMENTAL INFORMATION DATA
S321
END

Fig. 13

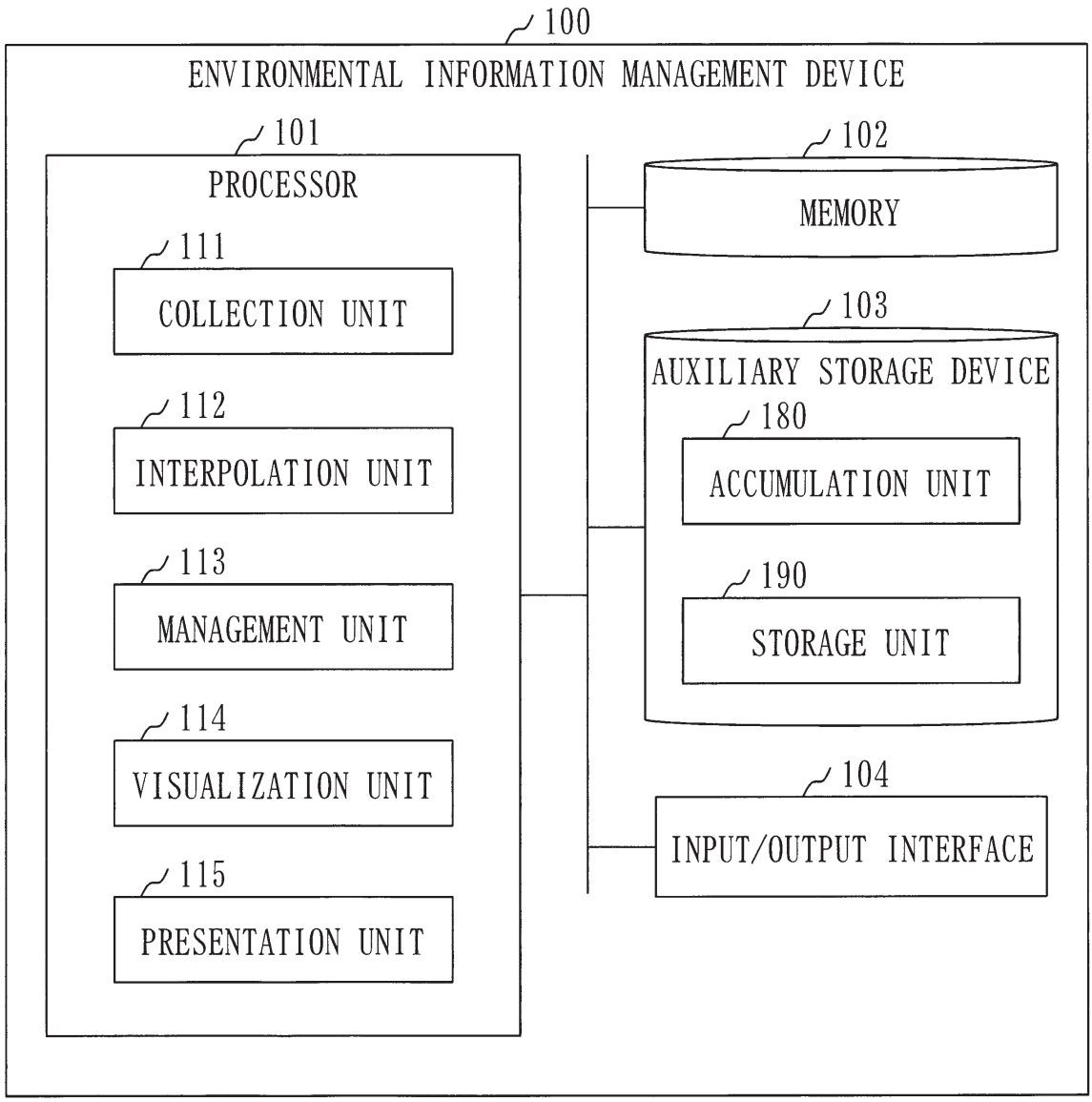

100
ENVIRONMENTAL INFORMATION MANAGEMENT DEVICE
101
PROCESSOR
111
COLLECTION UNIT
112
INTERPOLATION UNIT
113
MANAGEMENT UNIT
114
VISUALIZATION UNIT
115
PRESENTATION UNIT
102
MEMORY
103
AUXILIARY STORAGE DEVICE
180
ACCUMULATION UNIT
190
STORAGE UNIT
104
INPUT/OUTPUT INTERFACE

Fig. 14

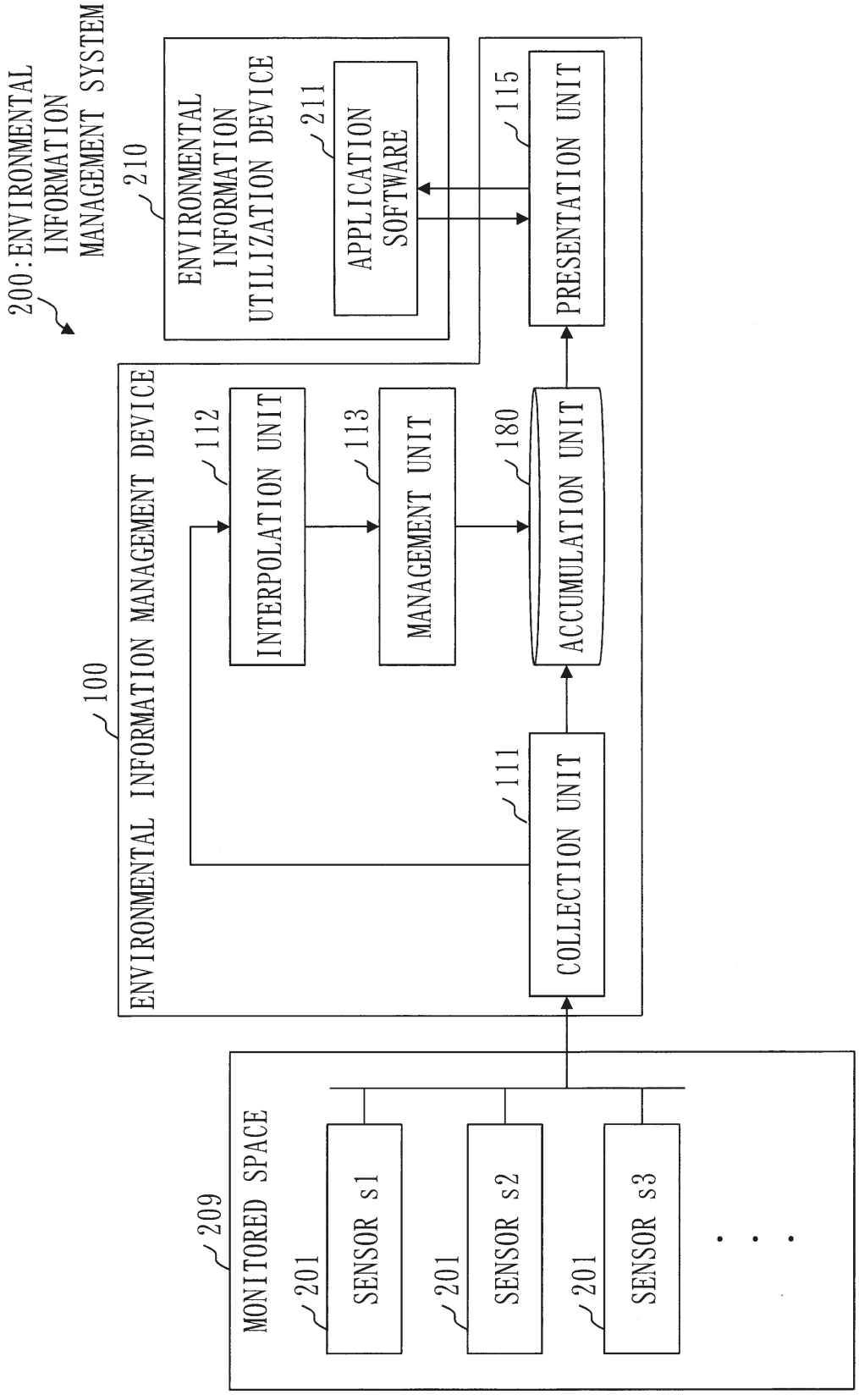

200:ENVIRONMENTAL INFORMATION MANAGEMENT SYSTEM
210
ENVIRONMENTAL INFORMATION UTILIZATION DEVICE
211
APPLICATION SOFTWARE
115
PRESENTATION UNIT
100
ENVIRONMENTAL INFORMATION MANAGEMENT DEVICE
112
INTERPOLATION UNIT
113
MANAGEMENT UNIT
180
ACCUMULATION UNIT
111
COLLECTION UNIT
209
MONITORED SPACE
201
SENSOR s1
201
SENSOR s2
201
SENSOR s3
. . .

Fig. 15

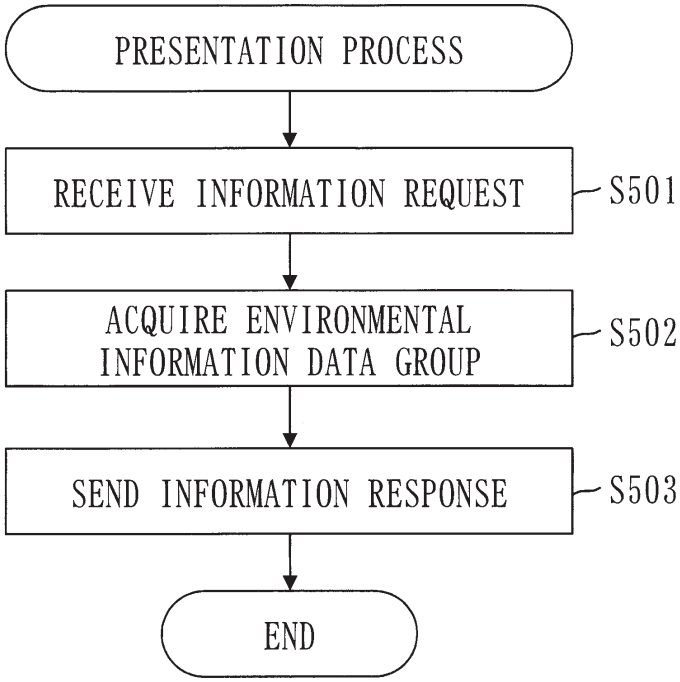

PRESENTATION PROCESS
RECEIVE INFORMATION REQUEST
S501
ACQUIRE ENVIRONMENTAL INFORMATION DATA GROUP
S502
SEND INFORMATION RESPONSE
S503
END

Fig. 16

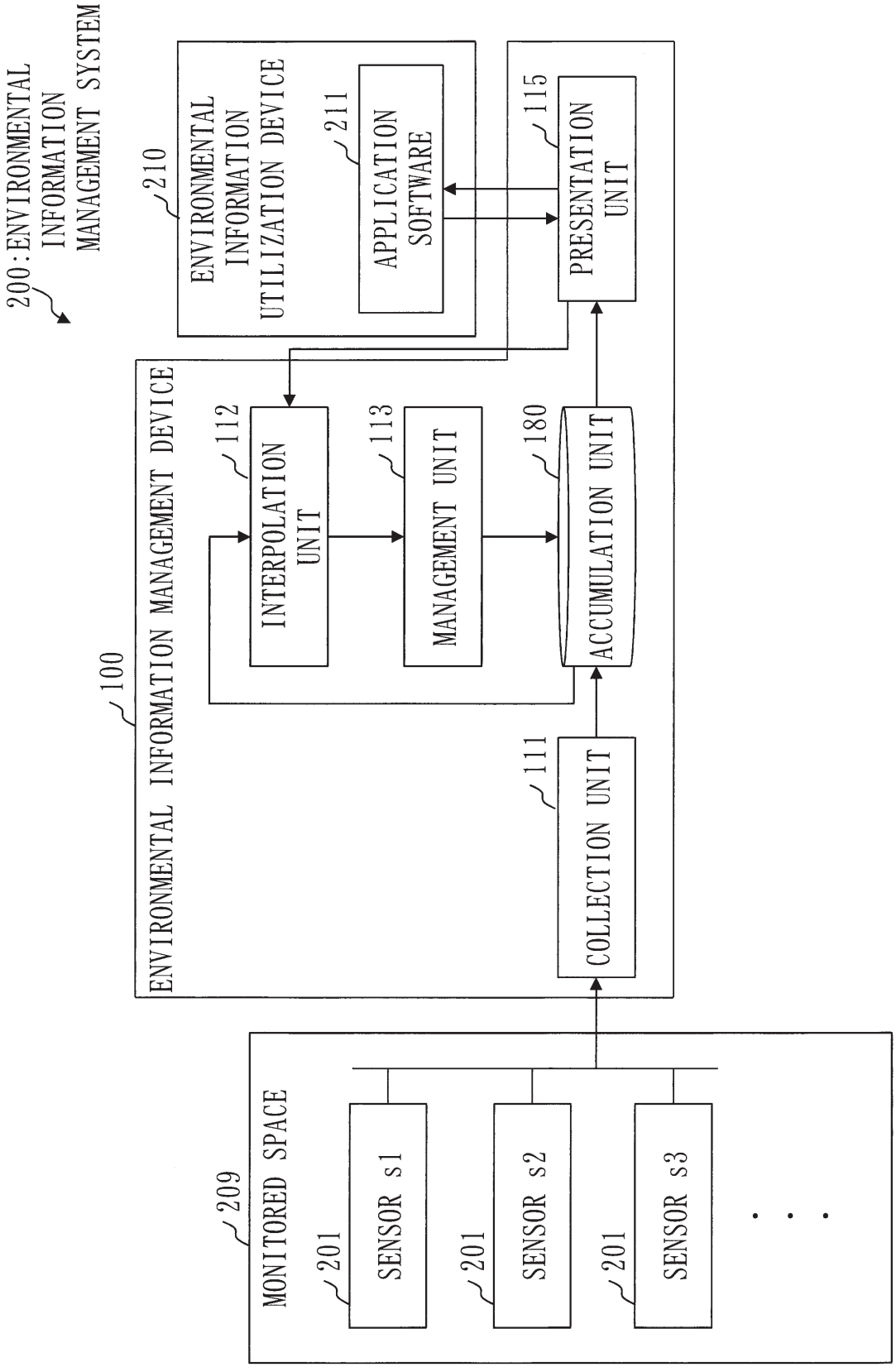

200:ENVIRONMENTAL INFORMATION MANAGEMENT SYSTEM
210
ENVIRONMENTAL INFORMATION UTILIZATION DEVICE
211
APPLICATION SOFTWARE
115
PRESENTATION UNIT
100
ENVIRONMENTAL INFORMATION MANAGEMENT DEVICE
112
INTERPOLATION UNIT
113
MANAGEMENT UNIT
180
ACCUMULATION UNIT
111
COLLECTION UNIT
209
MONITORED SPACE
201
SENSOR s1
201
SENSOR s2
201
SENSOR s3
. . .

Fig. 17

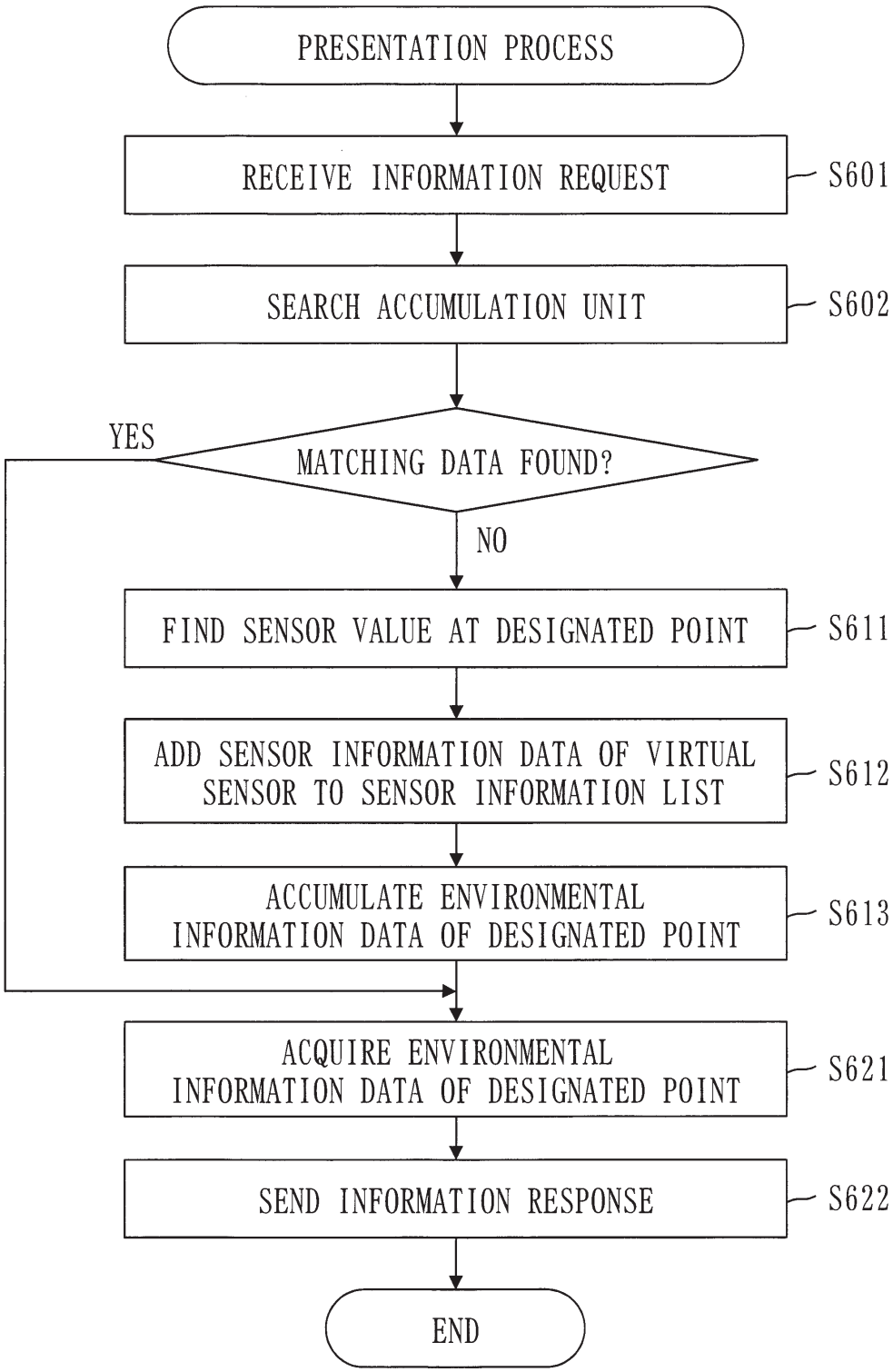

PRESENTATION PROCESS
RECEIVE INFORMATION REQUEST
S601
SEARCH ACCUMULATION UNIT
S602
YES
MATCHING DATA FOUND?
NO
FIND SENSOR VALUE AT DESIGNATED POINT
S611
ADD SENSOR INFORMATION DATA OF VIRTUAL SENSOR TO SENSOR INFORMATION LIST
S612
ACCUMULATE ENVIRONMENTAL INFORMATION DATA OF DESIGNATED POINT
S613
ACQUIRE ENVIRONMENTAL INFORMATION DATA OF DESIGNATED POINT
S621
SEND INFORMATION RESPONSE
S622
END

Fig. 18

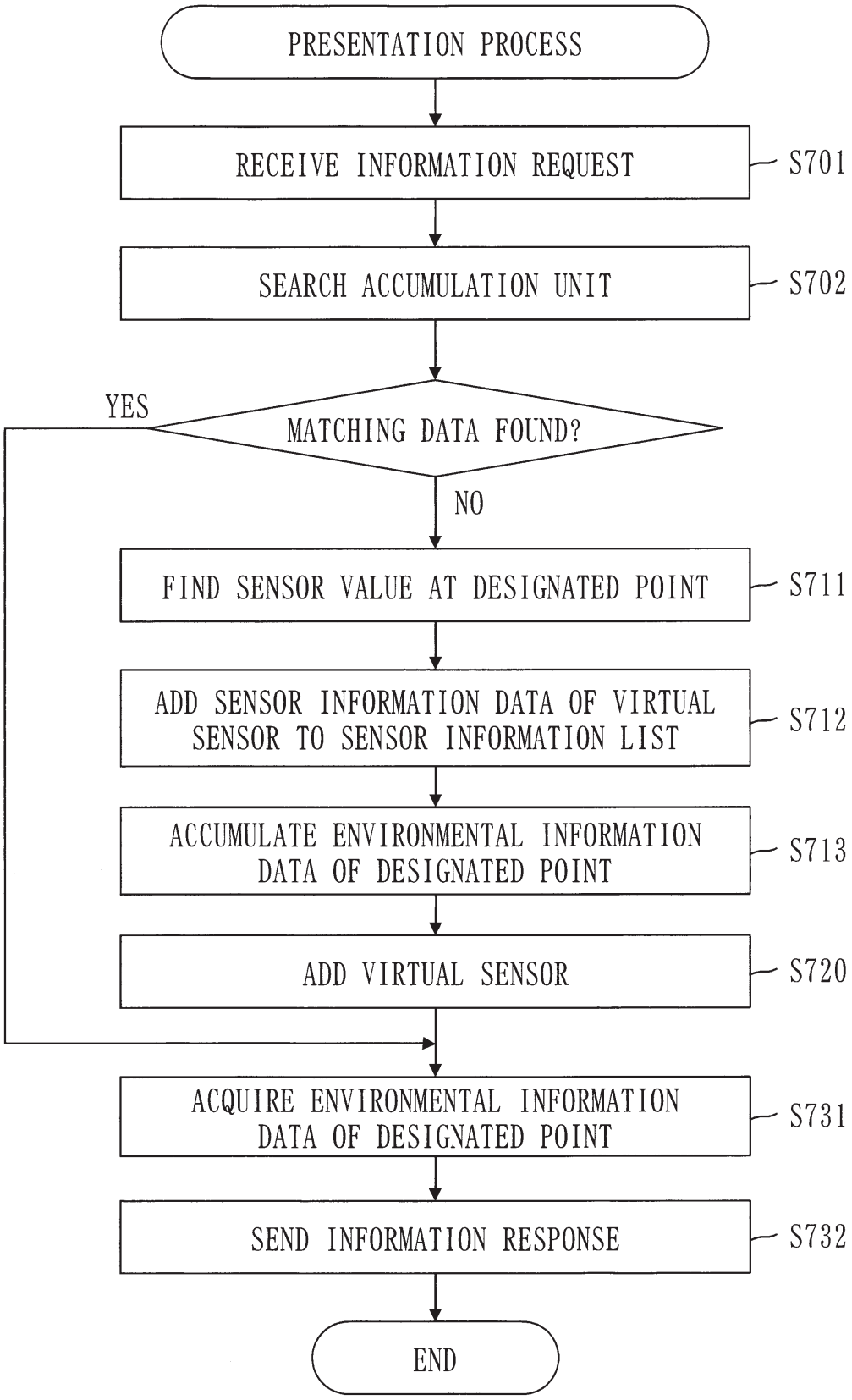

PRESENTATION PROCESS
RECEIVE INFORMATION REQUEST
S701
SEARCH ACCUMULATION UNIT
S702
MATCHING DATA FOUND?
YES
NO
FIND SENSOR VALUE AT DESIGNATED POINT
S711
ADD SENSOR INFORMATION DATA OF VIRTUAL SENSOR TO SENSOR INFORMATION LIST
S712
ACCUMULATE ENVIRONMENTAL INFORMATION DATA OF DESIGNATED POINT
S713
ADD VIRTUAL SENSOR
S720
ACQUIRE ENVIRONMENTAL INFORMATION DATA OF DESIGNATED POINT
S731
SEND INFORMATION RESPONSE
S732
END

Fig. 19

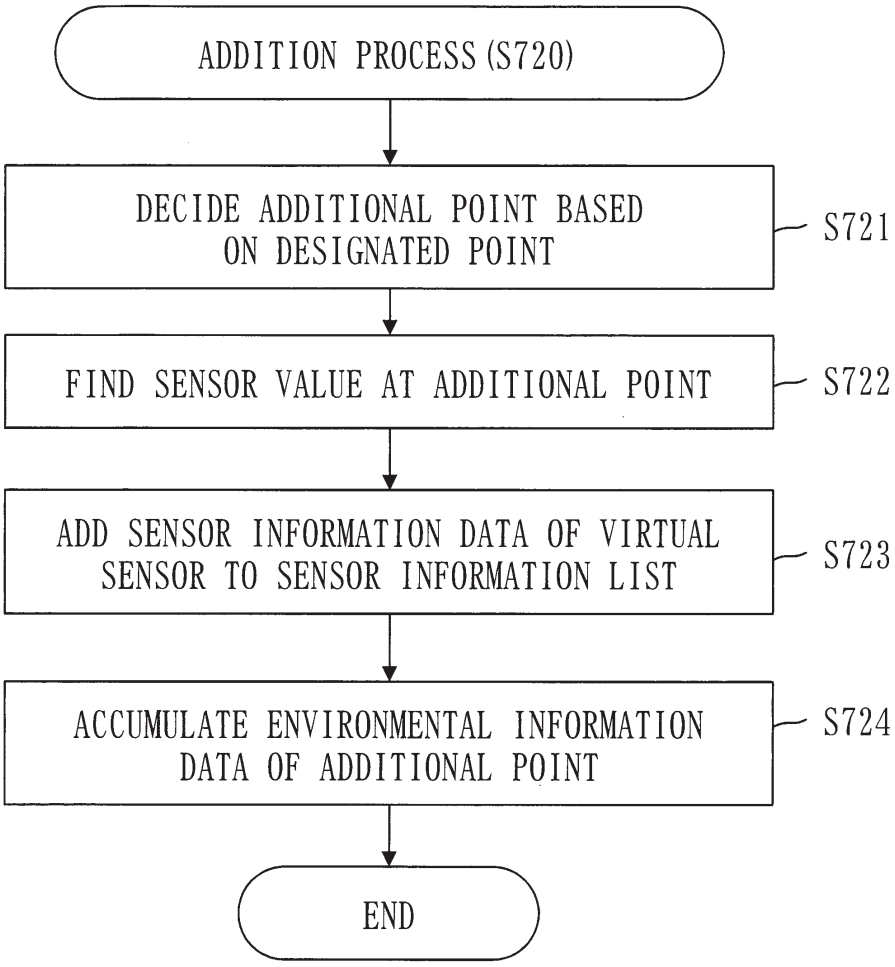

ADDITION PROCESS (S720)
DECIDE ADDITIONAL POINT BASED ON DESIGNATED POINT
S721
FIND SENSOR VALUE AT ADDITIONAL POINT
S722
ADD SENSOR INFORMATION DATA OF VIRTUAL SENSOR TO SENSOR INFORMATION LIST
S723
ACCUMULATE ENVIRONMENTAL INFORMATION DATA OF ADDITIONAL POINT
S724
END

Fig.20

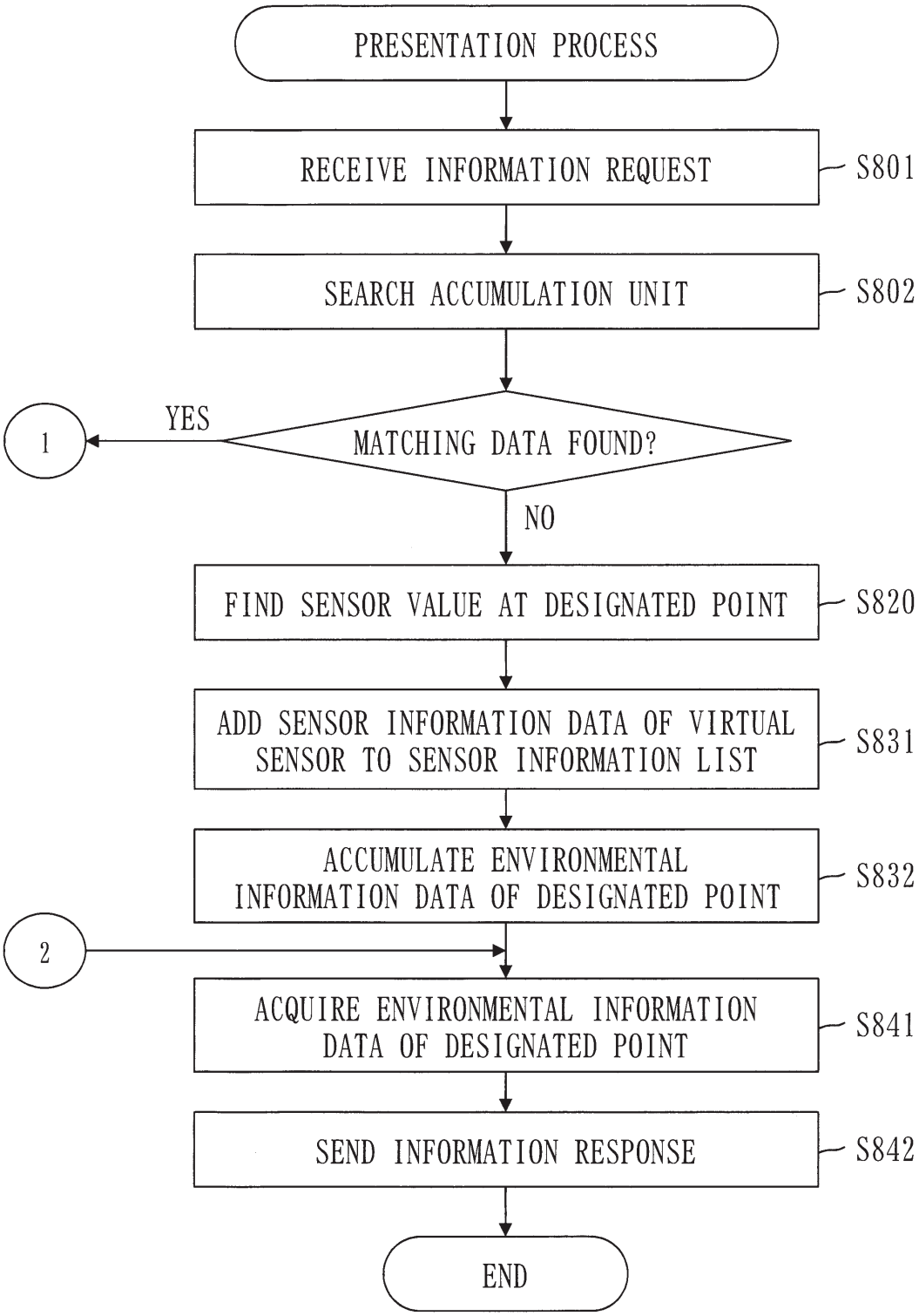

PRESENTATION PROCESS
RECEIVE INFORMATION REQUEST
S801
SEARCH ACCUMULATION UNIT
S802
MATCHING DATA FOUND?
YES
1
NO
FIND SENSOR VALUE AT DESIGNATED POINT
S820
ADD SENSOR INFORMATION DATA OF VIRTUAL SENSOR TO SENSOR INFORMATION LIST
S831
ACCUMULATE ENVIRONMENTAL INFORMATION DATA OF DESIGNATED POINT
S832
2
ACQUIRE ENVIRONMENTAL INFORMATION DATA OF DESIGNATED POINT
S841
SEND INFORMATION RESPONSE
S842
END

Fig. 21

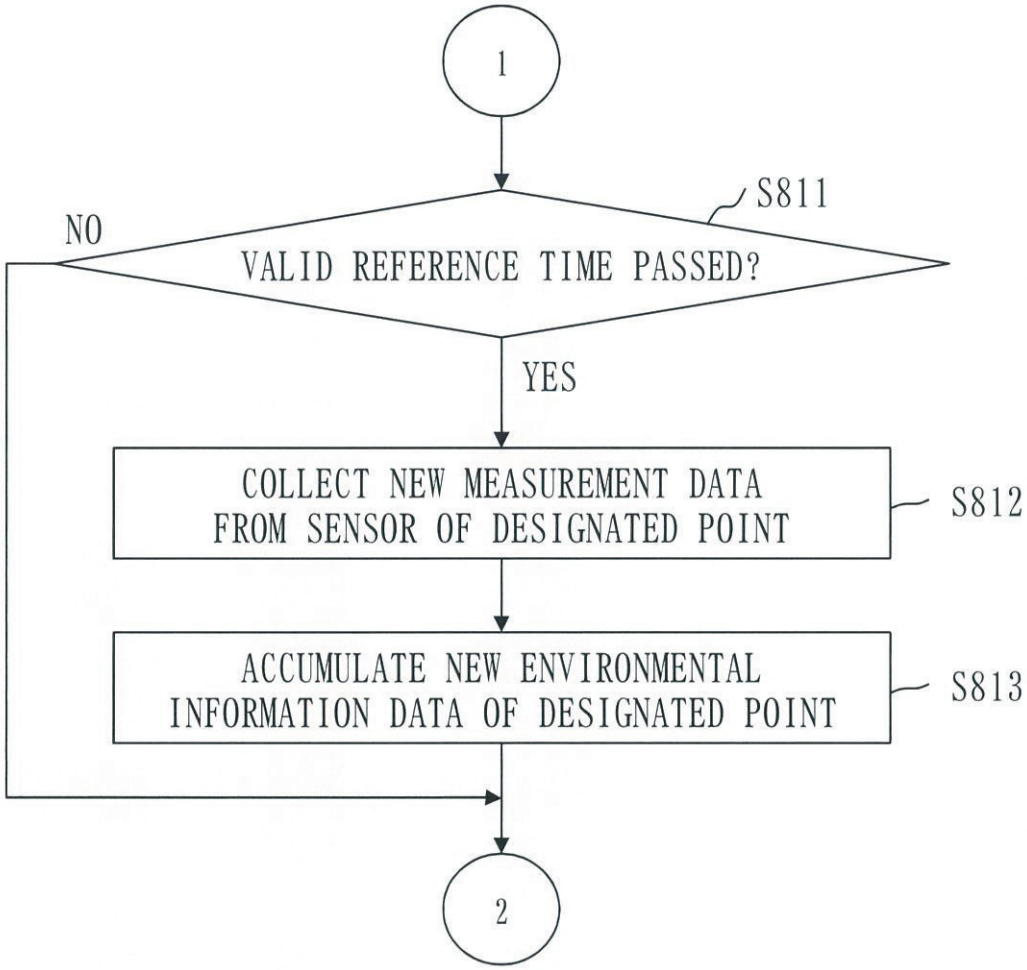

1
S811
NO
VALID REFERENCE TIME PASSED?
YES
COLLECT NEW MEASUREMENT DATA FROM SENSOR OF DESIGNATED POINT
S812
ACCUMULATE NEW ENVIRONMENTAL INFORMATION DATA OF DESIGNATED POINT
S813
2

Fig. 22

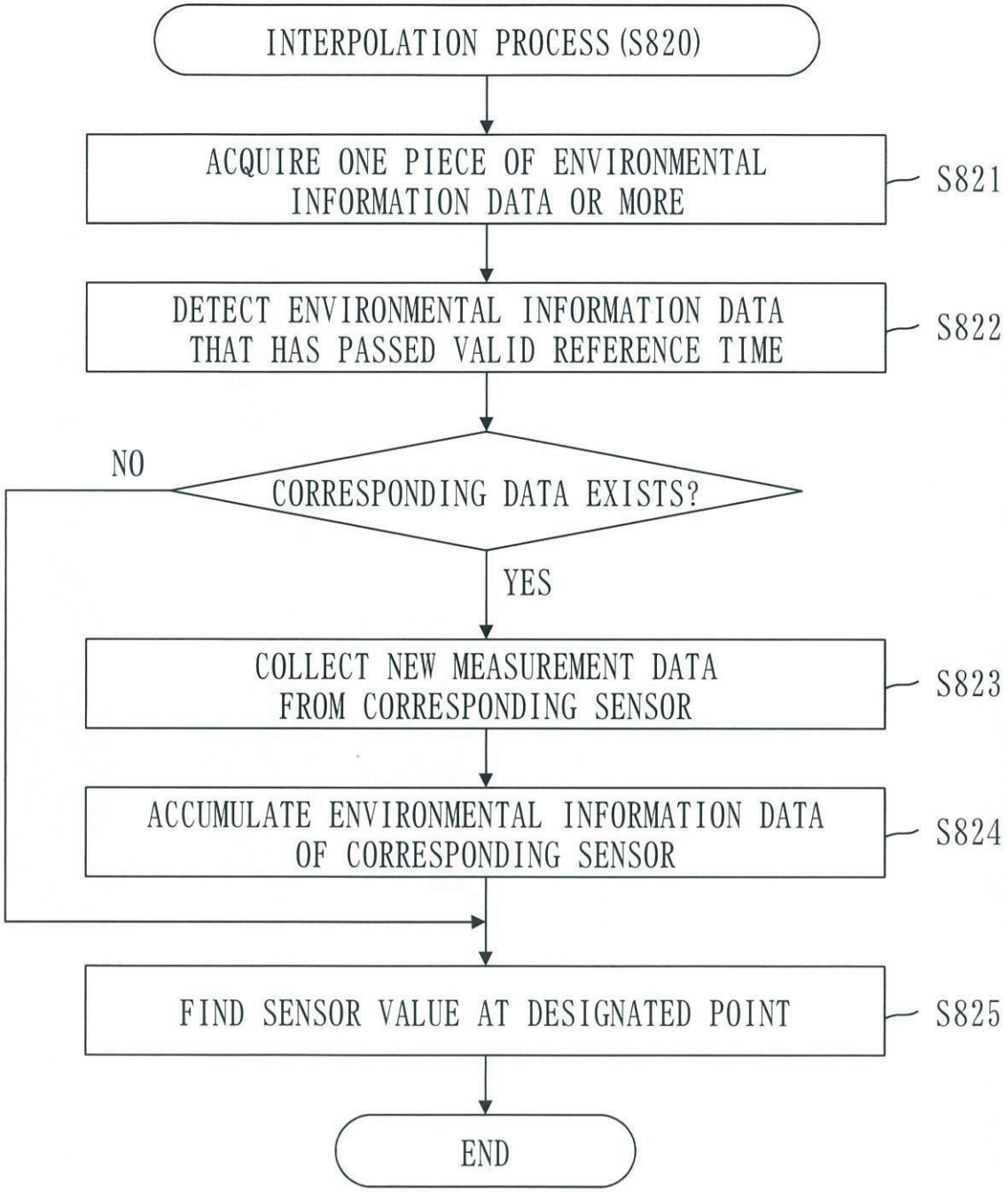

INTERPOLATION PROCESS (S820)
ACQUIRE ONE PIECE OF ENVIRONMENTAL INFORMATION DATA OR MORE
S821
DETECT ENVIRONMENTAL INFORMATION DATA THAT HAS PASSED VALID REFERENCE TIME
S822
NO
CORRESPONDING DATA EXISTS?
YES
COLLECT NEW MEASUREMENT DATA FROM CORRESPONDING SENSOR
S823
ACCUMULATE ENVIRONMENTAL INFORMATION DATA OF CORRESPONDING SENSOR
S824
FIND SENSOR VALUE AT DESIGNATED POINT
S825
END

Fig. 23

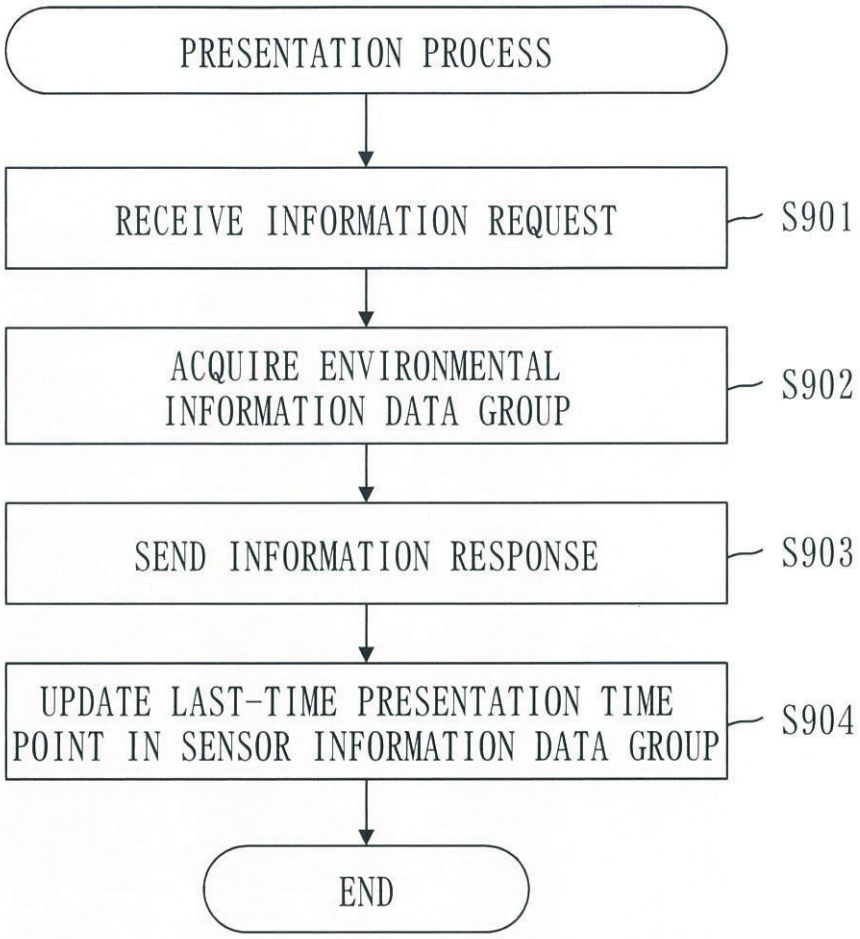

PRESENTATION PROCESS
RECEIVE INFORMATION REQUEST
S901
ACQUIRE ENVIRONMENTAL INFORMATION DATA GROUP
S902
SEND INFORMATION RESPONSE
S903
UPDATE LAST-TIME PRESENTATION TIME POINT IN SENSOR INFORMATION DATA GROUP
S904
END

Fig.24

191:SENSOR INFORMATION LIST

SENSOR IDENTIFIER	SENSOR COORDINATE VALUE	INFORMATION TYPE	SENSOR TYPE	LAST-TIME PRESENTATION TIME POINT	
s1	(0, 1, 0)	TEMPERATURE	REAL	YYYY-MM-DD hh:mm:ss	192
s2	(1, 2, 0)	TEMPERATURE	REAL	YYYY-MM-DD hh:mm:ss	192
s3	(2, 1, 0)	TEMPERATURE	REAL	YYYY-MM-DD hh:mm:ss	192
v1	(1, 1, 0)	TEMPERATURE	VIRTUAL	YYYY-MM-DD hh:mm:ss	193
...	...	...	...		

Fig. 25

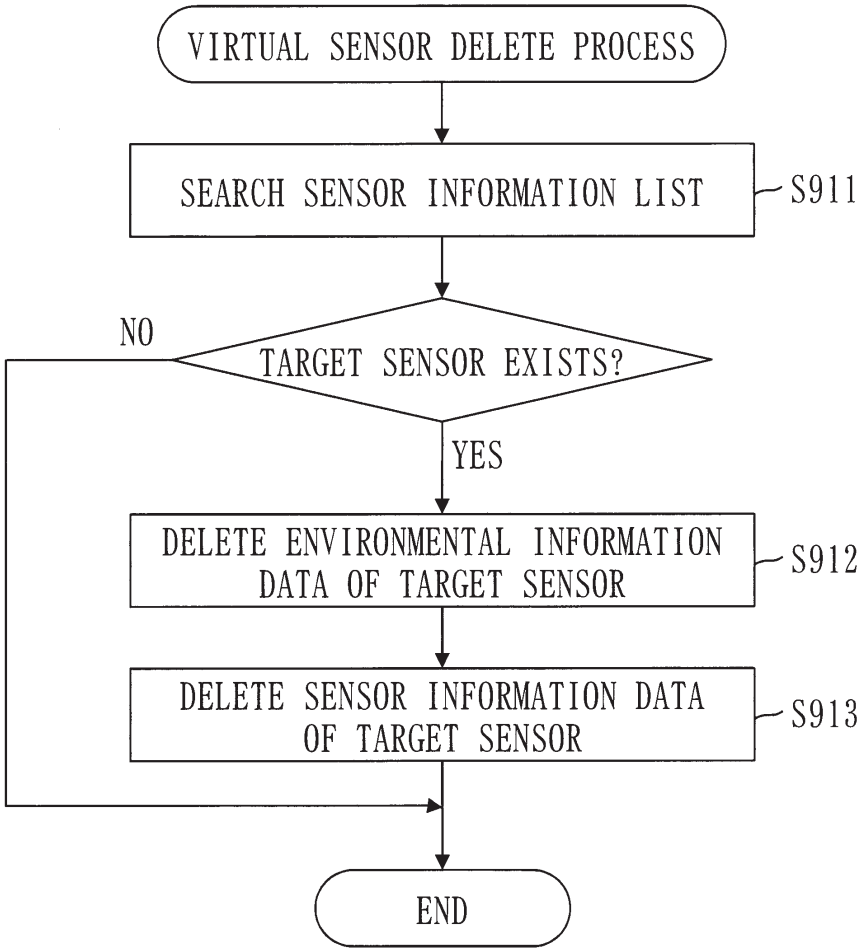

VIRTUAL SENSOR DELETE PROCESS
SEARCH SENSOR INFORMATION LIST
S911
NO
TARGET SENSOR EXISTS?
YES
DELETE ENVIRONMENTAL INFORMATION DATA OF TARGET SENSOR
S912
DELETE SENSOR INFORMATION DATA OF TARGET SENSOR
S913
END

Fig.26

191B:SENSOR INFORMATION LIST

SENSOR IDENTIFIER	SENSOR COORDINATE VALUE	INFORMATION TYPE	SENSOR TYPE	···	ACCURACY INFORMATION	
s1	(0, 1, 0)	TEMPERATURE	REAL	···	±20%	192
s2	(1, 2, 0)	TEMPERATURE	REAL	···	±20%	192
s3	(2, 1, 0)	TEMPERATURE	REAL	···	±20%	192
···	···	···	···	···	···	

Fig.27

191A:SENSOR INFORMATION LIST

SENSOR IDENTIFIER	SENSOR COORDINATE VALUE	INFORMATION TYPE	SENSOR TYPE	···	ACCURACY INFORMATION	
s1	(0, 1, 0)	TEMPERATURE	REAL	···	±20%	192
s2	(1, 2, 0)	TEMPERATURE	REAL	···	±20%	192
s3	(2, 1, 0)	TEMPERATURE	REAL	···	±20%	192
v1	(1, 1, 0)	TEMPERATURE	VIRTUAL	···	±20%	193
···	···	···	···	···	···	

Fig. 28

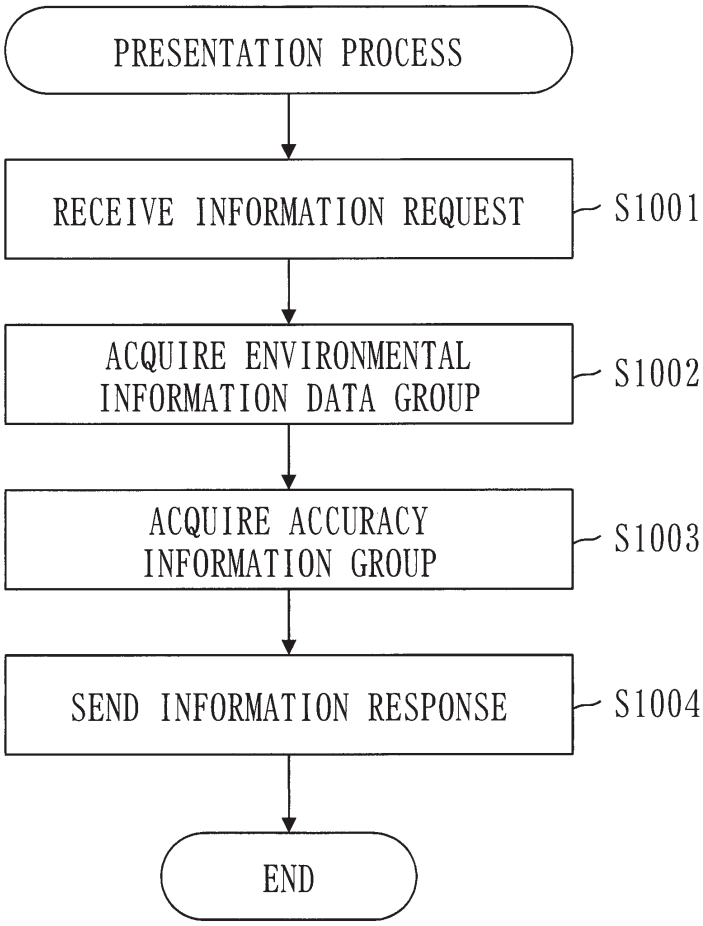

PRESENTATION PROCESS
RECEIVE INFORMATION REQUEST
S1001
ACQUIRE ENVIRONMENTAL INFORMATION DATA GROUP
S1002
ACQUIRE ACCURACY INFORMATION GROUP
S1003
SEND INFORMATION RESPONSE
S1004
END

Fig.29

191A:SENSOR INFORMATION LIST

SENSOR IDENTIFIER	SENSOR COORDINATE VALUE	INFORMATION TYPE	SENSOR TYPE	…	REFERENCE COORDINATE VALUE	STATUS FLAG	
s1	(0, 1, 0)	TEMPERATURE	REAL	…			192
s2	(1, 2, 0)	TEMPERATURE	REAL	…			192
s3	(2, 1, 0)	TEMPERATURE	REAL	…			192
v1	(1, 1, 0)	TEMPERATURE	VIRTUAL	…	(0, 1, 0) (1, 2, 0) (2, 1, 0)	VALID	193
…	…	…	…	…			

Fig. 30

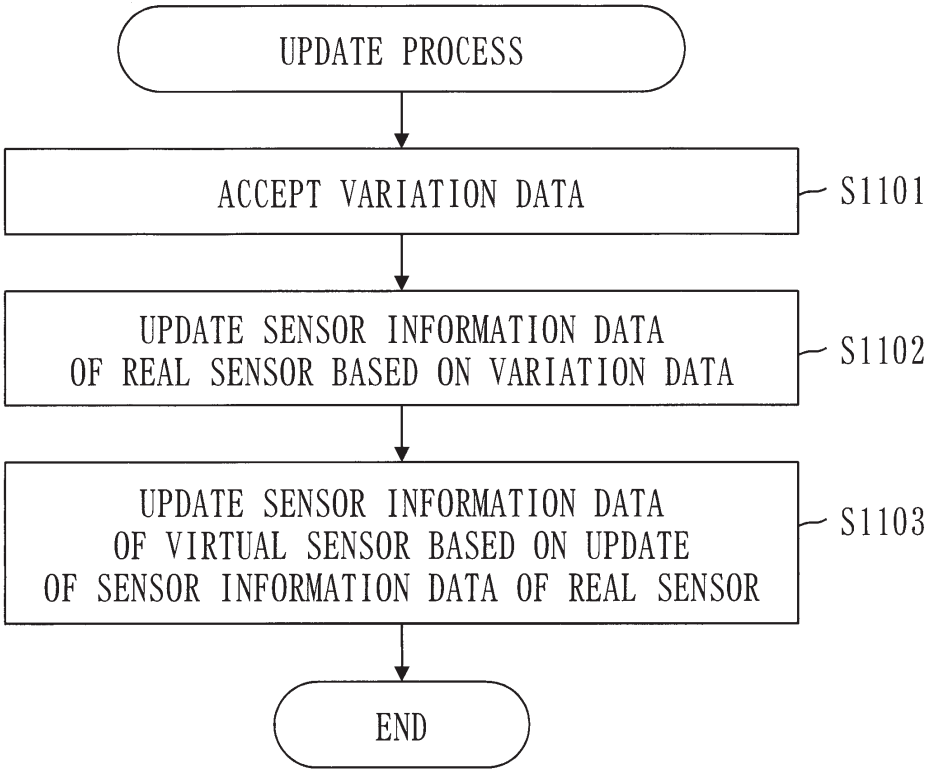
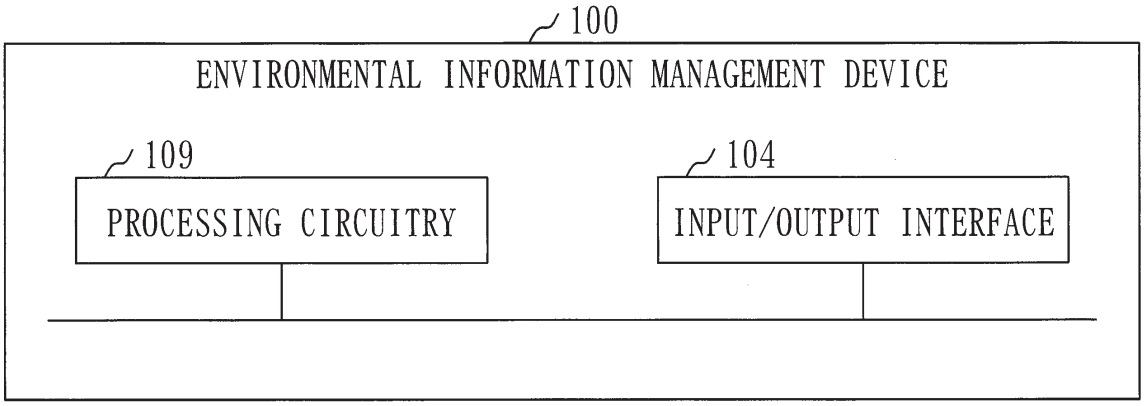

UPDATE PROCESS
ACCEPT VARIATION DATA
S1101
UPDATE SENSOR INFORMATION DATA OF REAL SENSOR BASED ON VARIATION DATA
S1102
UPDATE SENSOR INFORMATION DATA OF VIRTUAL SENSOR BASED ON UPDATE OF SENSOR INFORMATION DATA OF REAL SENSOR
S1103
END

Fig.31


100
ENVIRONMENTAL INFORMATION MANAGEMENT DEVICE
109
PROCESSING CIRCUITRY
104
INPUT/OUTPUT INTERFACE