FIG.1A

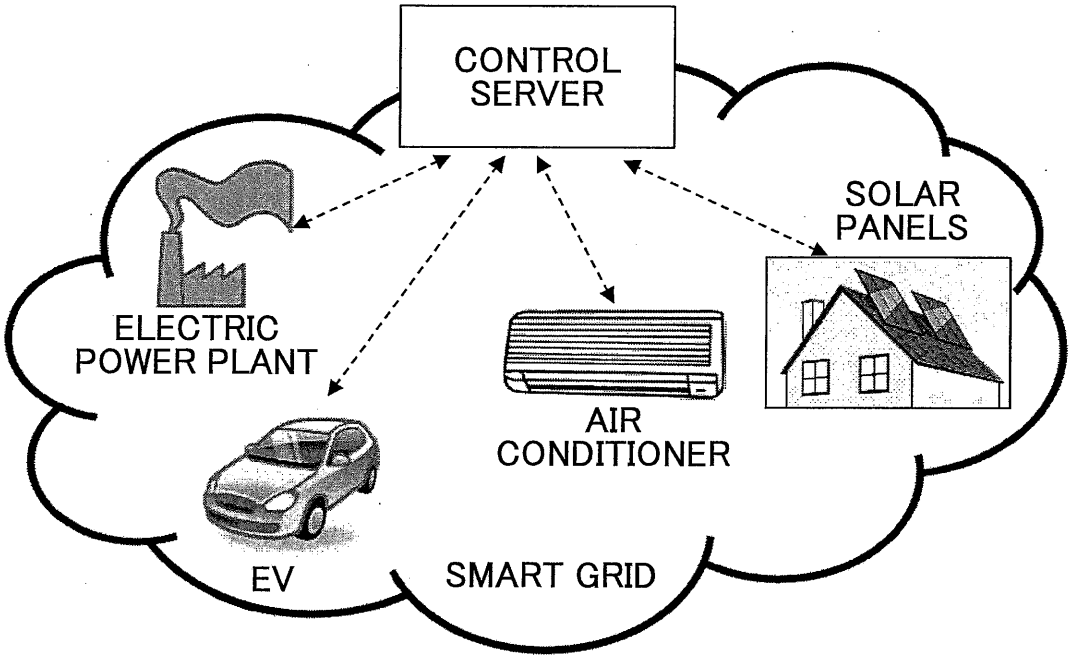

CONTROL SERVER
SOLAR PANELS
ELECTRIC POWER PLANT
AIR CONDITIONER
EV
SMART GRID

FIG.1B

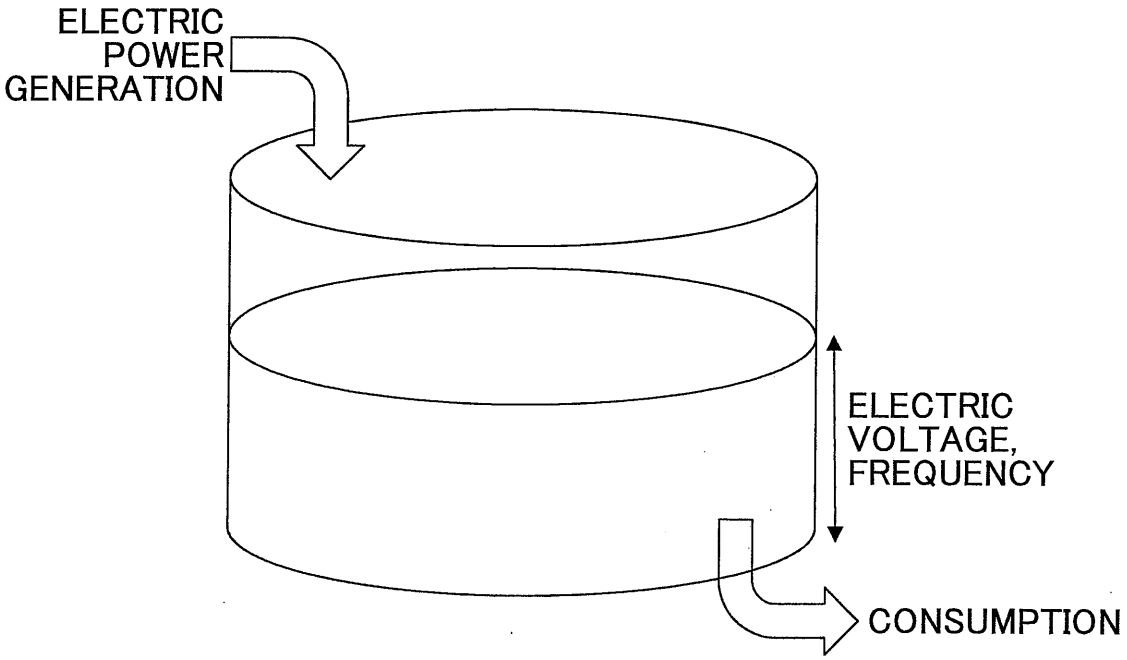

ELECTRIC POWER GENERATION
ELECTRIC VOLTAGE, FREQUENCY
CONSUMPTION

FIG.2

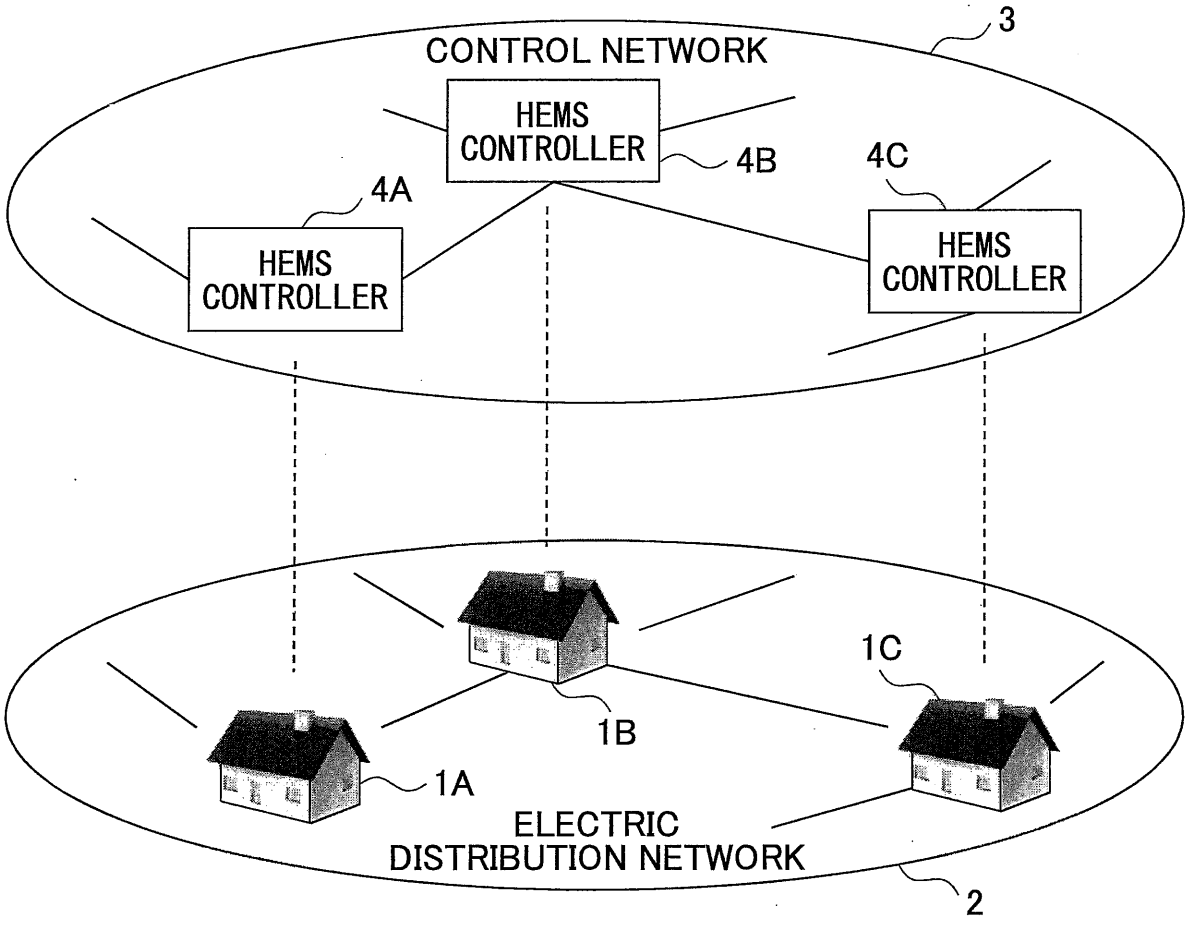

3
CONTROL NETWORK
HEMS CONTROLLER
4B
4A
4C
HEMS CONTROLLER
HEMS CONTROLLER
1C
1B
1A
ELECTRIC DISTRIBUTION NETWORK
2

FIG.3

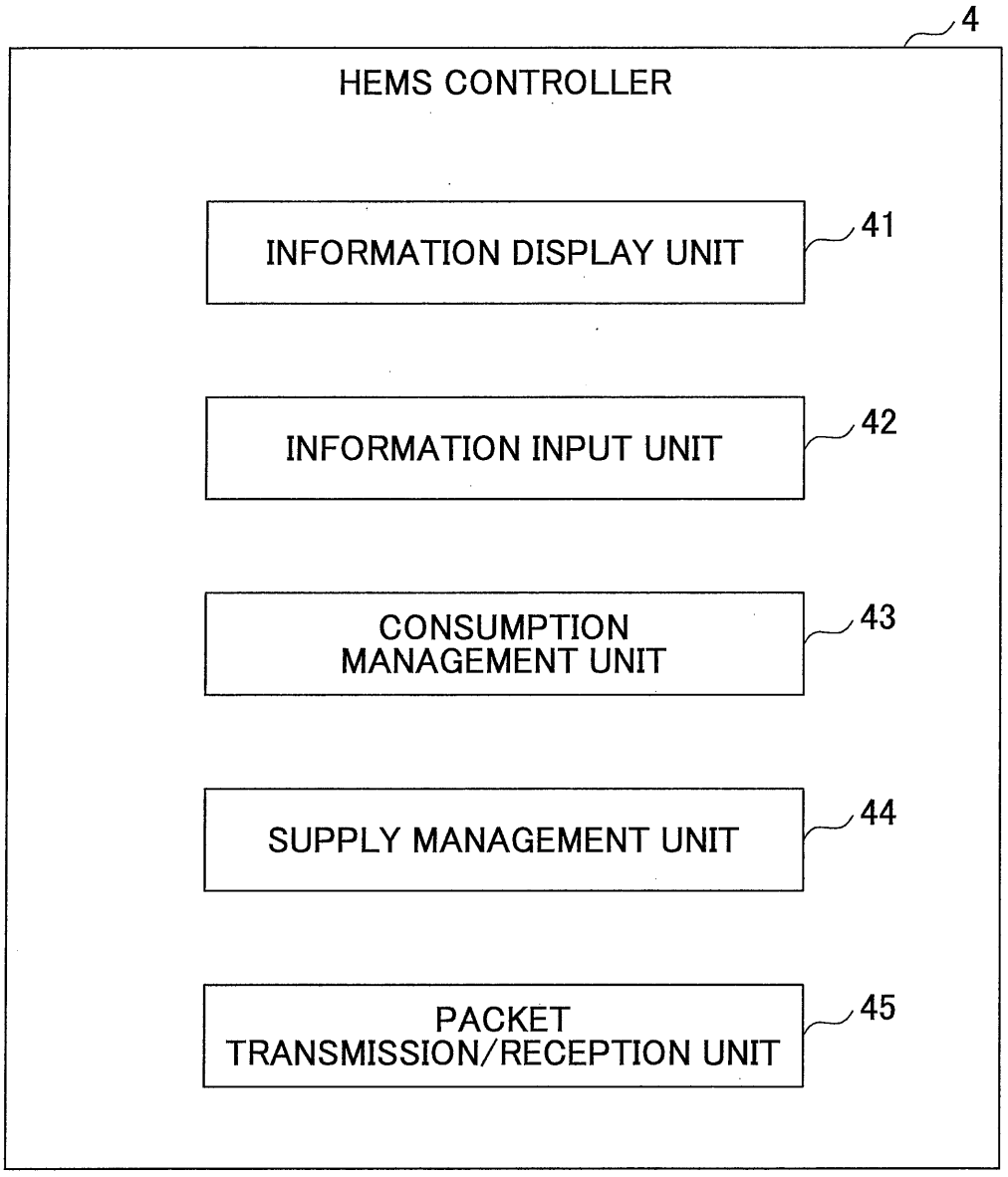

4
HEMS CONTROLLER
INFORMATION DISPLAY UNIT
41
INFORMATION INPUT UNIT
42
CONSUMPTION MANAGEMENT UNIT
43
SUPPLY MANAGEMENT UNIT
44
PACKET TRANSMISSION/RECEPTION UNIT
45

FIG.4

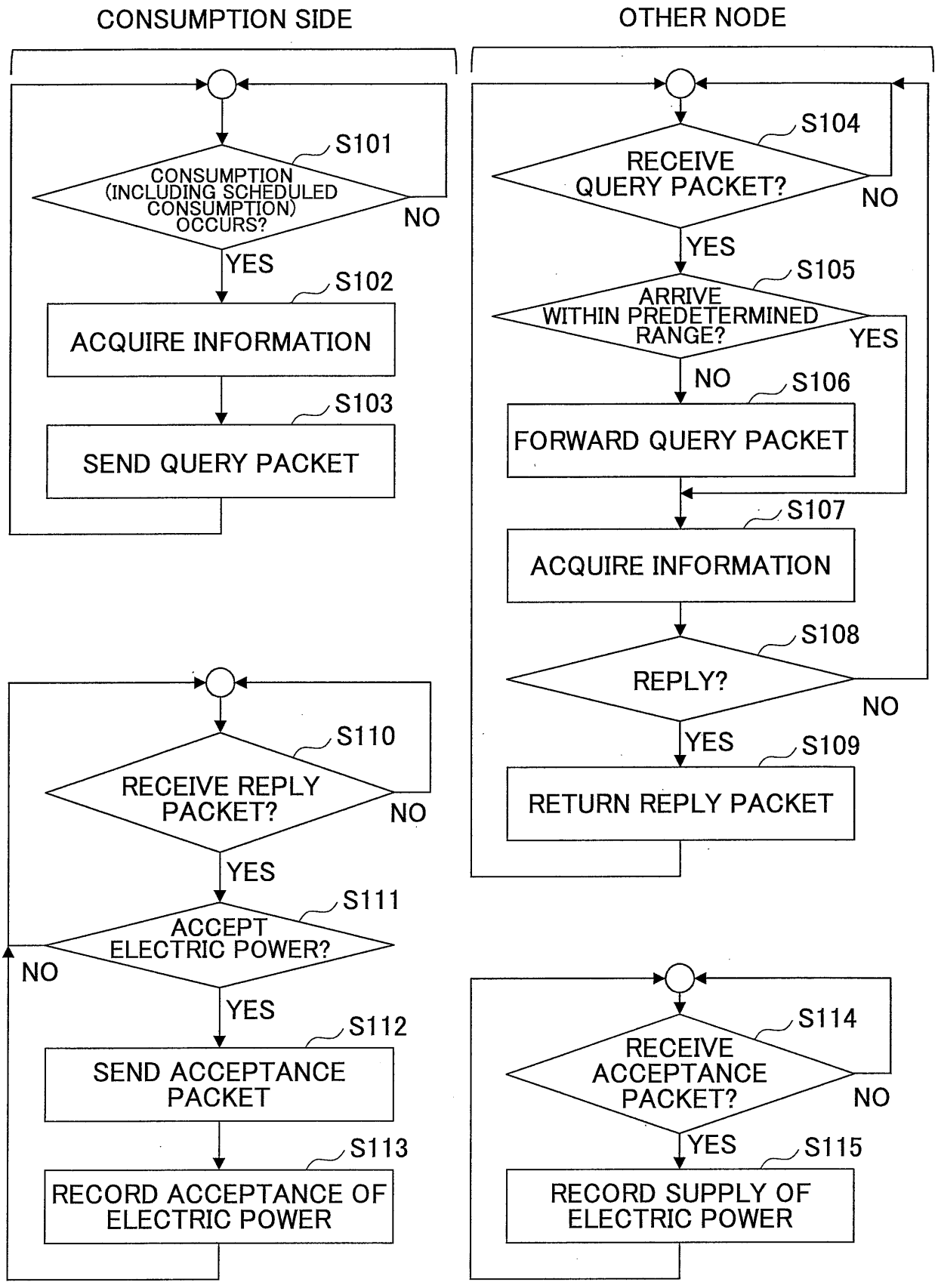

CONSUMPTION SIDE
OTHER NODE
S101
CONSUMPTION (INCLUDING SCHEDULED CONSUMPTION) OCCURS?
NO
YES
S102
ACQUIRE INFORMATION
S103
SEND QUERY PACKET
S104
RECEIVE QUERY PACKET?
NO
YES
S105
ARRIVE WITHIN PREDETERMINED RANGE?
YES
NO
S106
FORWARD QUERY PACKET
S107
ACQUIRE INFORMATION
S108
REPLY?
NO
YES
S109
RETURN REPLY PACKET
S110
RECEIVE REPLY PACKET?
NO
YES
S111
ACCEPT ELECTRIC POWER?
NO
YES
S112
SEND ACCEPTANCE PACKET
S113
RECORD ACCEPTANCE OF ELECTRIC POWER
S114
RECEIVE ACCEPTANCE PACKET?
NO
YES
S115
RECORD SUPPLY OF ELECTRIC POWER

FIG.5

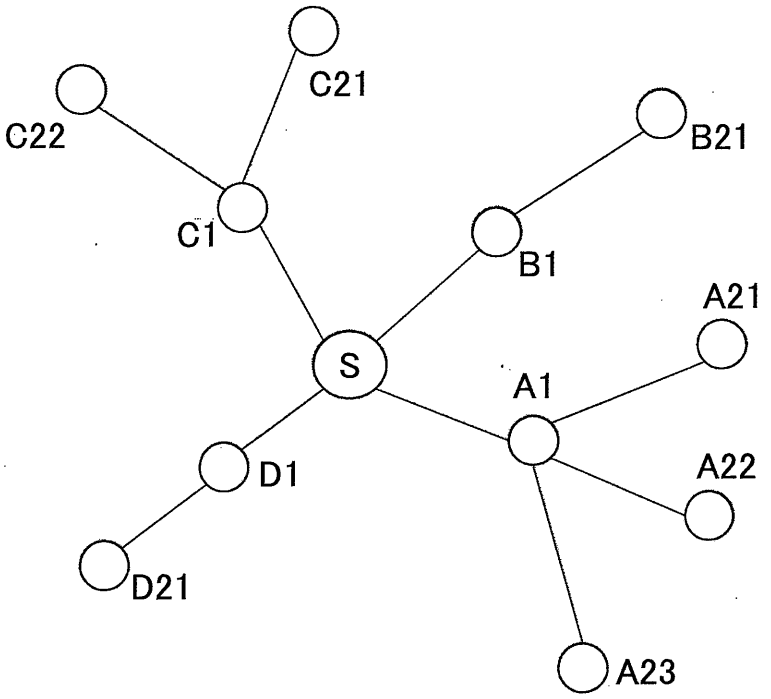


FIG.6

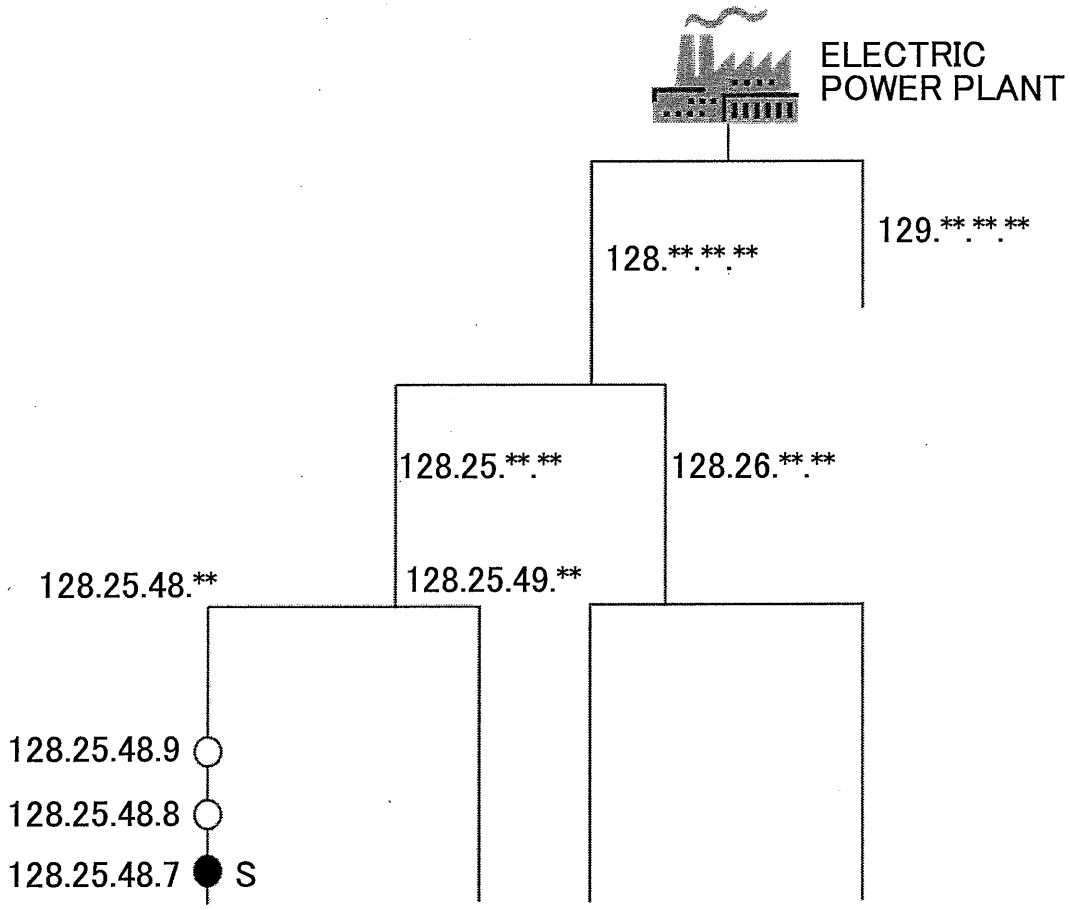


FIG.7

QUERY PACKET

ELECTRIC POWER: 20 W	TIME OF USE: 30 min

REPLY PACKET

ELECTRIC POWER: 20 W	COST: 25 YEN	NUMBER OF HOPS: 3
ELECTRIC POWER: 20 W	COST: 20 YEN	NUMBER OF HOPS: 4

FIG.8

QUERY PACKET

ELECTRIC POWER: 20 W	TIME OF USE: 30 min	COST: 25 YEN

REPLY PACKET

ELECTRIC POWER: 10 W	COST: 25 YEN	NUMBER OF HOPS: 2
ELECTRIC POWER: 20 W	COST: 40 YEN	NUMBER OF HOPS: 2

FIG.9

QUERY PACKET

ELECTRIC POWER: 20 W	TIME OF USE: 30 min	COST: 25 YEN

REPLY PACKET

ELECTRIC POWER: 20 W	COST: 10 YEN	TIME OF USE: FROM TWO HOURS LATER	NUMBER OF HOPS: 2
ELECTRIC POWER: 20 W	COST: 10 YEN	TIME OF USE: ONLY 10 MINUTES	NUMBER OF HOPS: 2

FIG.10

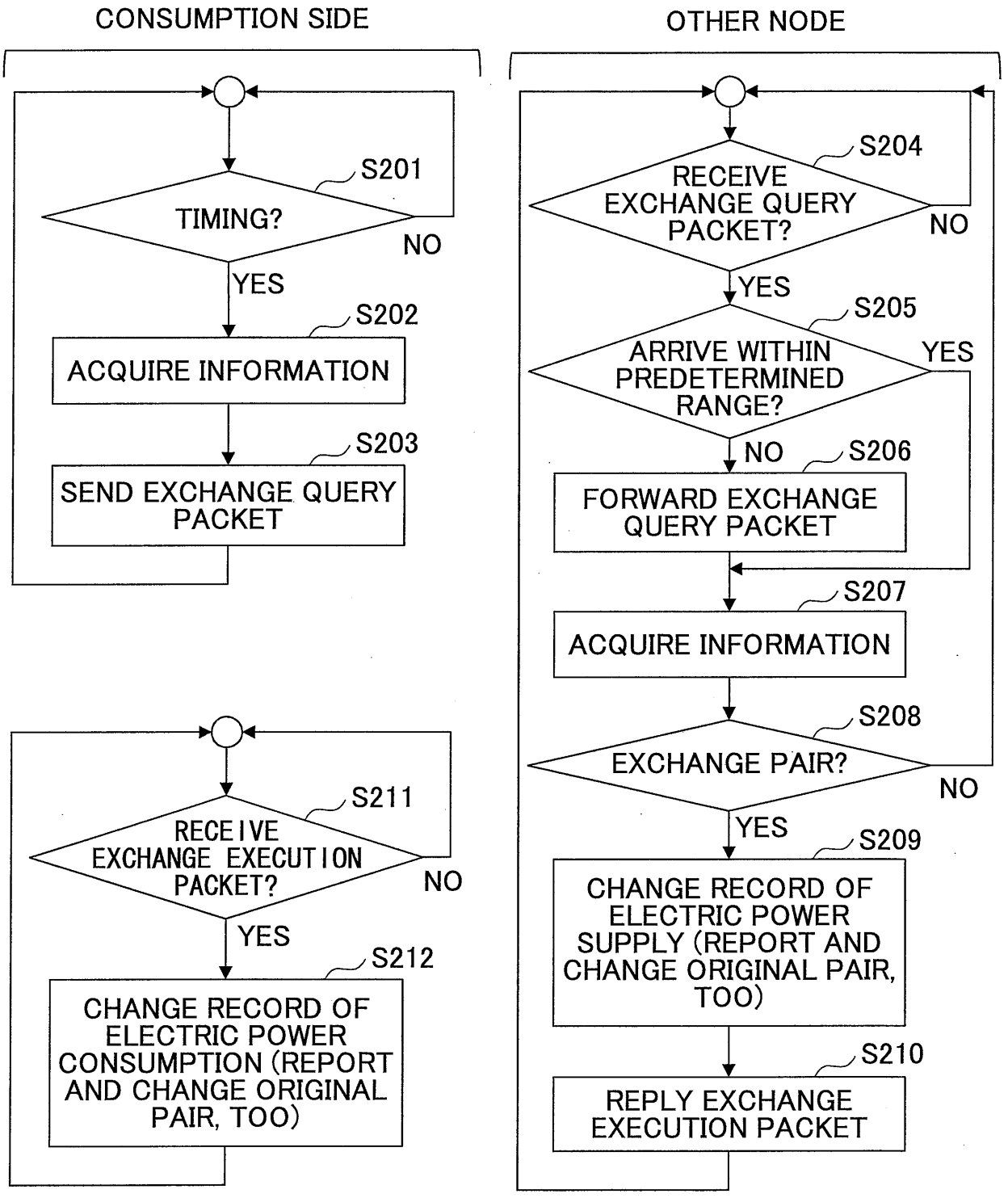

CONSUMPTION SIDE
OTHER NODE
S201
TIMING?
NO
YES
S202
ACQUIRE INFORMATION
S203
SEND EXCHANGE QUERY PACKET
S204
RECEIVE EXCHANGE QUERY PACKET?
NO
YES
S205
ARRIVE WITHIN PREDETERMINED RANGE?
YES
NO
S206
FORWARD EXCHANGE QUERY PACKET
S207
ACQUIRE INFORMATION
S208
EXCHANGE PAIR?
NO
YES
S209
CHANGE RECORD OF ELECTRIC POWER SUPPLY (REPORT AND CHANGE ORIGINAL PAIR, TOO)
S210
REPLY EXCHANGE EXECUTION PACKET
S211
RECEIVE EXCHANGE EXECUTION PACKET?
NO
YES
S212
CHANGE RECORD OF ELECTRIC POWER CONSUMPTION (REPORT AND CHANGE ORIGINAL PAIR, TOO)

FIG.11

CONSUMPTION POSITION	SUPPLY POSITION	ELECTRIC POWER	NUMBER OF HOPS

FIG.12

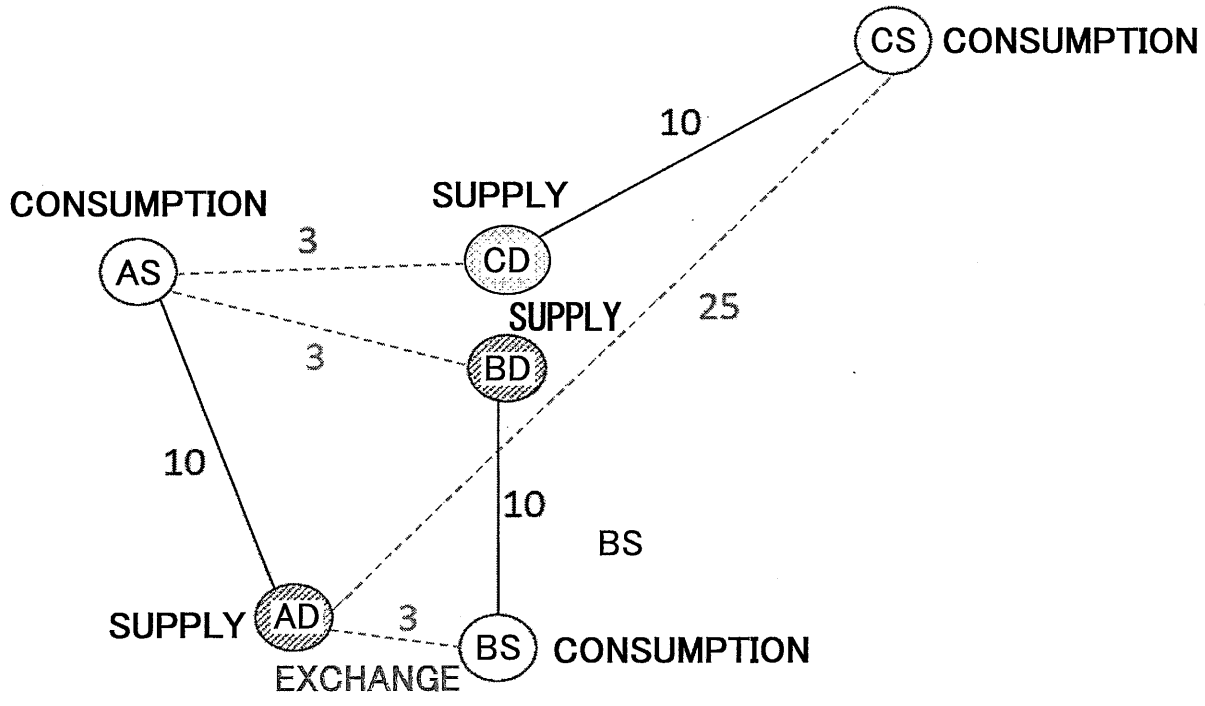


FIG.13

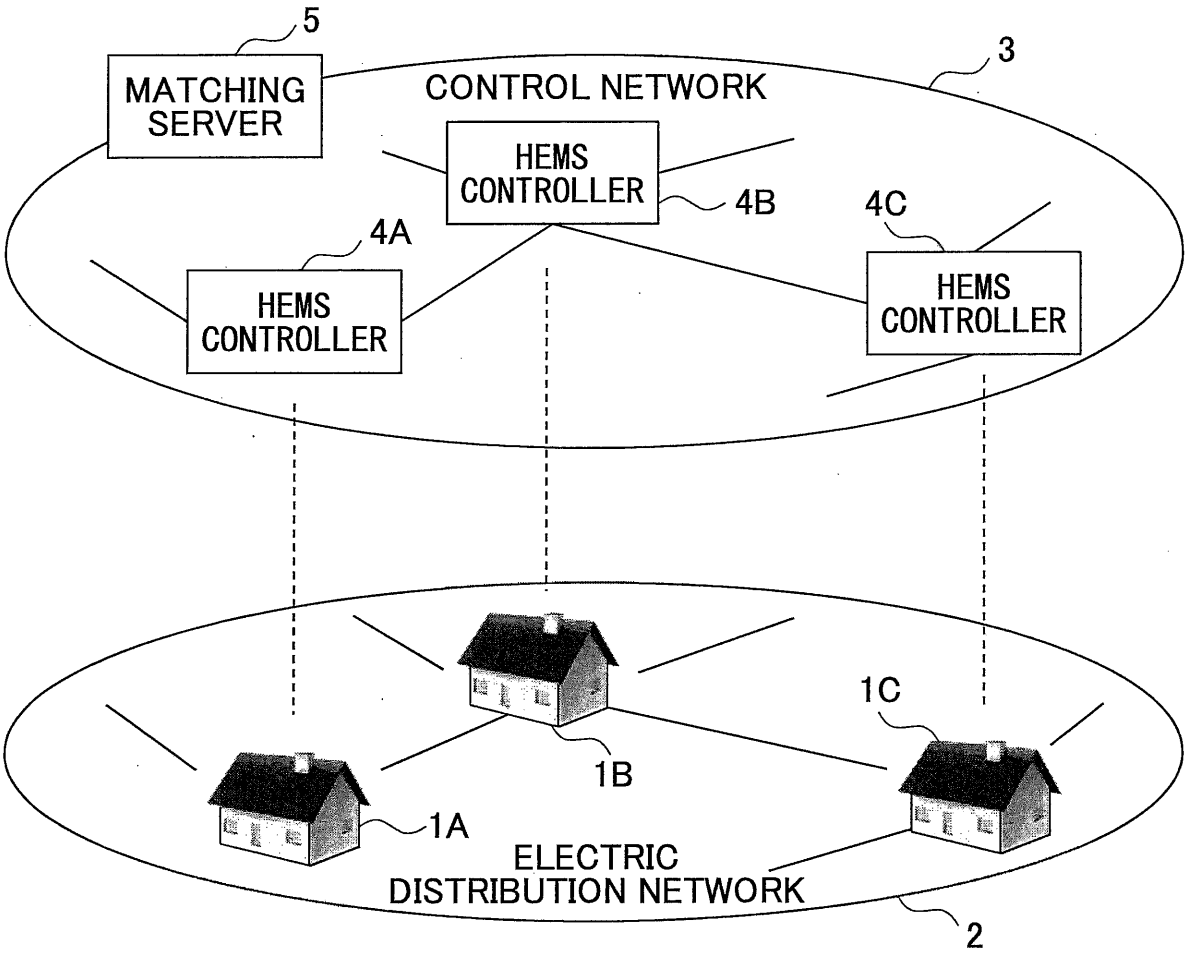

5
MATCHING SERVER
CONTROL NETWORK
3
HEMS CONTROLLER
4B
4C
4A
HEMS CONTROLLER
HEMS CONTROLLER
1C
1B
1A
ELECTRIC DISTRIBUTION NETWORK
2

FIG.14

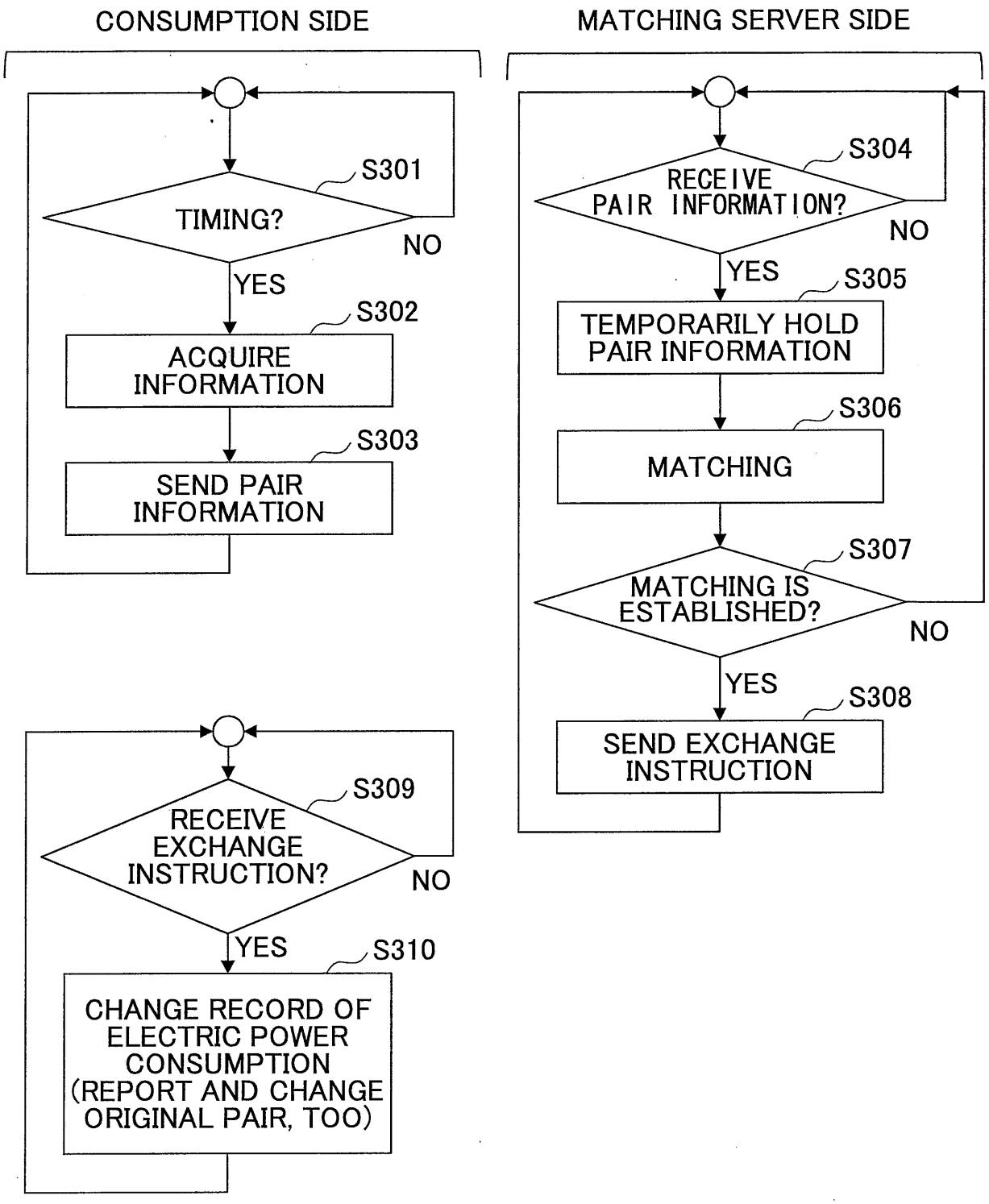

CONSUMPTION SIDE
MATCHING SERVER SIDE
S301
TIMING?
NO
YES
S302
ACQUIRE INFORMATION
S303
SEND PAIR INFORMATION
S304
RECEIVE PAIR INFORMATION?
NO
YES
S305
TEMPORARILY HOLD PAIR INFORMATION
S306
MATCHING
S307
MATCHING IS ESTABLISHED?
NO
YES
S308
SEND EXCHANGE INSTRUCTION
S309
RECEIVE EXCHANGE INSTRUCTION?
NO
YES
S310
CHANGE RECORD OF ELECTRIC POWER CONSUMPTION (REPORT AND CHANGE ORIGINAL PAIR, TOO)

FIG.15

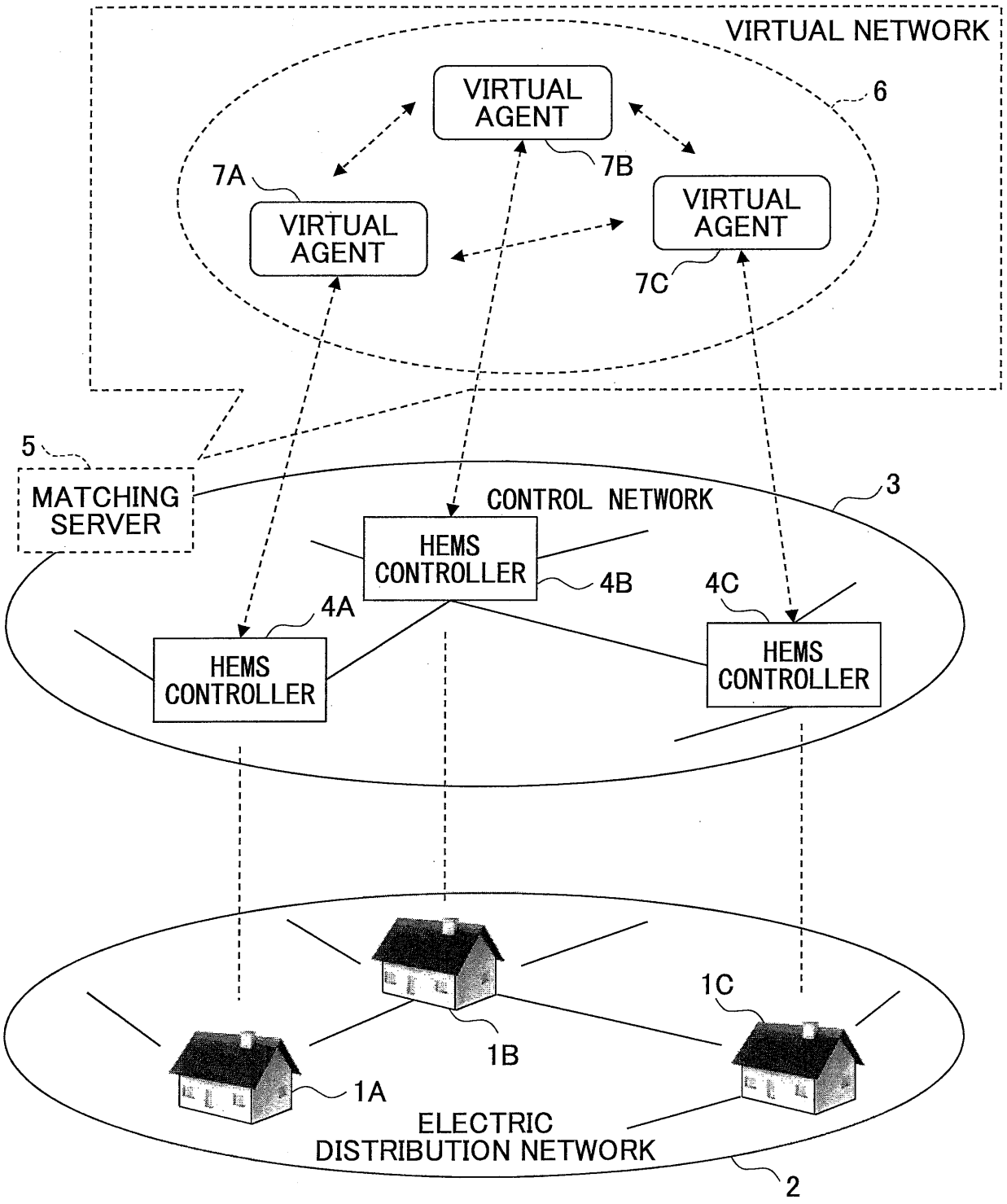

VIRTUAL NETWORK
VIRTUAL AGENT
6
7A
7B
VIRTUAL AGENT
VIRTUAL AGENT
7C
5
MATCHING SERVER
CONTROL NETWORK
3
HEMS CONTROLLER
4B
4A
4C
HEMS CONTROLLER
HEMS CONTROLLER
1C
1B
1A
ELECTRIC DISTRIBUTION NETWORK
2

FIG.16

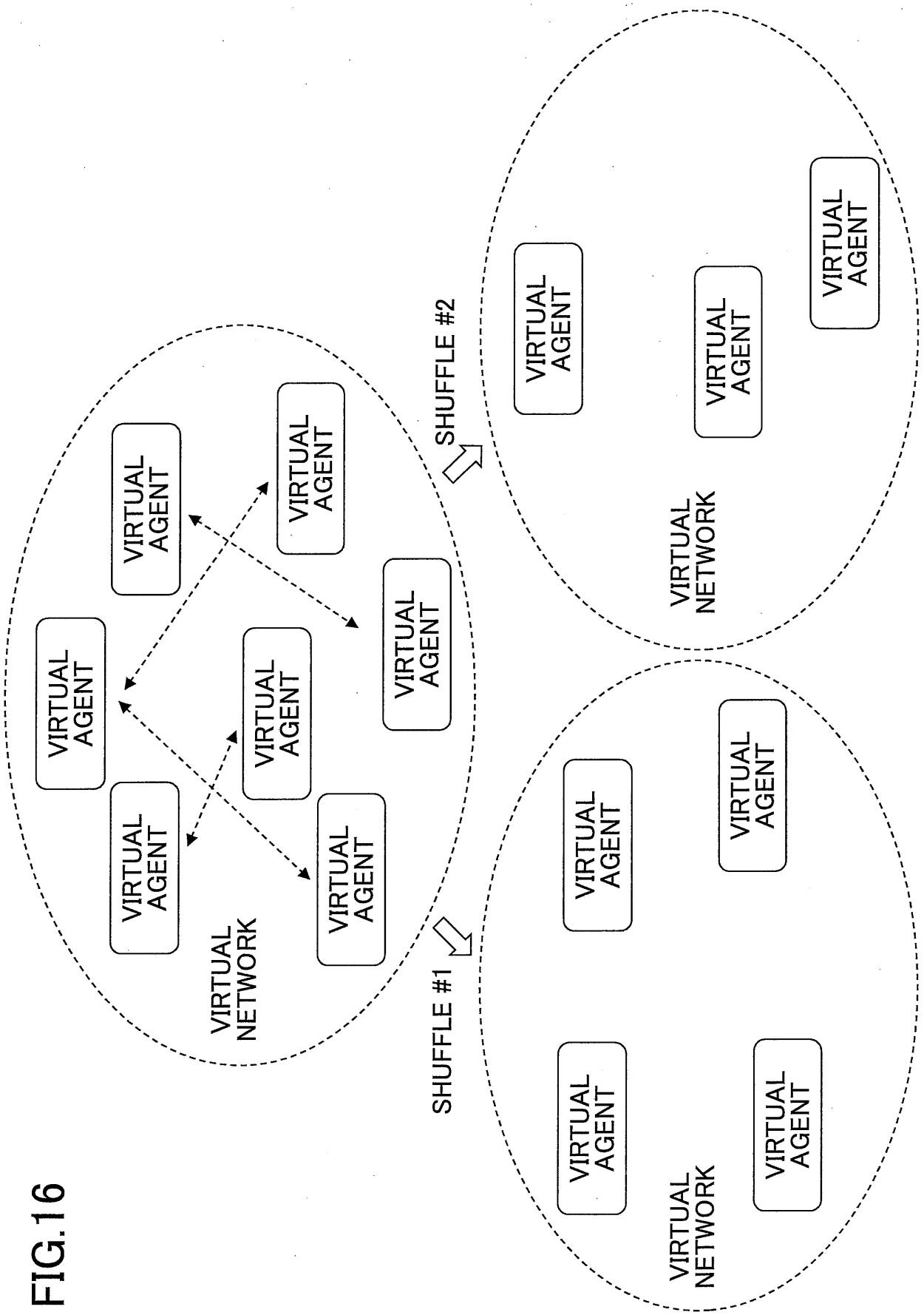


FIG.17

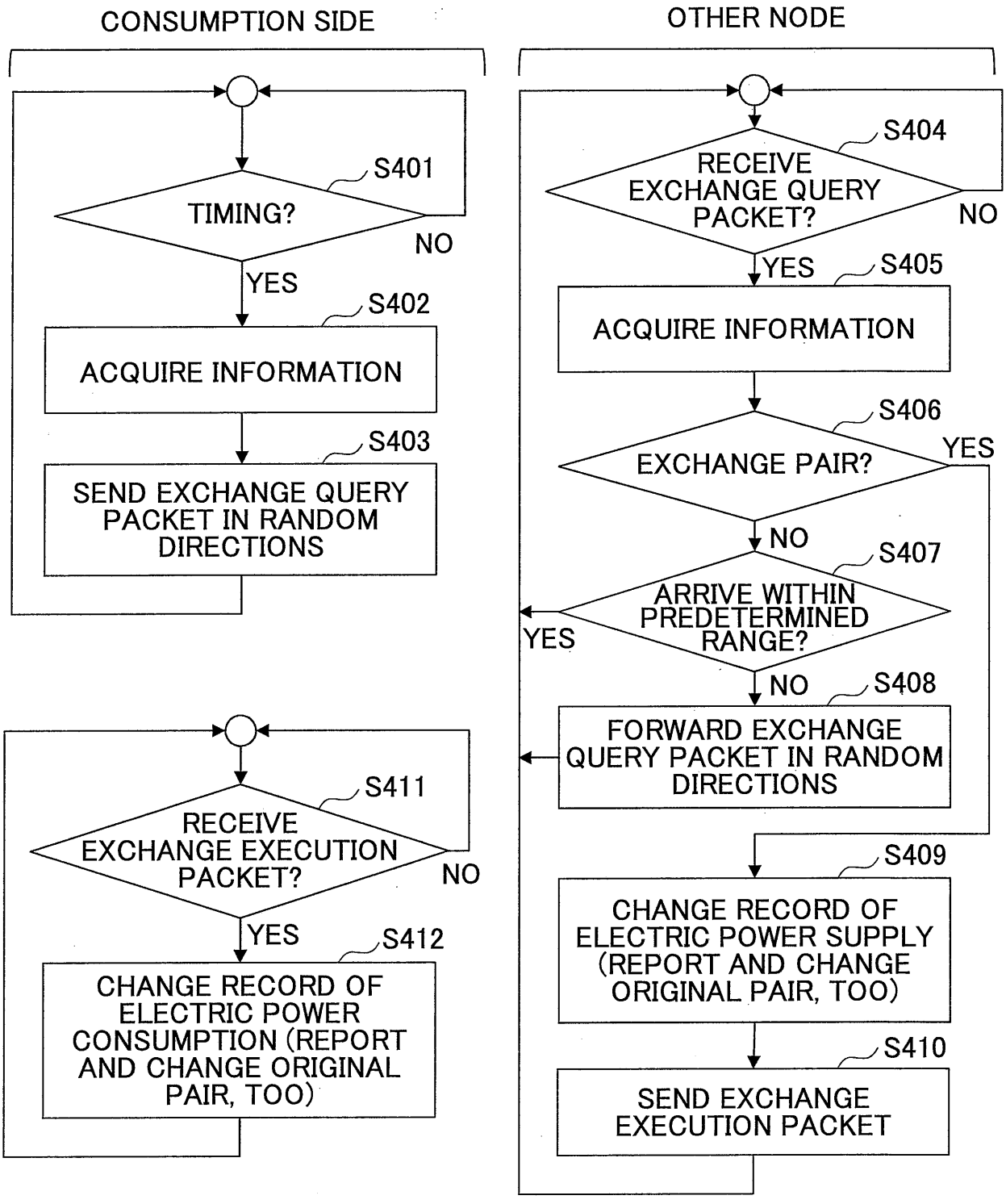

CONSUMPTION SIDE
OTHER NODE
S401
TIMING?
NO
YES
S402
ACQUIRE INFORMATION
S403
SEND EXCHANGE QUERY PACKET IN RANDOM DIRECTIONS
S404
RECEIVE EXCHANGE QUERY PACKET?
NO
YES
S405
ACQUIRE INFORMATION
S406
EXCHANGE PAIR?
YES
NO
S407
ARRIVE WITHIN PREDETERMINED RANGE?
YES
NO
S408
FORWARD EXCHANGE QUERY PACKET IN RANDOM DIRECTIONS
S409
CHANGE RECORD OF ELECTRIC POWER SUPPLY (REPORT AND CHANGE ORIGINAL PAIR, TOO)
S410
SEND EXCHANGE EXECUTION PACKET
S411
RECEIVE EXCHANGE EXECUTION PACKET?
NO
YES
S412
CHANGE RECORD OF ELECTRIC POWER CONSUMPTION (REPORT AND CHANGE ORIGINAL PAIR, TOO)

FIG.18

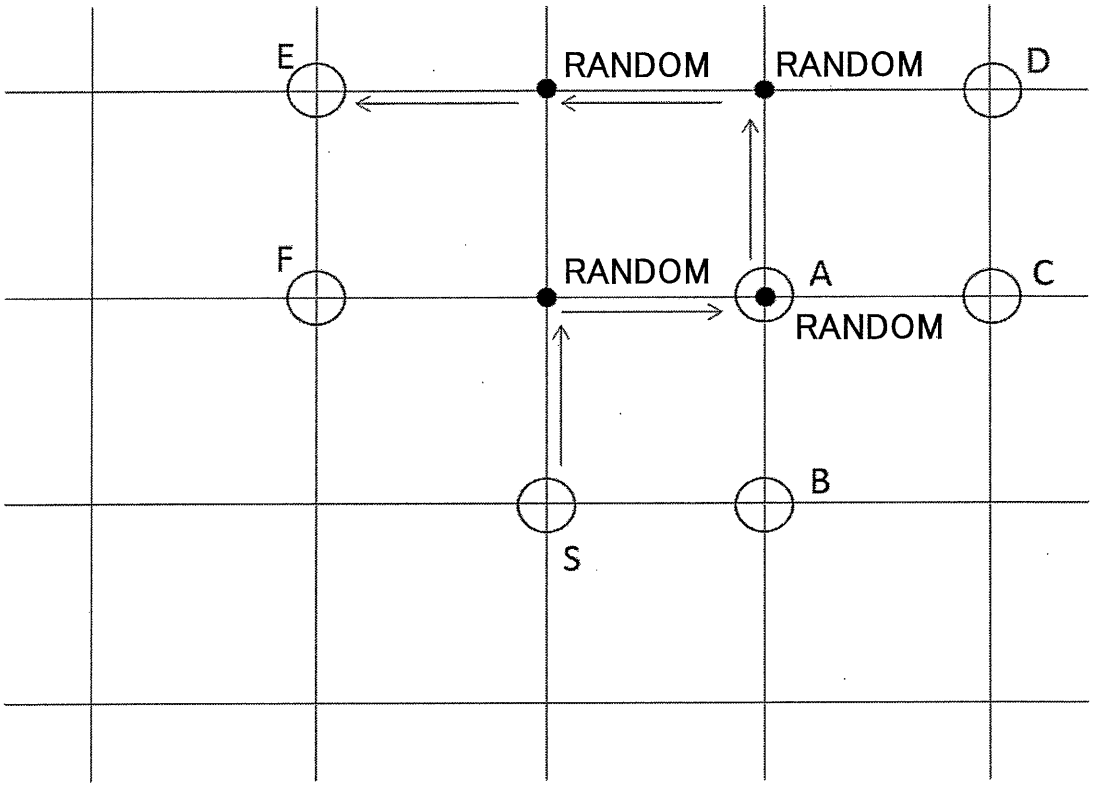


FIG.19

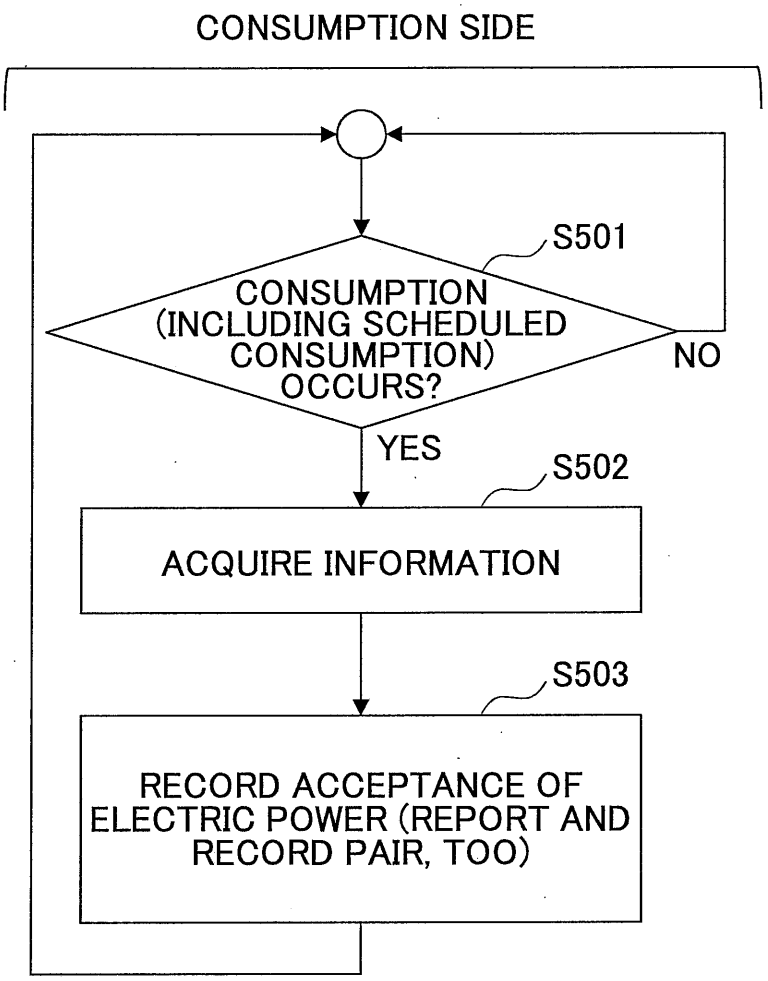


FIG.20A

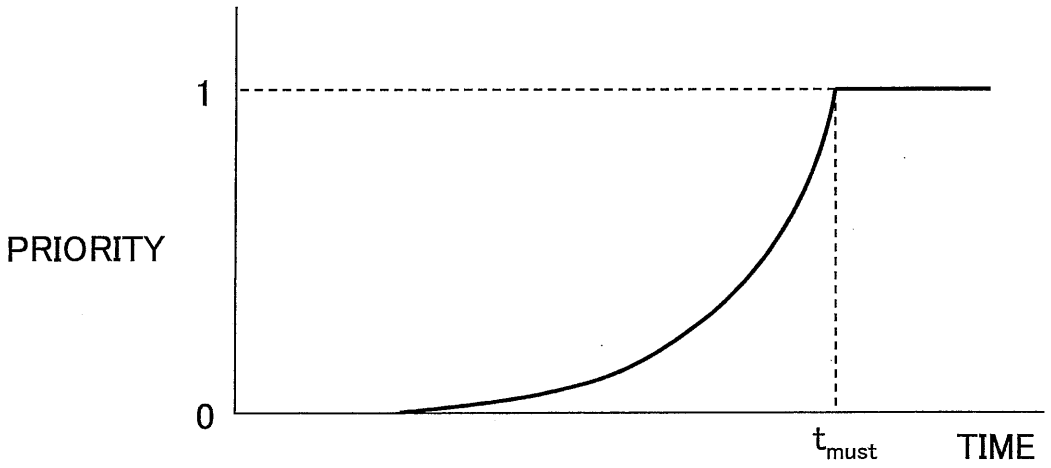


FIG.20B

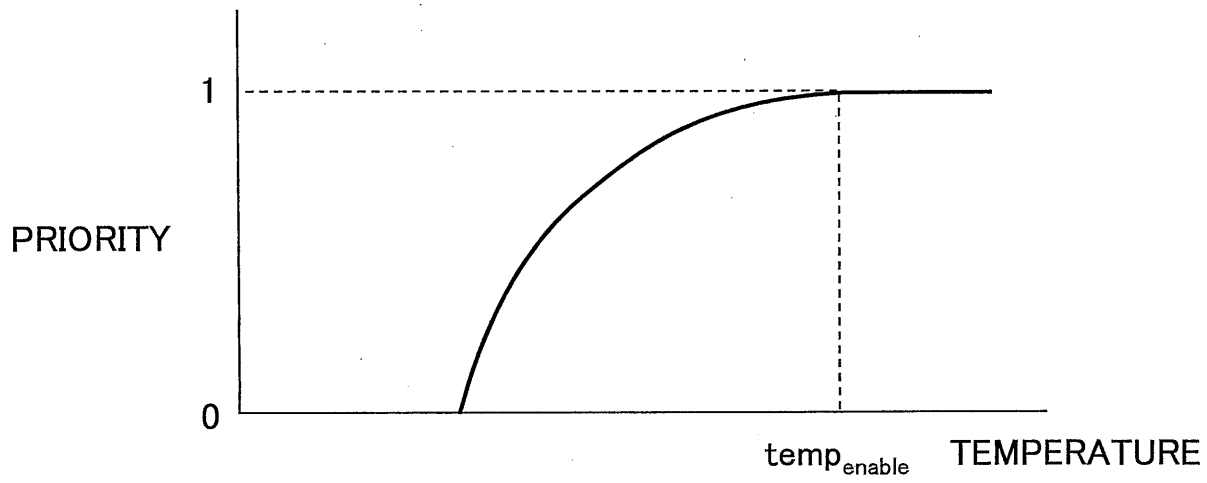


FIG.20C

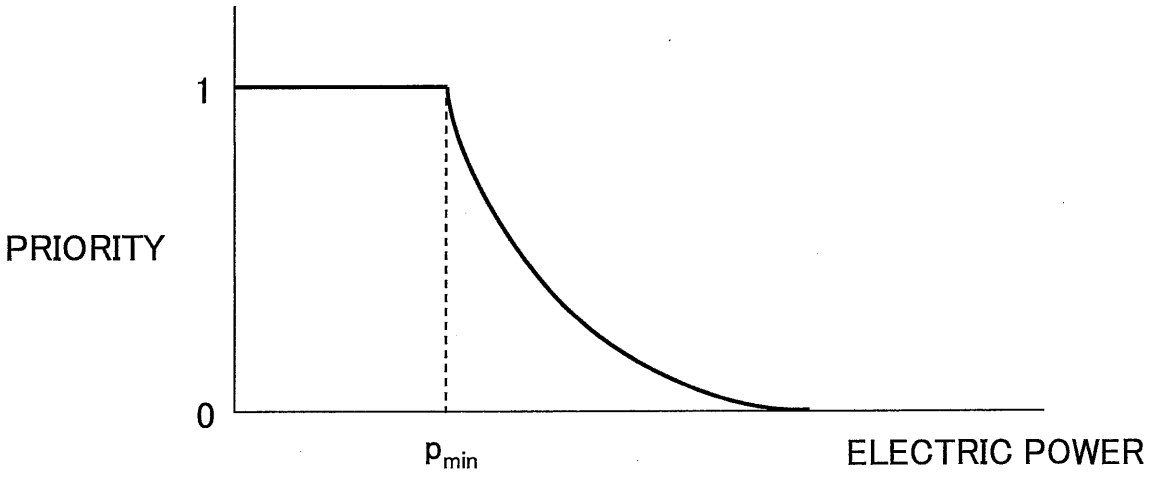


FIG.21

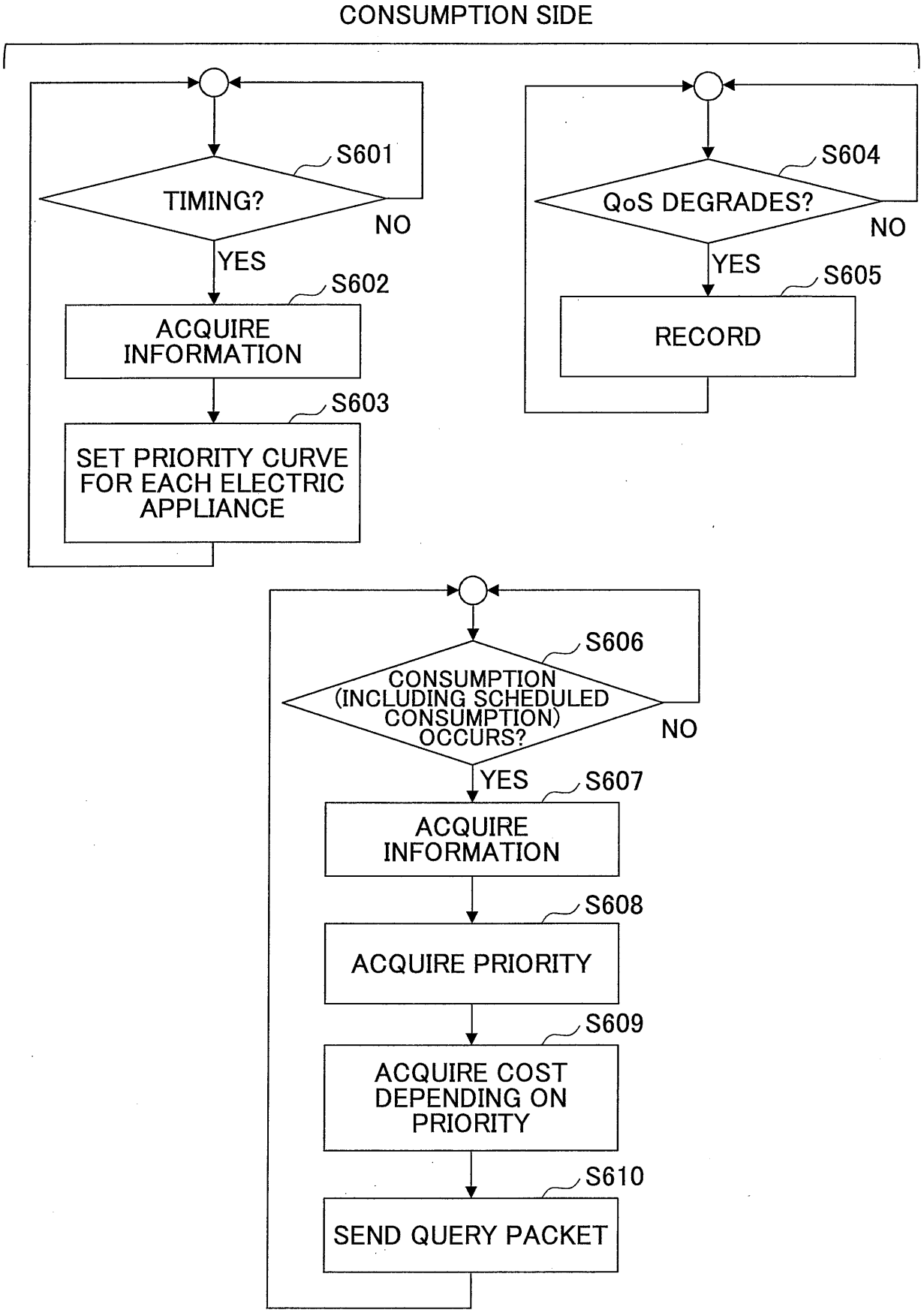

CONSUMPTION SIDE
S601
TIMING?
NO
YES
S602
ACQUIRE INFORMATION
S603
SET PRIORITY CURVE FOR EACH ELECTRIC APPLIANCE
S604
QoS DEGRADES?
NO
YES
S605
RECORD
S606
CONSUMPTION (INCLUDING SCHEDULED CONSUMPTION) OCCURS?
NO
YES
S607
ACQUIRE INFORMATION
S608
ACQUIRE PRIORITY
S609
ACQUIRE COST DEPENDING ON PRIORITY
S610
SEND QUERY PACKET

FIG.22

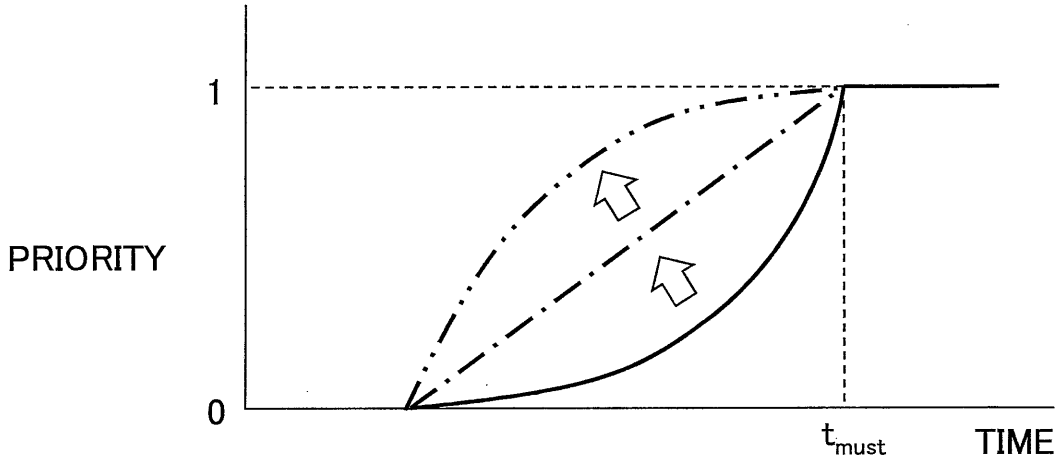

1
PRIORITY
0
t_{must}
TIME

FIG.23

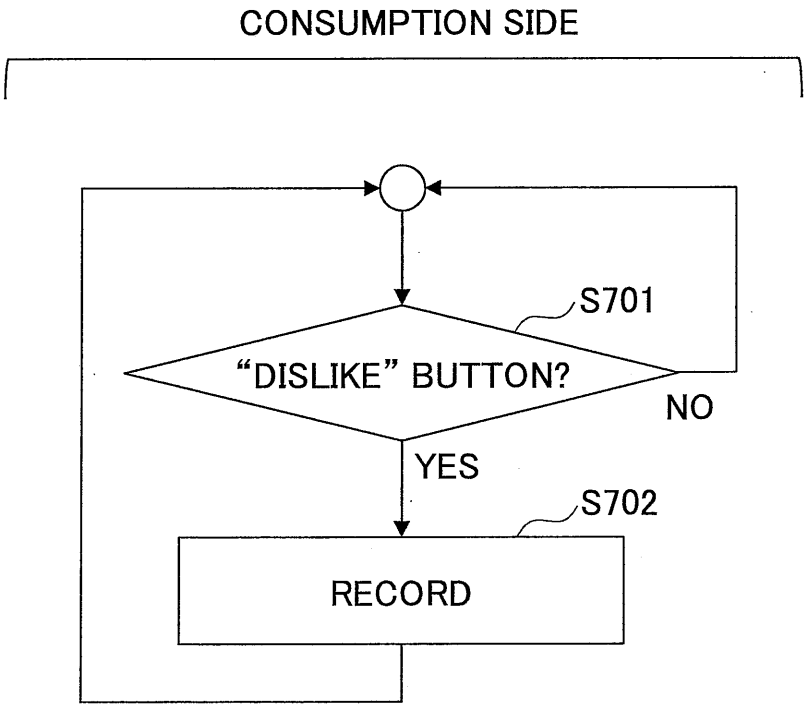
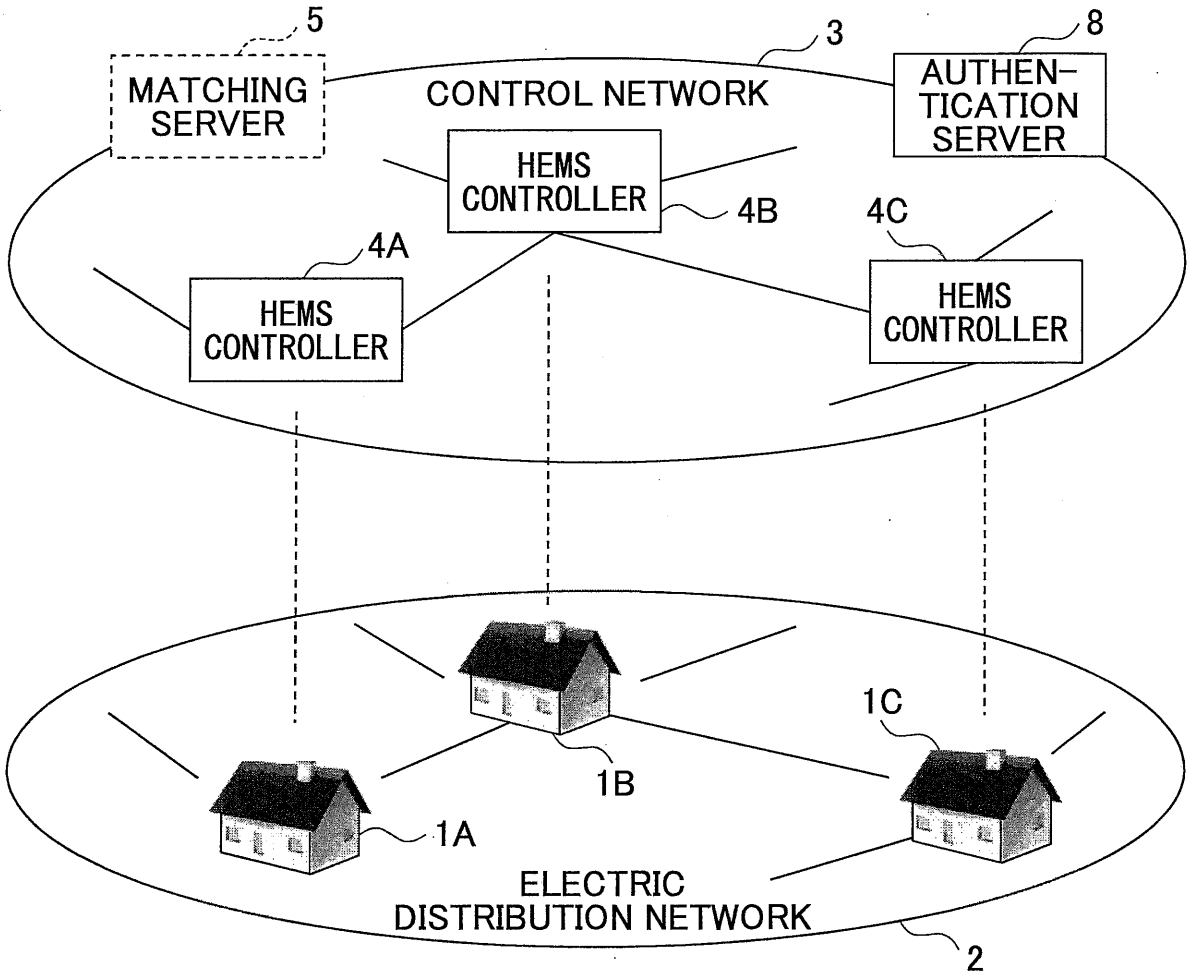

CONSUMPTION SIDE
S701
"DISLIKE" BUTTON?
NO
YES
S702
RECORD

FIG.24


5
MATCHING SERVER
3
CONTROL NETWORK
8
AUTHEN-TICATION SERVER
HEMS CONTROLLER
4B
4C
4A
HEMS CONTROLLER
HEMS CONTROLLER
1C
1B
1A
ELECTRIC DISTRIBUTION NETWORK
2