FIG.1

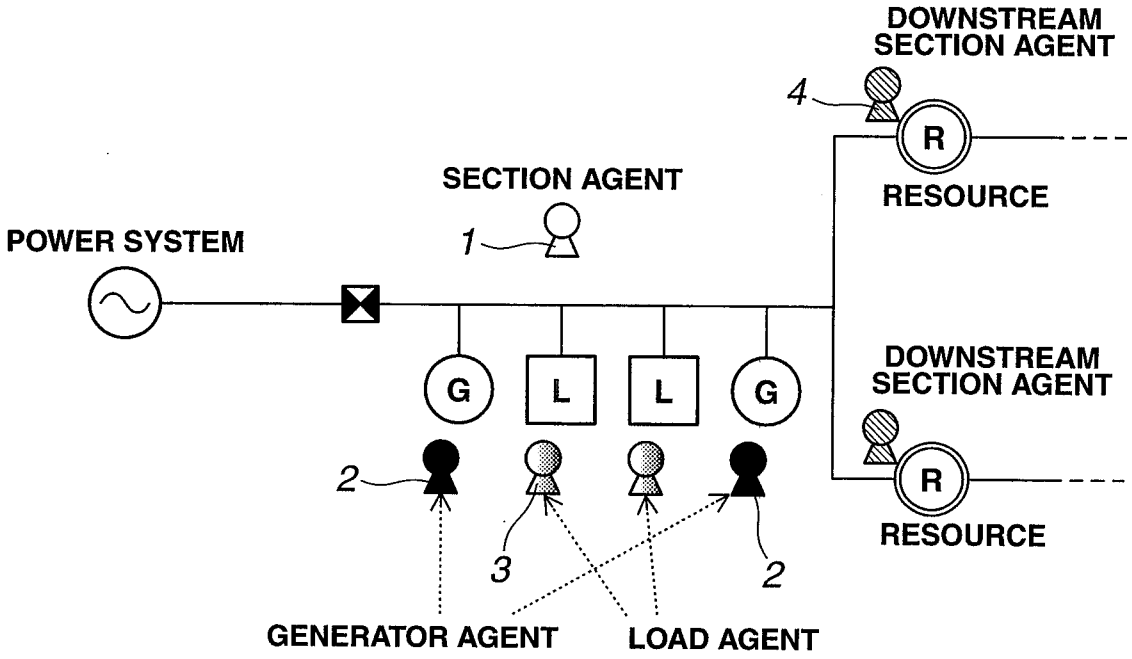

DOWNSTREAM SECTION AGENT
4
R
RESOURCE
SECTION AGENT
1
POWER SYSTEM
G
L
L
G
DOWNSTREAM SECTION AGENT
2
R
RESOURCE
3
2
GENERATOR AGENT
LOAD AGENT

FIG.2

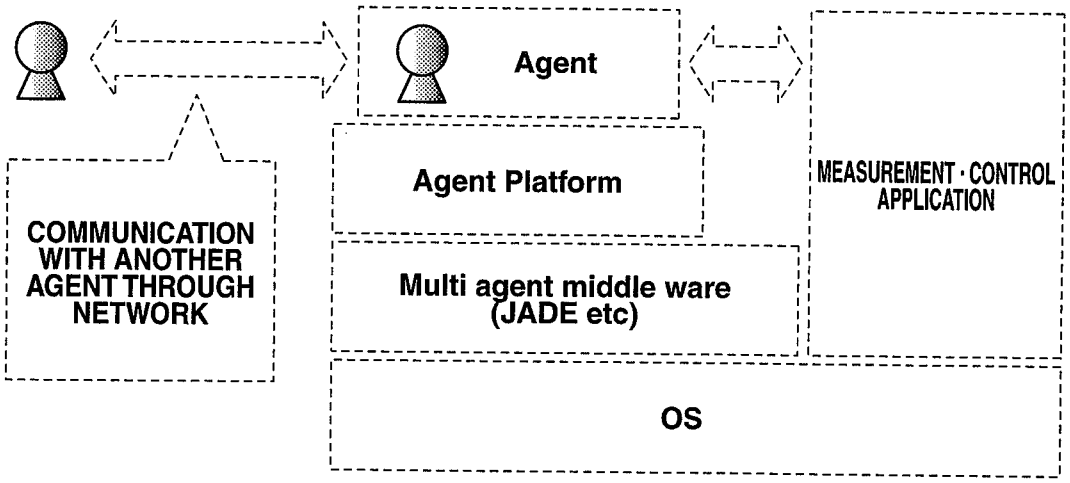

Agent
Agent Platform
MEASUREMENT · CONTROL APPLICATION
COMMUNICATION WITH ANOTHER AGENT THROUGH NETWORK
Multi agent middle ware (JADE etc)
OS

FIG.3

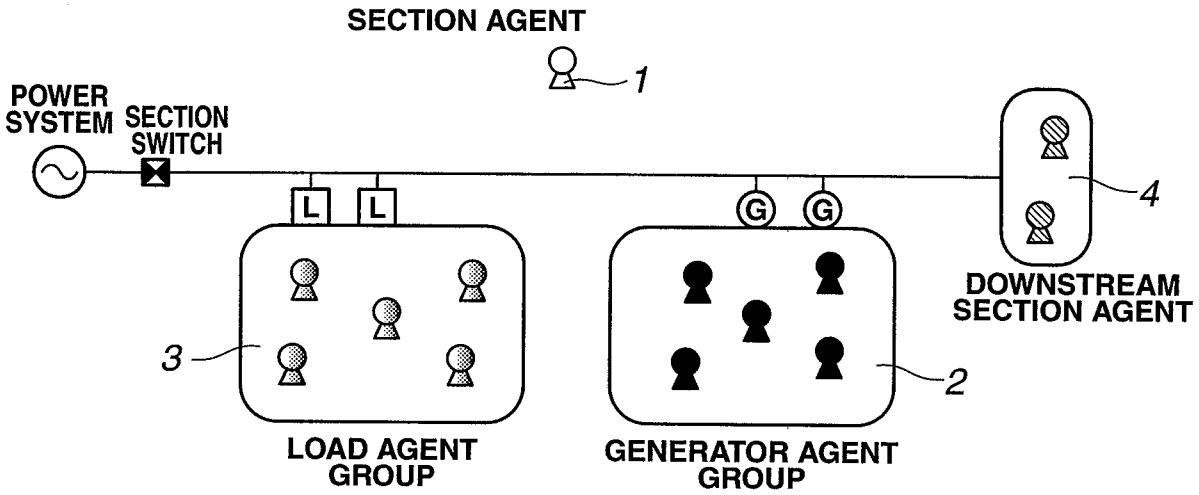

SECTION AGENT
1
POWER SYSTEM
SECTION SWITCH
L
L
G
G
4
DOWNSTREAM SECTION AGENT
3
2
LOAD AGENT GROUP
GENERATOR AGENT GROUP

FIG.4

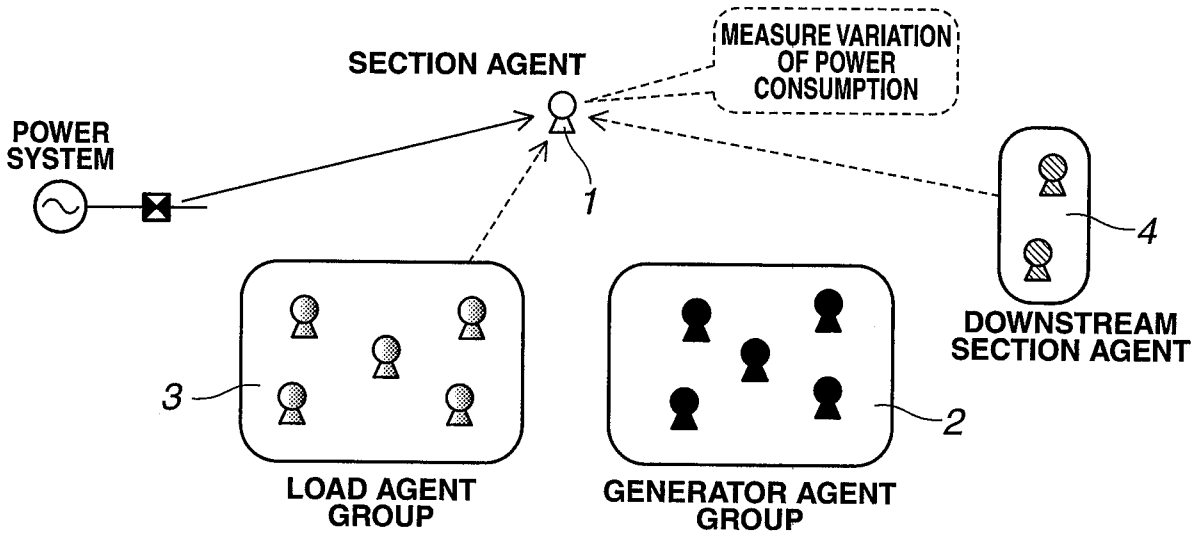

SECTION AGENT
MEASURE VARIATION OF POWER CONSUMPTION
POWER SYSTEM
1
4
DOWNSTREAM SECTION AGENT
3
2
LOAD AGENT GROUP
GENERATOR AGENT GROUP

FIG.5

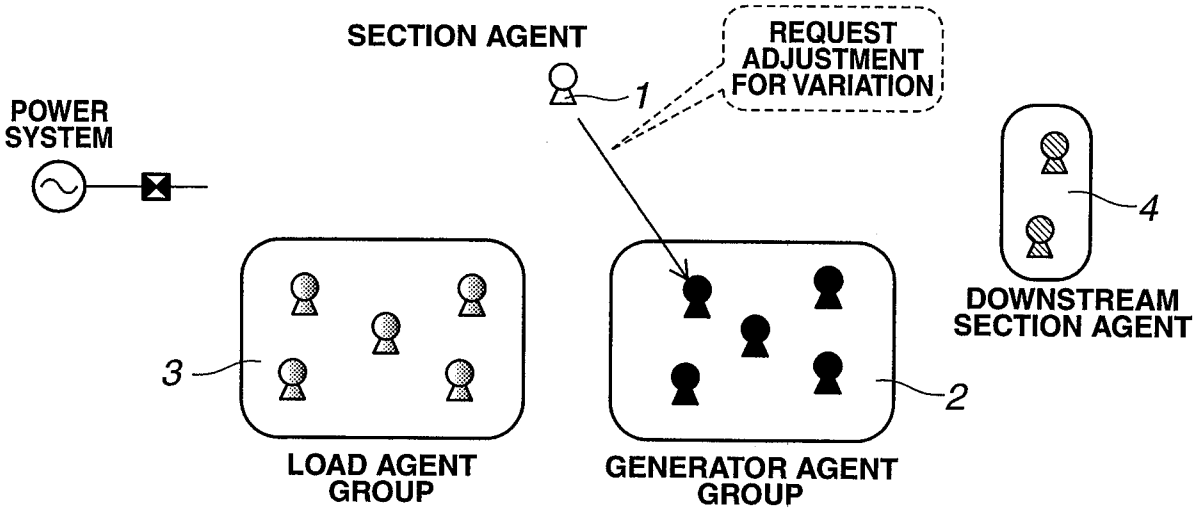

SECTION AGENT
1
REQUEST ADJUSTMENT FOR VARIATION
POWER SYSTEM
4
DOWNSTREAM SECTION AGENT
3
2
LOAD AGENT GROUP
GENERATOR AGENT GROUP

FIG.6

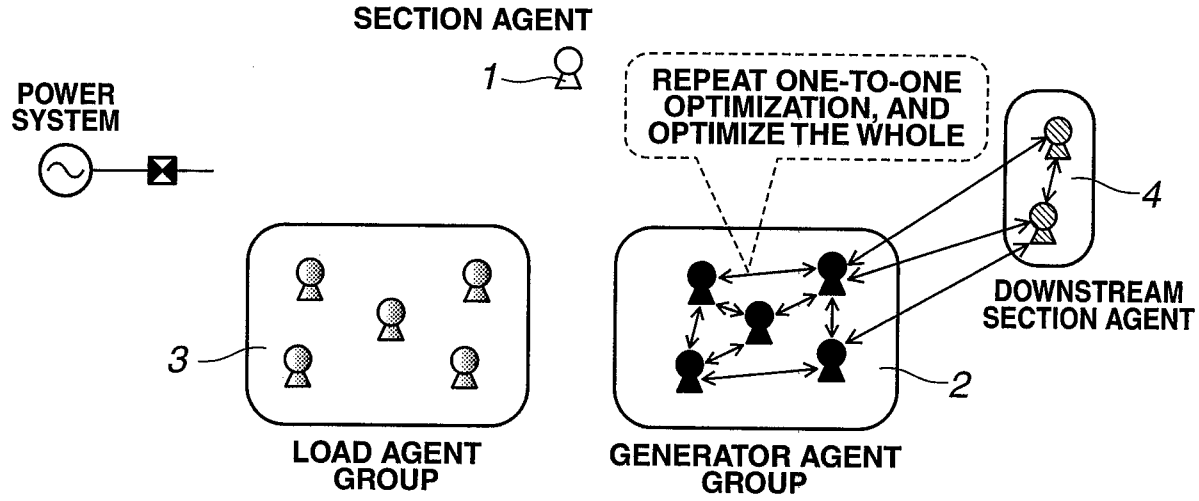

SECTION AGENT
1
REPEAT ONE-TO-ONE OPTIMIZATION, AND OPTIMIZE THE WHOLE
POWER SYSTEM
4
DOWNSTREAM SECTION AGENT
3
2
LOAD AGENT GROUP
GENERATOR AGENT GROUP

FIG.7

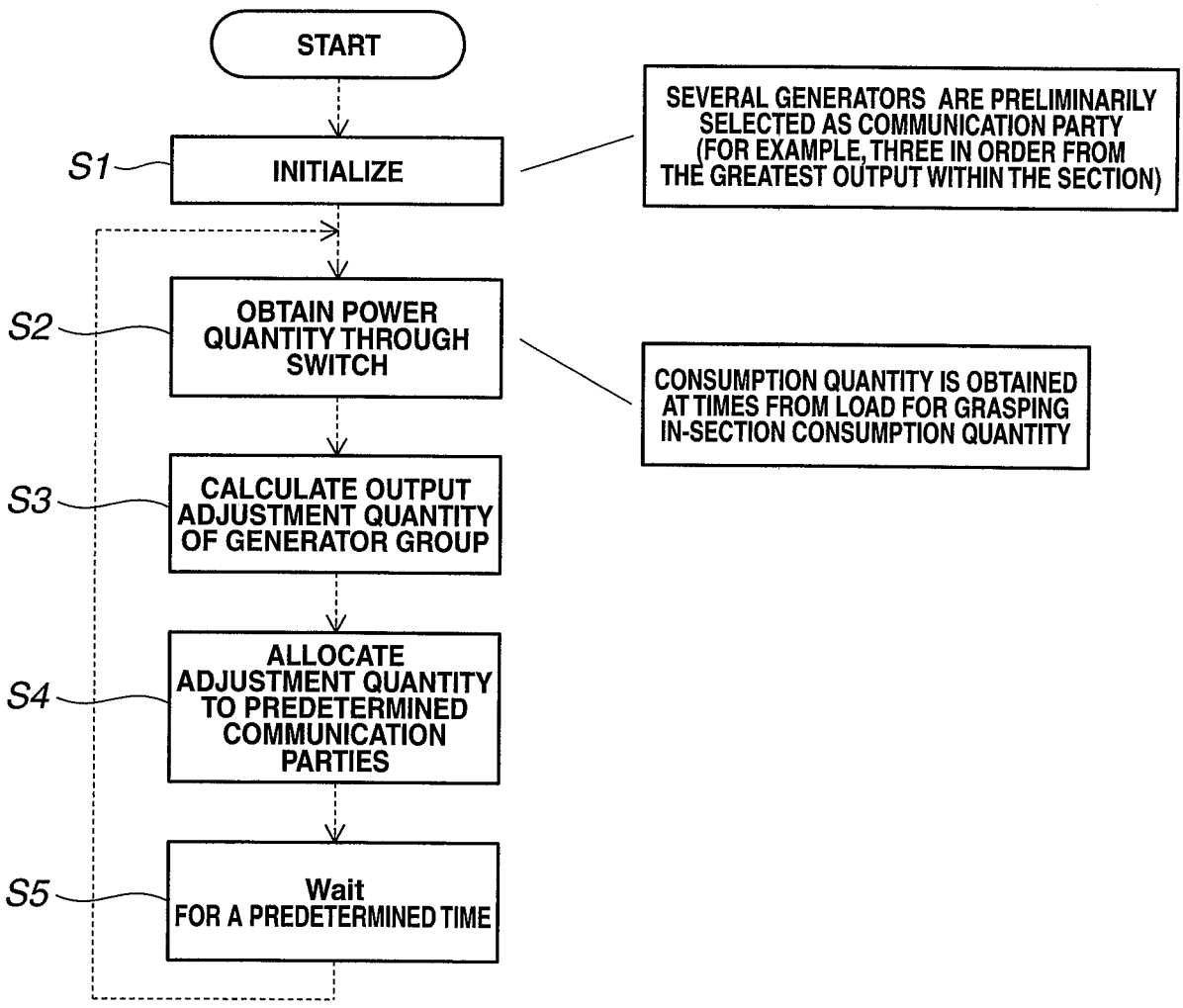

START
S1
INITIALIZE
SEVERAL GENERATORS ARE PRELIMINARILY SELECTED AS COMMUNICATION PARTY (FOR EXAMPLE, THREE IN ORDER FROM THE GREATEST OUTPUT WITHIN THE SECTION)
S2
OBTAIN POWER QUANTITY THROUGH SWITCH
CONSUMPTION QUANTITY IS OBTAINED AT TIMES FROM LOAD FOR GRASPING IN-SECTION CONSUMPTION QUANTITY
S3
CALCULATE OUTPUT ADJUSTMENT QUANTITY OF GENERATOR GROUP
S4
ALLOCATE ADJUSTMENT QUANTITY TO PREDETERMINED COMMUNICATION PARTIES
S5
Wait
FOR A PREDETERMINED TIME

FIG.8

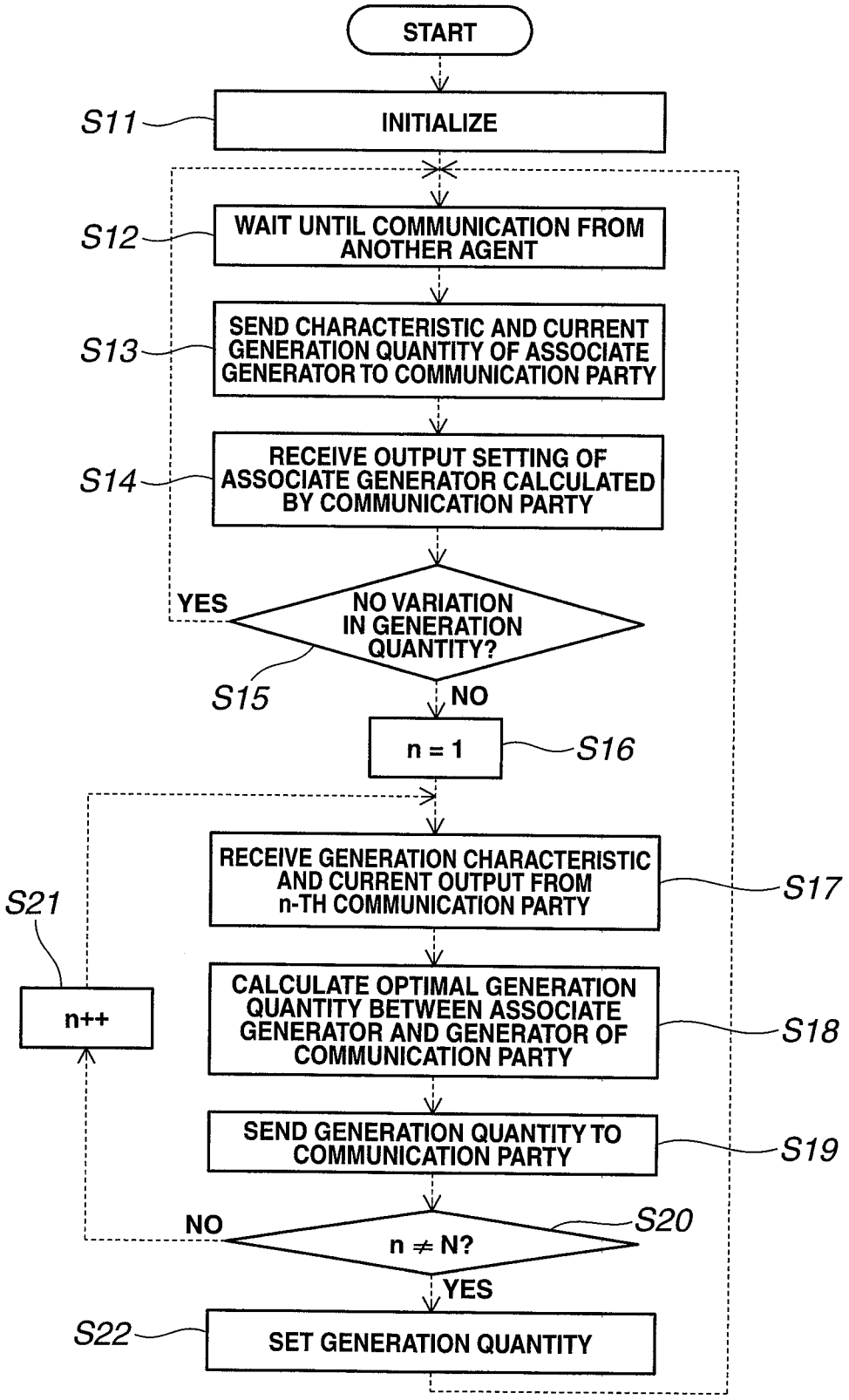

START
S11
INITIALIZE
S12
WAIT UNTIL COMMUNICATION FROM ANOTHER AGENT
S13
SEND CHARACTERISTIC AND CURRENT GENERATION QUANTITY OF ASSOCIATE GENERATOR TO COMMUNICATION PARTY
S14
RECEIVE OUTPUT SETTING OF ASSOCIATE GENERATOR CALCULATED BY COMMUNICATION PARTY
YES
NO VARIATION IN GENERATION QUANTITY?
S15
NO
n = 1
S16
RECEIVE GENERATION CHARACTERISTIC AND CURRENT OUTPUT FROM n-TH COMMUNICATION PARTY
S17
S21
n++
CALCULATE OPTIMAL GENERATION QUANTITY BETWEEN ASSOCIATE GENERATOR AND GENERATOR OF COMMUNICATION PARTY
S18
SEND GENERATION QUANTITY TO COMMUNICATION PARTY
S19
NO
n ≠ N?
S20
YES
S22
SET GENERATION QUANTITY

FIG.9

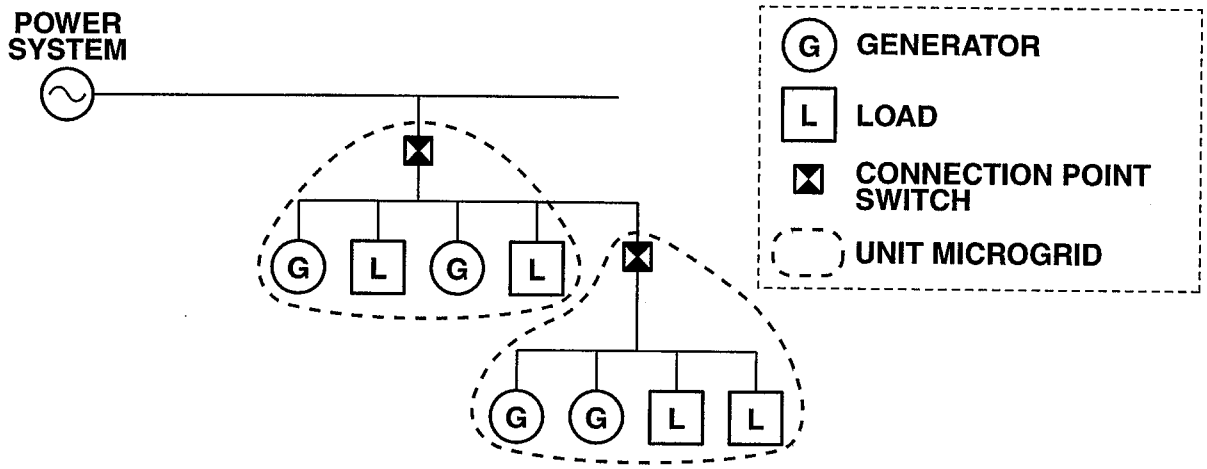

POWER SYSTEM
G
L
G
L
G
G
L
L
G GENERATOR
L LOAD
CONNECTION POINT SWITCH
UNIT MICROGRID

FIG.10

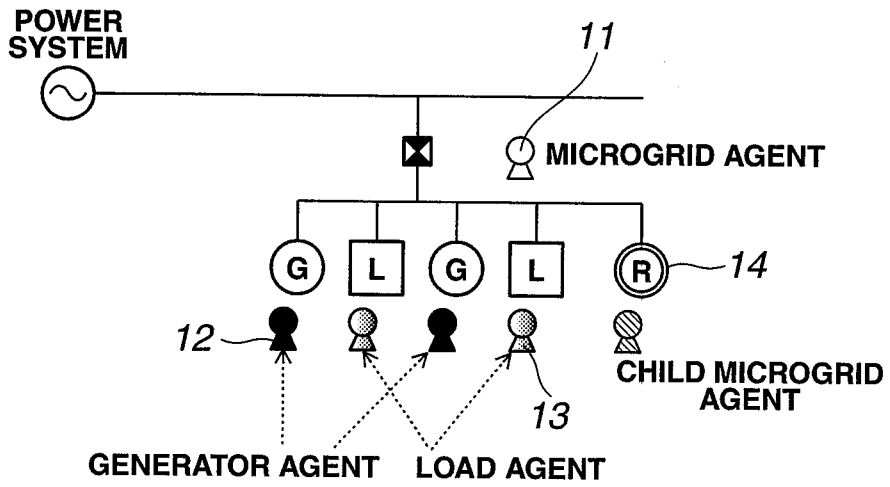

POWER SYSTEM
11
MICROGRID AGENT
G
L
G
L
R
14
12
13
CHILD MICROGRID AGENT
GENERATOR AGENT
LOAD AGENT

FIG.11

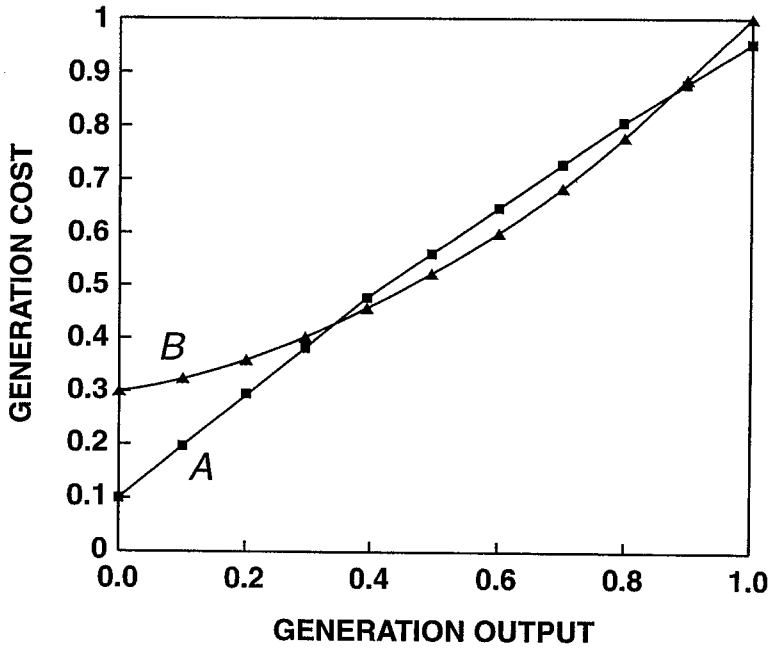

GENERATION COST
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
B
A
0.0
0.2
0.4
0.6
0.8
1.0
GENERATION OUTPUT

FIG.12

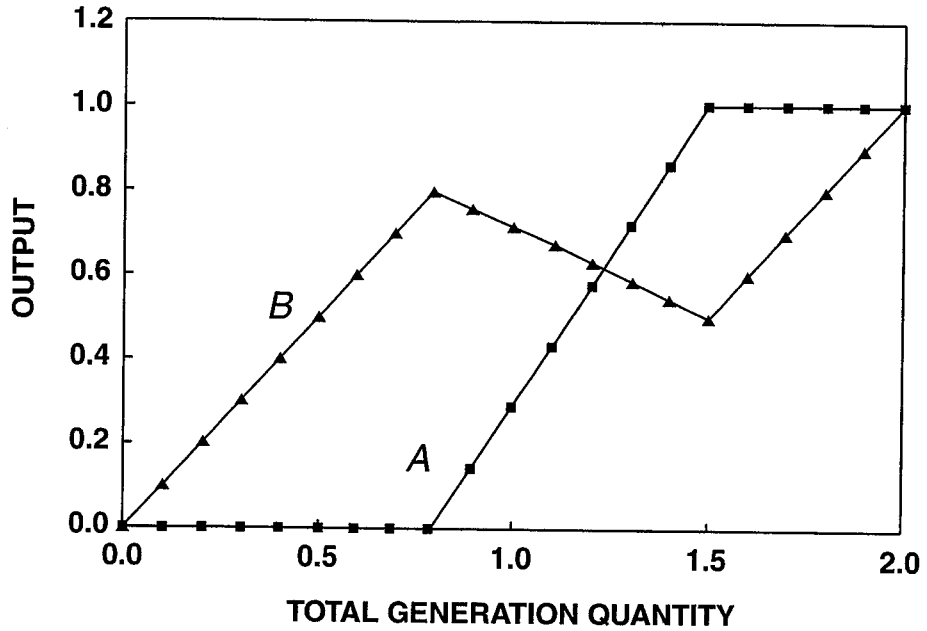

OUTPUT
1.2
1.0
0.8
0.6
0.4
0.2
0.0
B
A
0.0
0.5
1.0
1.5
2.0
TOTAL GENERATION QUANTITY

FIG.13

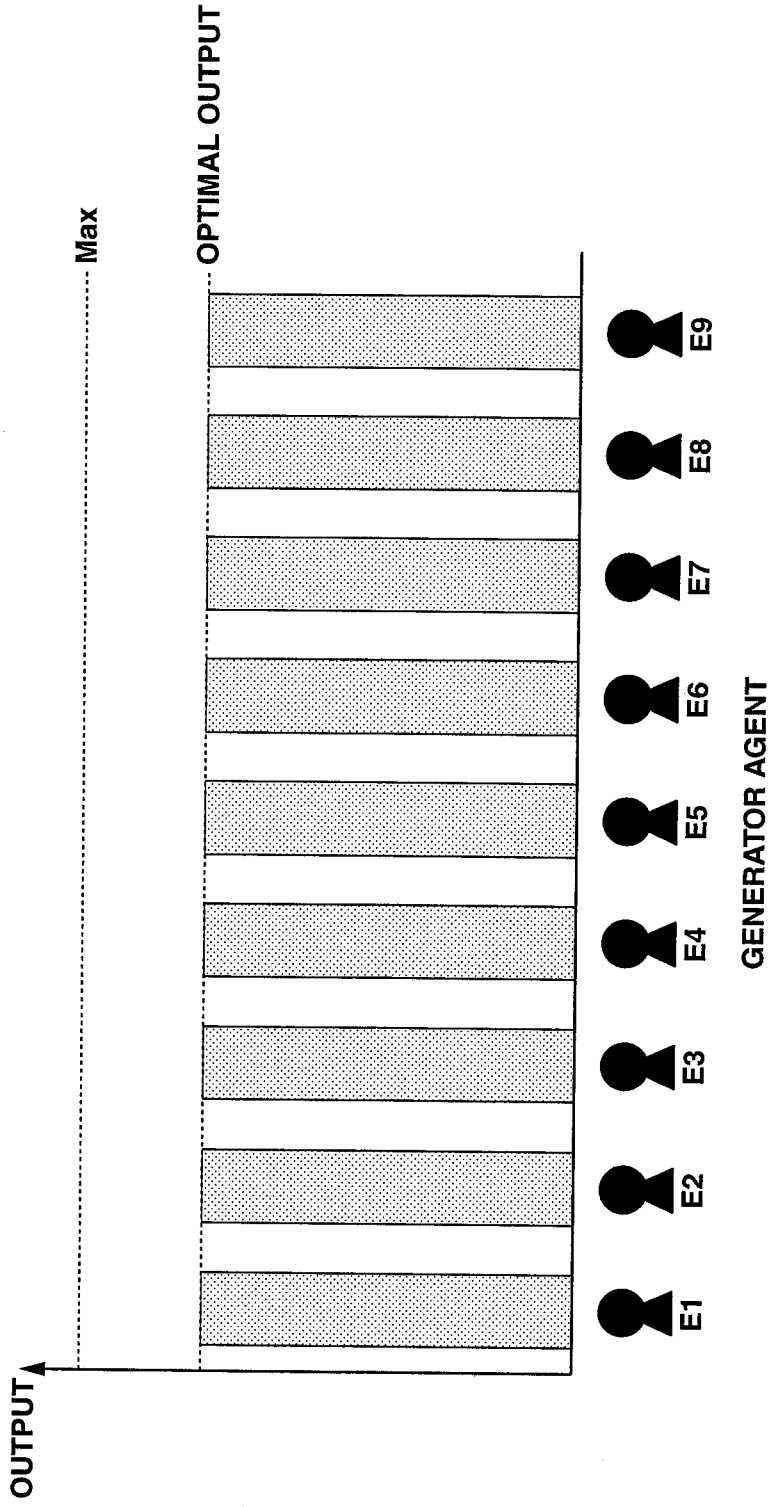

SECTION AGENT OR MICROGRID AGENT
Max
OPTIMAL OUTPUT
OUTPUT
E1
E2
E3
E4
E5
E6
E7
E8
E9
GENERATOR AGENT

FIG.14

GENERATOR OUTPUT ADJUSTING OPERATON (PART 2)

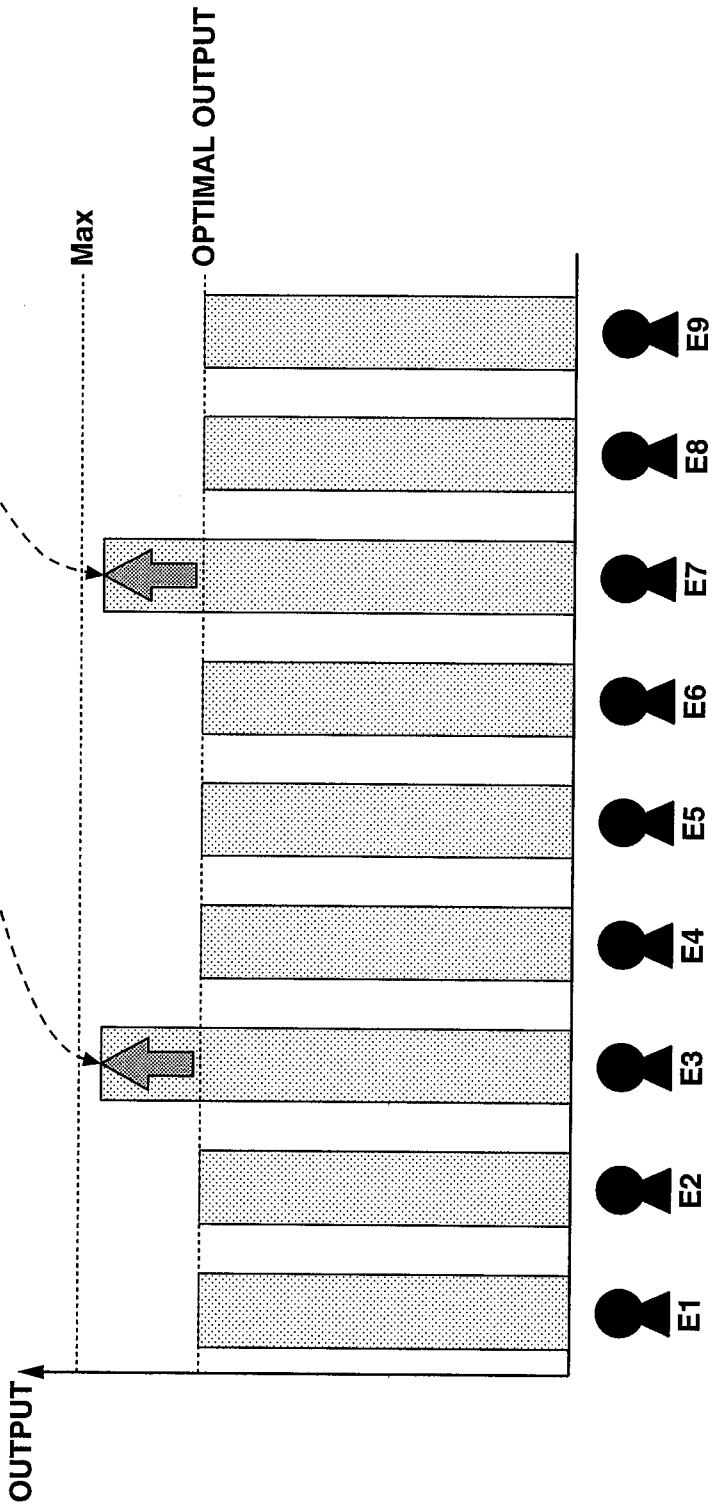


FIG.15

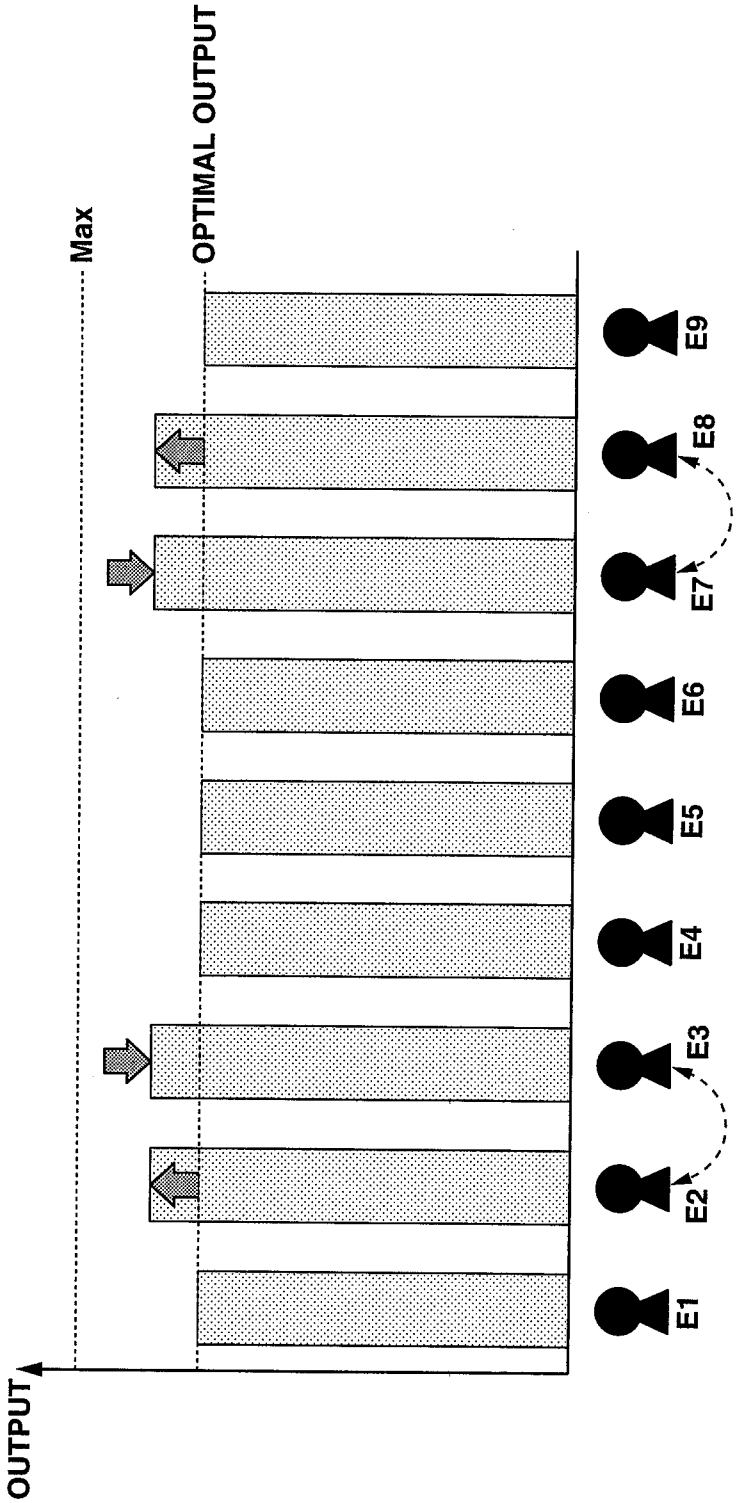


FIG.16

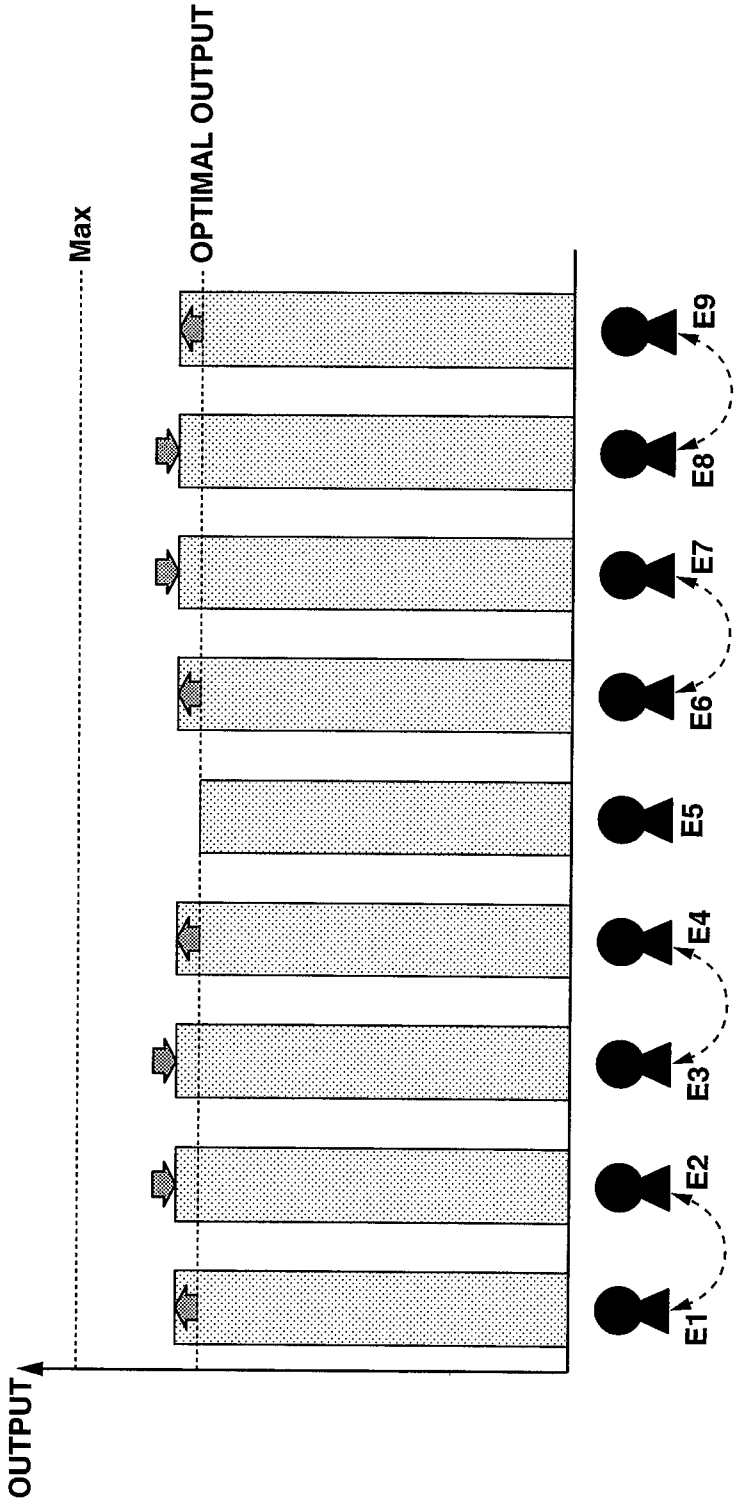


FIG.17

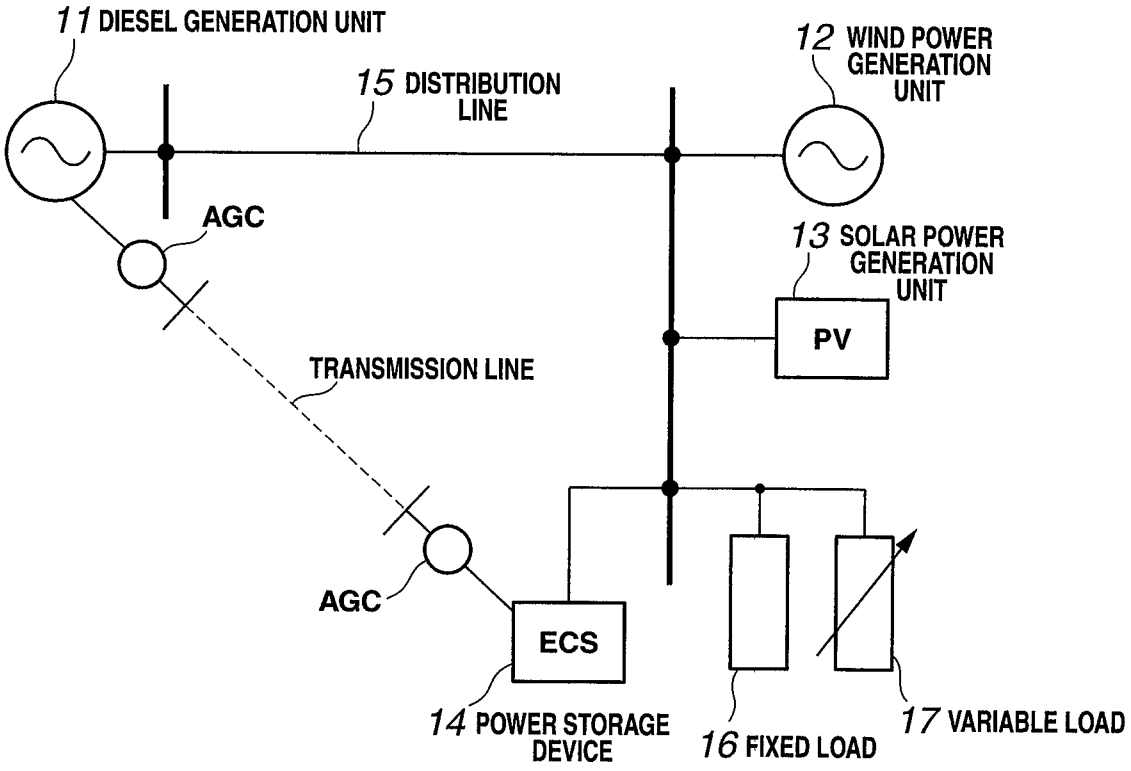

11 DIESEL GENERATION UNIT
15 DISTRIBUTION LINE
12 WIND POWER GENERATION UNIT
AGC
13 SOLAR POWER GENERATION UNIT
PV
TRANSMISSION LINE
AGC
ECS
14 POWER STORAGE DEVICE
16 FIXED LOAD
17 VARIABLE LOAD

FIG.18

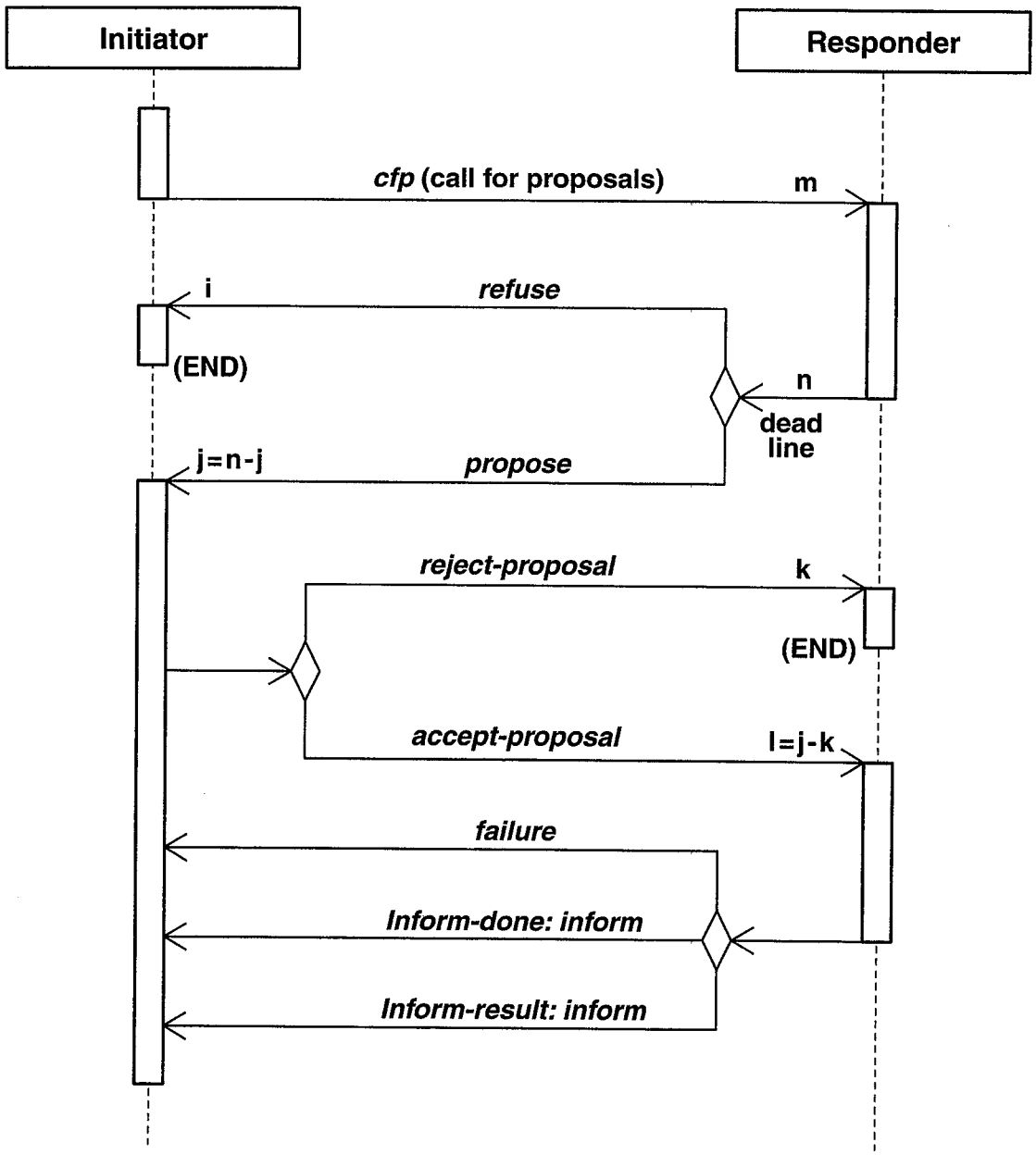

Initiator
Responder
cfp (call for proposals)
m
i
refuse
(END)
n
dead line
j=n-j
propose
reject-proposal
k
(END)
accept-proposal
l=j-k
failure
Inform-done: inform
Inform-result: inform

FIG.19

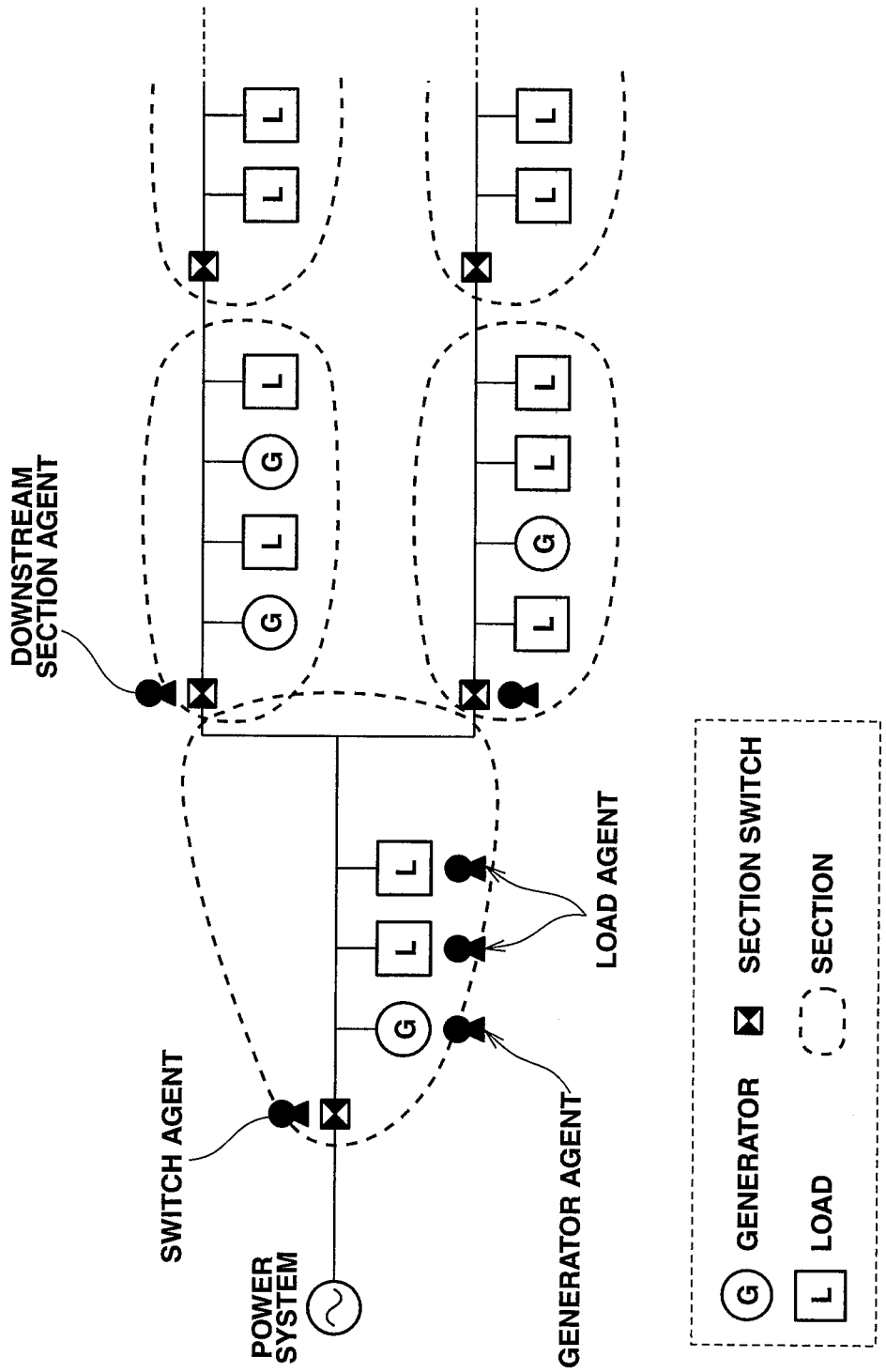

DOWNSTREAM SECTION AGENT
SWITCH AGENT
POWER SYSTEM
LOAD AGENT
GENERATOR AGENT
L
G
GENERATOR
SECTION SWITCH
LOAD
SECTION

FIG.20

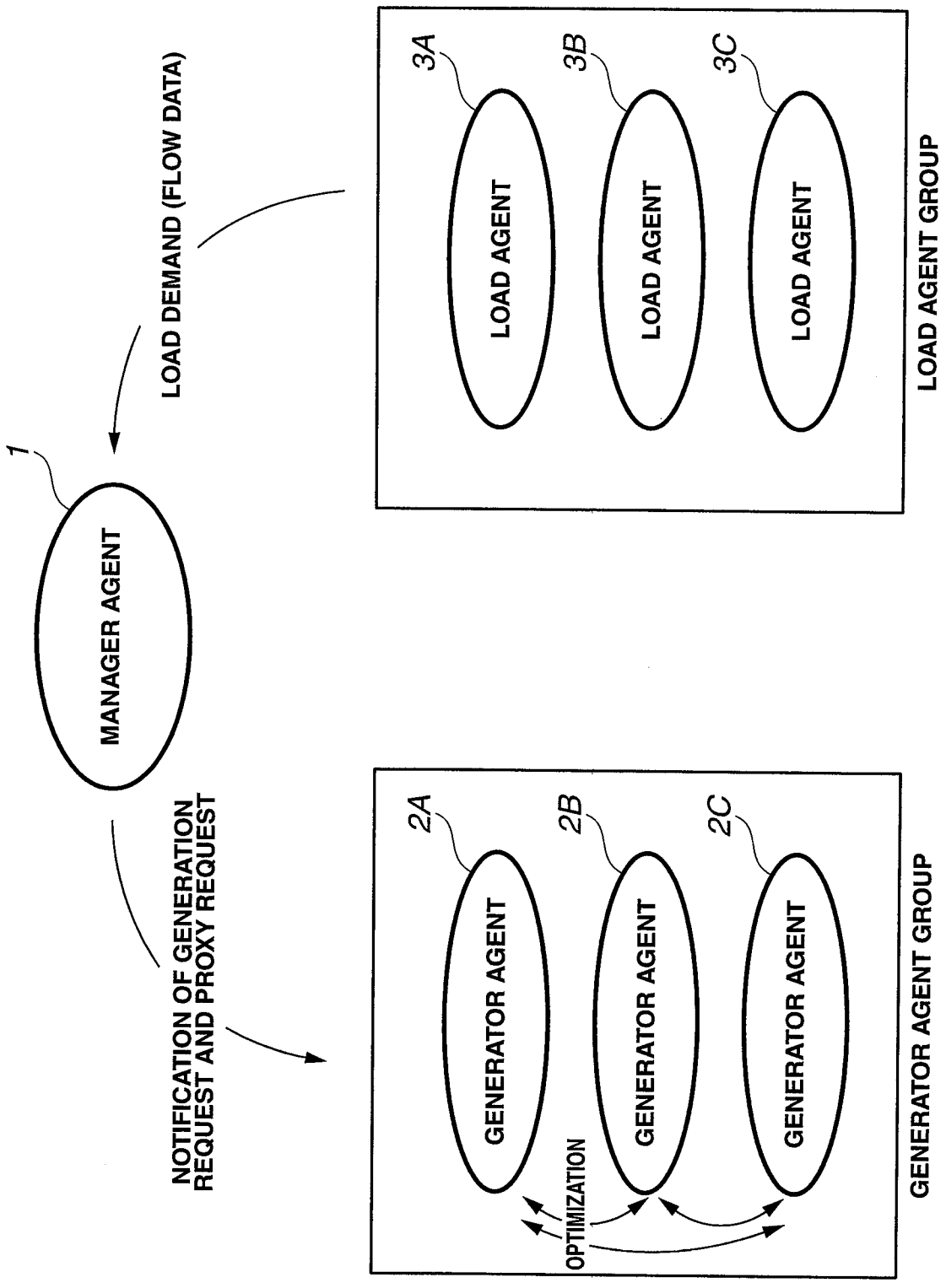

1
MANAGER AGENT
LOAD DEMAND (FLOW DATA)
NOTIFICATION OF GENERATION REQUEST AND PROXY REQUEST
3A
LOAD AGENT
3B
LOAD AGENT
3C
LOAD AGENT
LOAD AGENT GROUP
2A
GENERATOR AGENT
2B
GENERATOR AGENT
2C
GENERATOR AGENT
OPTIMIZATION
GENERATOR AGENT GROUP

FIG.21

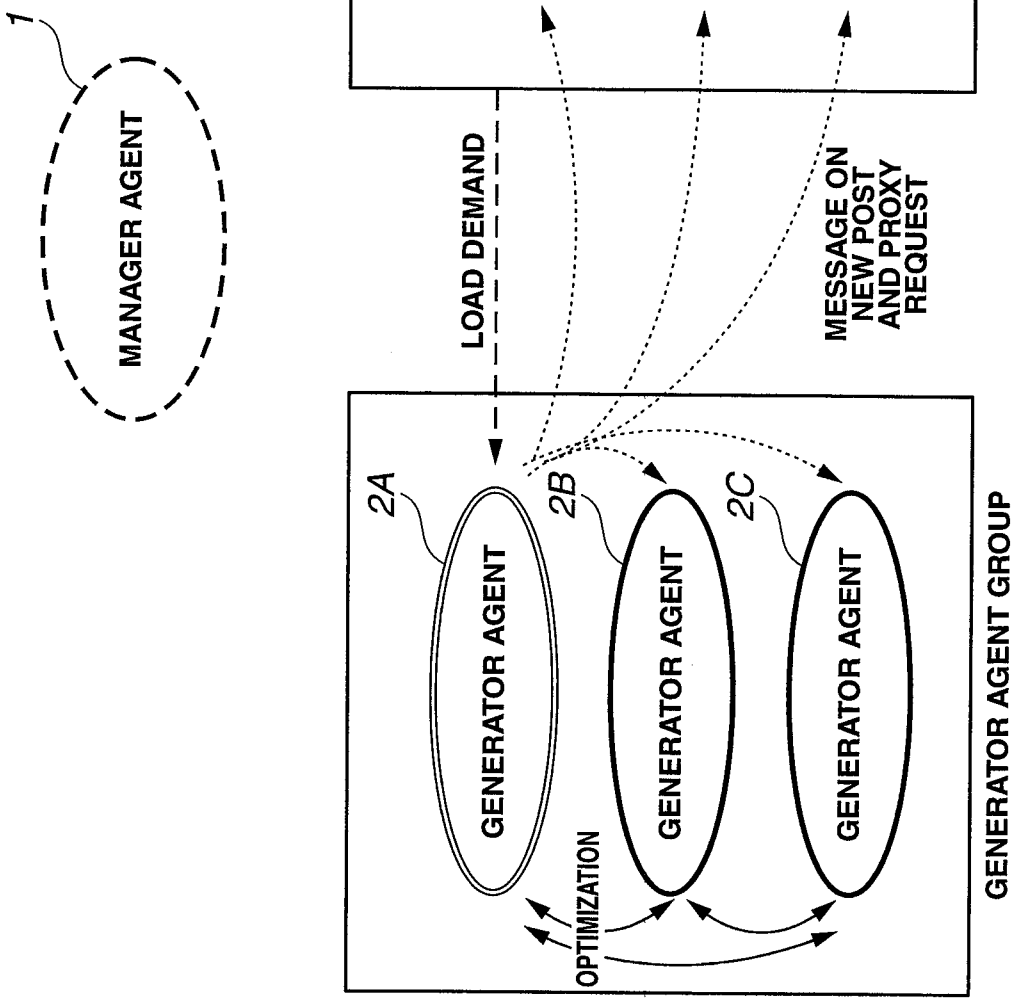

1
MANAGER AGENT
LOAD DEMAND
MESSAGE ON NEW POST AND PROXY REQUEST
3A
3B
3C
LOAD AGENT
LOAD AGENT
LOAD AGENT
LOAD AGENT GROUP
2A
2B
2C
GENERATOR AGENT
GENERATOR AGENT
GENERATOR AGENT
OPTIMIZATION
GENERATOR AGENT GROUP

FIG.22

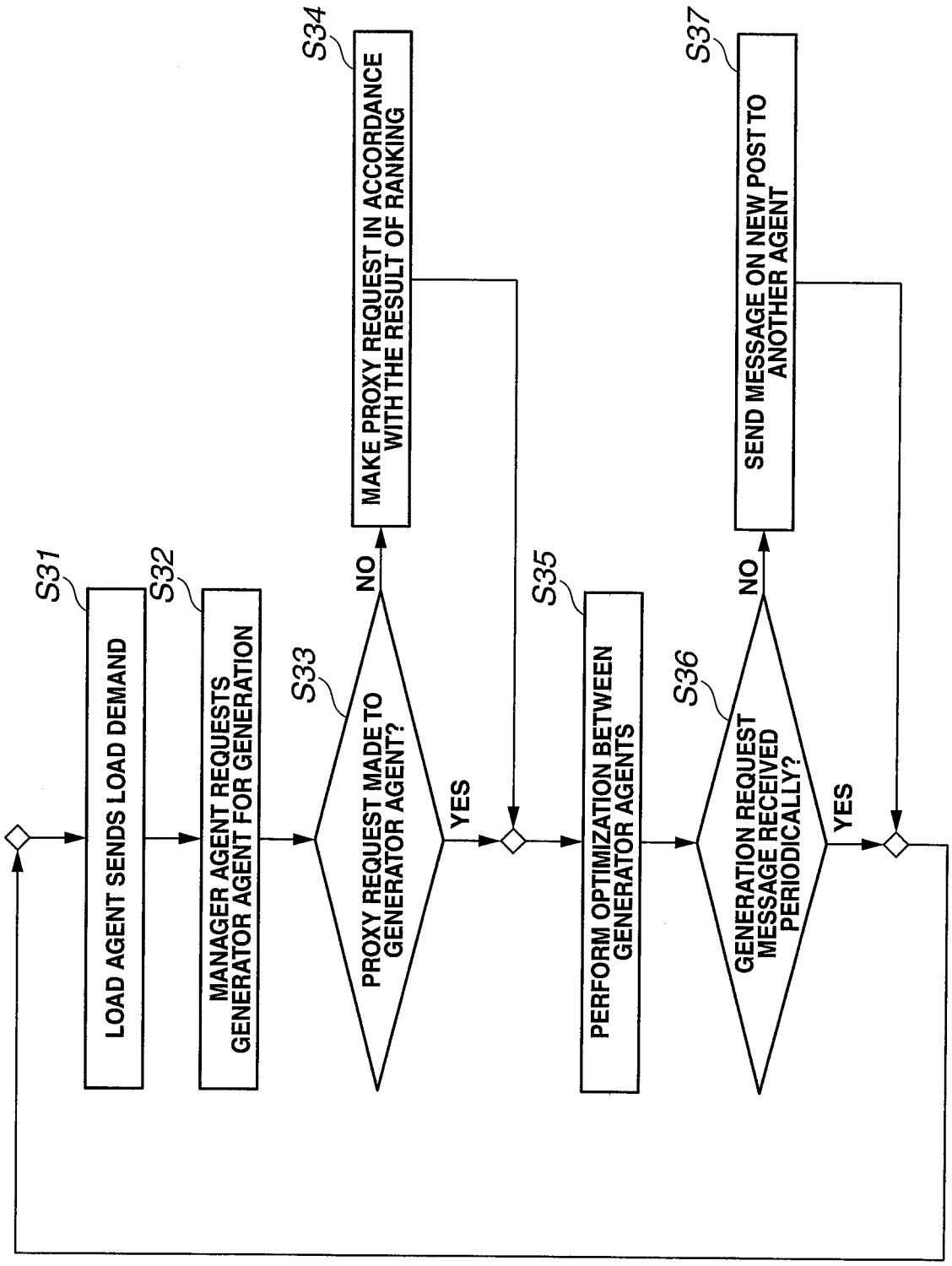
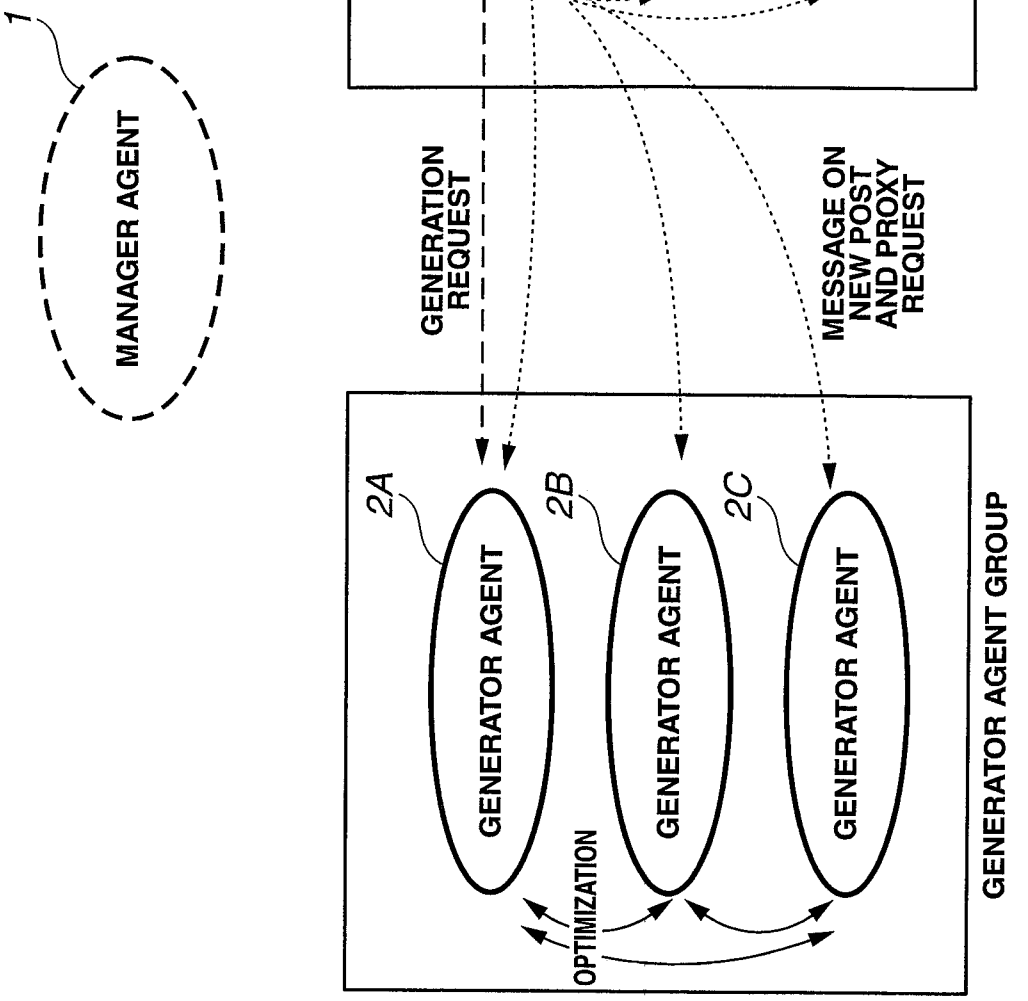

S31
LOAD AGENT SENDS LOAD DEMAND
S32
MANAGER AGENT REQUESTS GENERATOR AGENT FOR GENERATION
S33
PROXY REQUEST MADE TO GENERATOR AGENT?
NO
YES
S34
MAKE PROXY REQUEST IN ACCORDANCE WITH THE RESULT OF RANKING
S35
PERFORM OPTIMIZATION BETWEEN GENERATOR AGENTS
S36
GENERATION REQUEST MESSAGE RECEIVED PERIODICALLY?
NO
YES
S37
SEND MESSAGE ON NEW POST TO ANOTHER AGENT

FIG.23


1
MANAGER AGENT
3A
LOAD AGENT
3B
LOAD AGENT
LOAD DEMAND
3C
LOAD AGENT
LOAD AGENT GROUP
GENERATION REQUEST
MESSAGE ON NEW POST AND PROXY REQUEST
2A
GENERATOR AGENT
2B
GENERATOR AGENT
2C
GENERATOR AGENT
OPTIMIZATION
GENERATOR AGENT GROUP