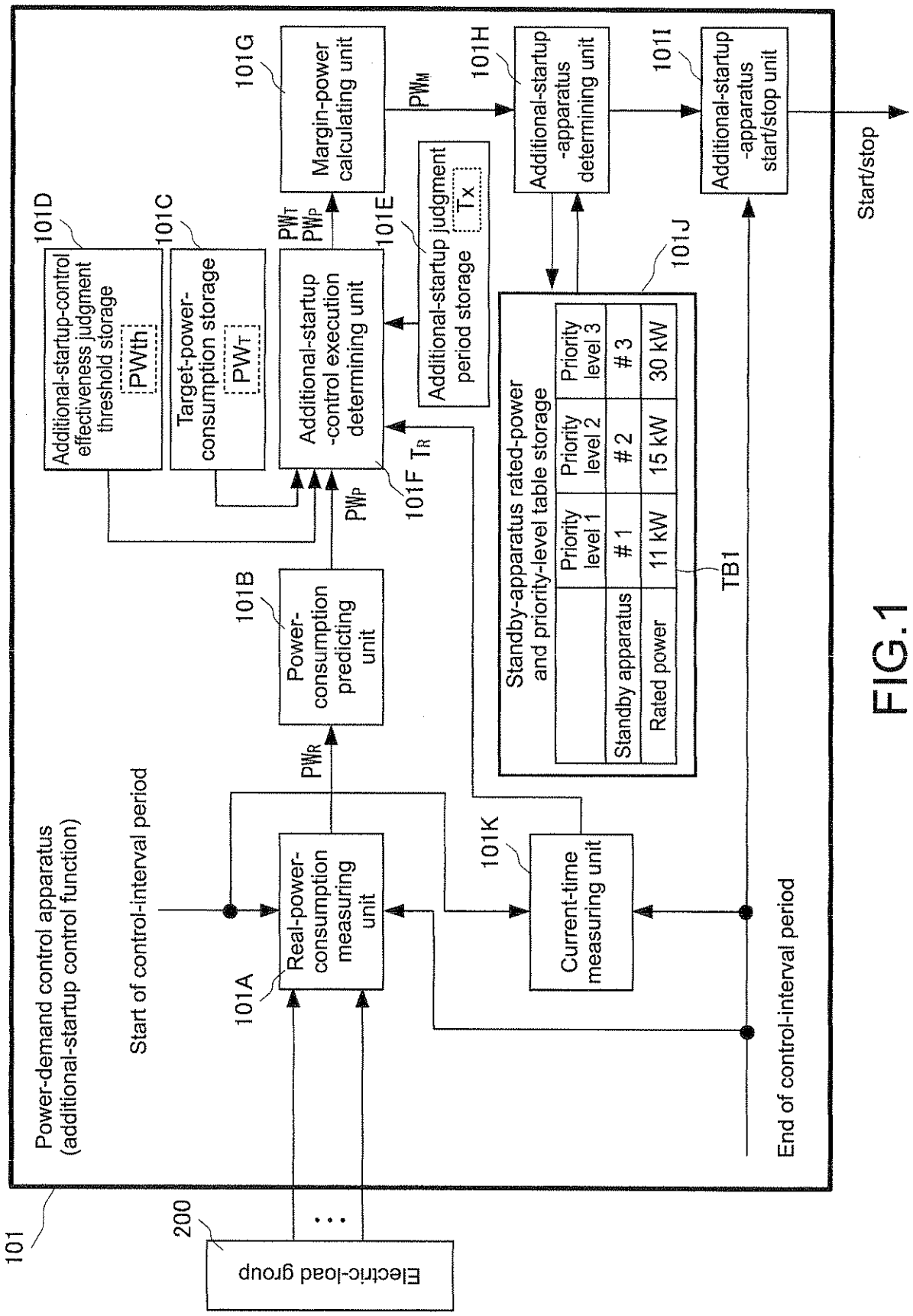
101
Power-demand control apparatus
(additional-startup control function)
200
Electric-load group
Start of control-interval period
End of control-interval period
101A
Real-power-consumption measuring unit
101B
Power-consumption predicting unit
101C
Target-power-consumption storage
PWT
101D
Additional-startup-control effectiveness judgment threshold storage
PWth
101E
Additional-startup -control execution determining unit
101F
Additional-startup judgment period storage
Tx
TR
101G
Margin-power calculating unit
PWM
101H
Additional-startup -apparatus determining unit
101I
Additional-startup -apparatus start/stop unit
Start/stop
101J
Standby-apparatus rated-power and priority-level table storage
Priority level 1
Priority level 2
Priority level 3
Standby apparatus
1
2
3
Rated power
11 kW
15 kW
30 kW
TB1
101K
Current-time measuring unit
PWR
PWP

FIG.1

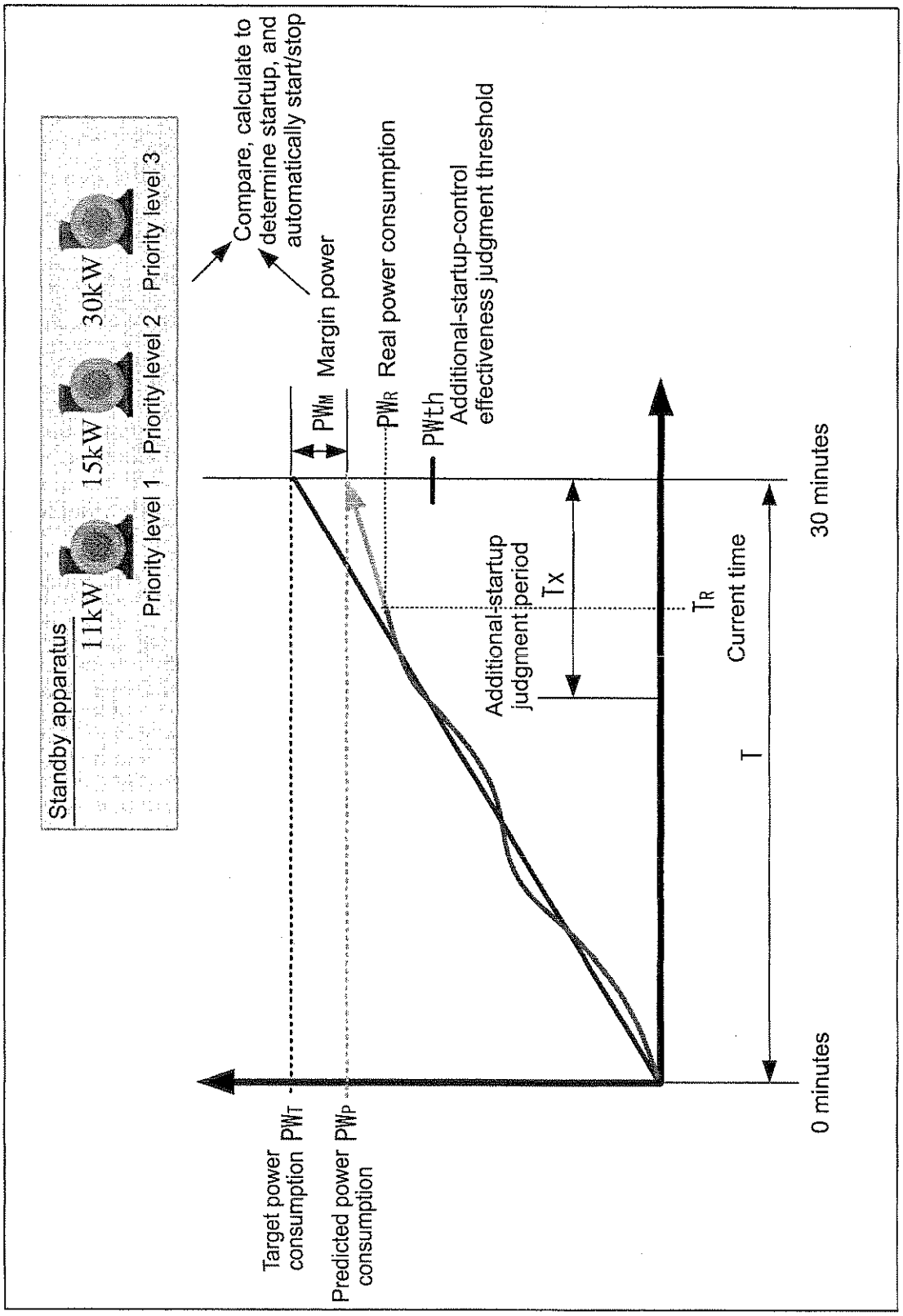
Standby apparatus
11kW
15kW
30kW
Priority level 1
Priority level 2
Priority level 3
Compare, calculate to determine startup, and automatically start/stop
Margin power
PWM
Real power consumption
PWR
PWth
Additional-startup-control effectiveness judgment threshold
Additional-startup judgment period
Tx
TR
Current time
T
30 minutes
0 minutes
Target power consumption PWT
Predicted power consumption PWP

FIG.2

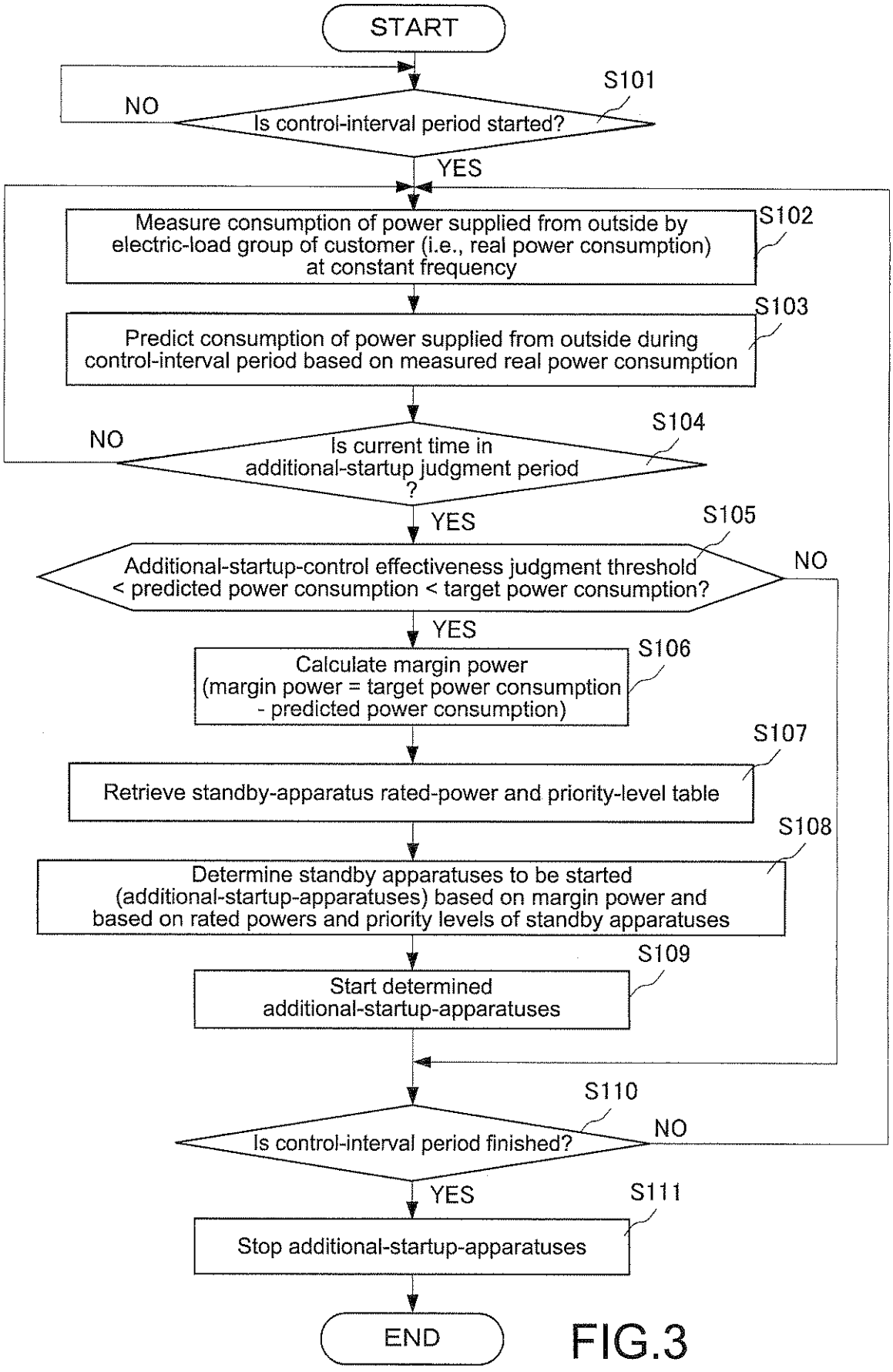
START
S101
NO
Is control-interval period started?
YES
Measure consumption of power supplied from outside by electric-load group of customer (i.e., real power consumption) at constant frequency
S102
Predict consumption of power supplied from outside during control-interval period based on measured real power consumption
S103
NO
Is current time in additional-startup judgment period ?
S104
YES
Additional-startup-control effectiveness judgment threshold < predicted power consumption < target power consumption?
S105
NO
YES
Calculate margin power (margin power = target power consumption - predicted power consumption)
S106
Retrieve standby-apparatus rated-power and priority-level table
S107
Determine standby apparatuses to be started (additional-startup-apparatuses) based on margin power and based on rated powers and priority levels of standby apparatuses
S108
Start determined additional-startup-apparatuses
S109
Is control-interval period finished?
S110
NO
YES
Stop additional-startup-apparatuses
S111
END

FIG.3

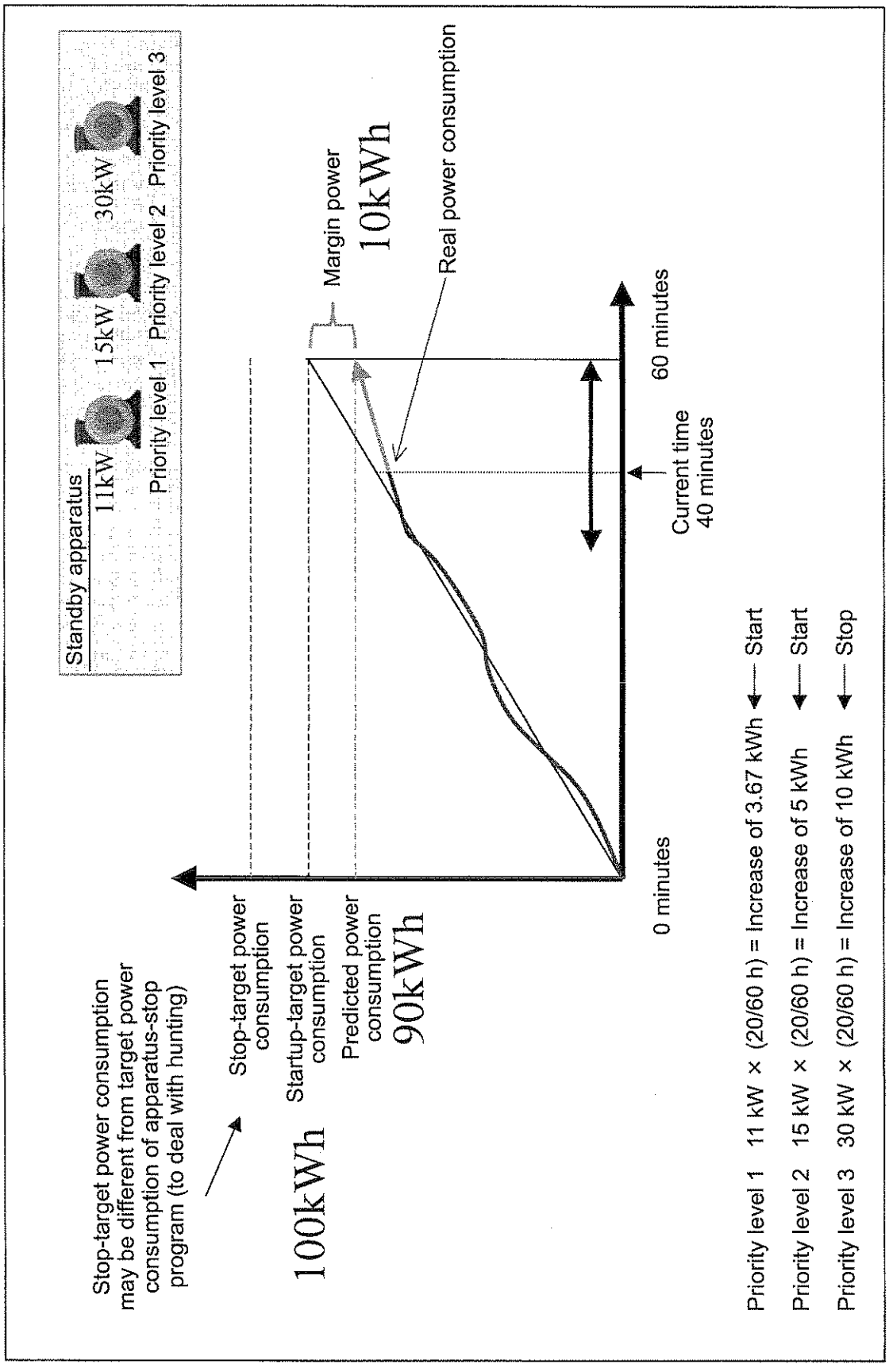
Standby apparatus
11kW
15kW
30kW
Priority level 1
Priority level 2
Priority level 3
Stop-target power consumption may be different from target power consumption of apparatus-stop program (to deal with hunting)
Stop-target power consumption
100kWh
Startup-target power consumption
Predicted power consumption
90kWh
Margin power
10kWh
Real power consumption
0 minutes
Current time
40 minutes
60 minutes
Priority level 1 11 kW × (20/60 h) = Increase of 3.67 kWh ← Start
Priority level 2 15 kW × (20/60 h) = Increase of 5 kWh ← Start
Priority level 3 30 kW × (20/60 h) = Increase of 10 kWh ← Stop

FIG.4

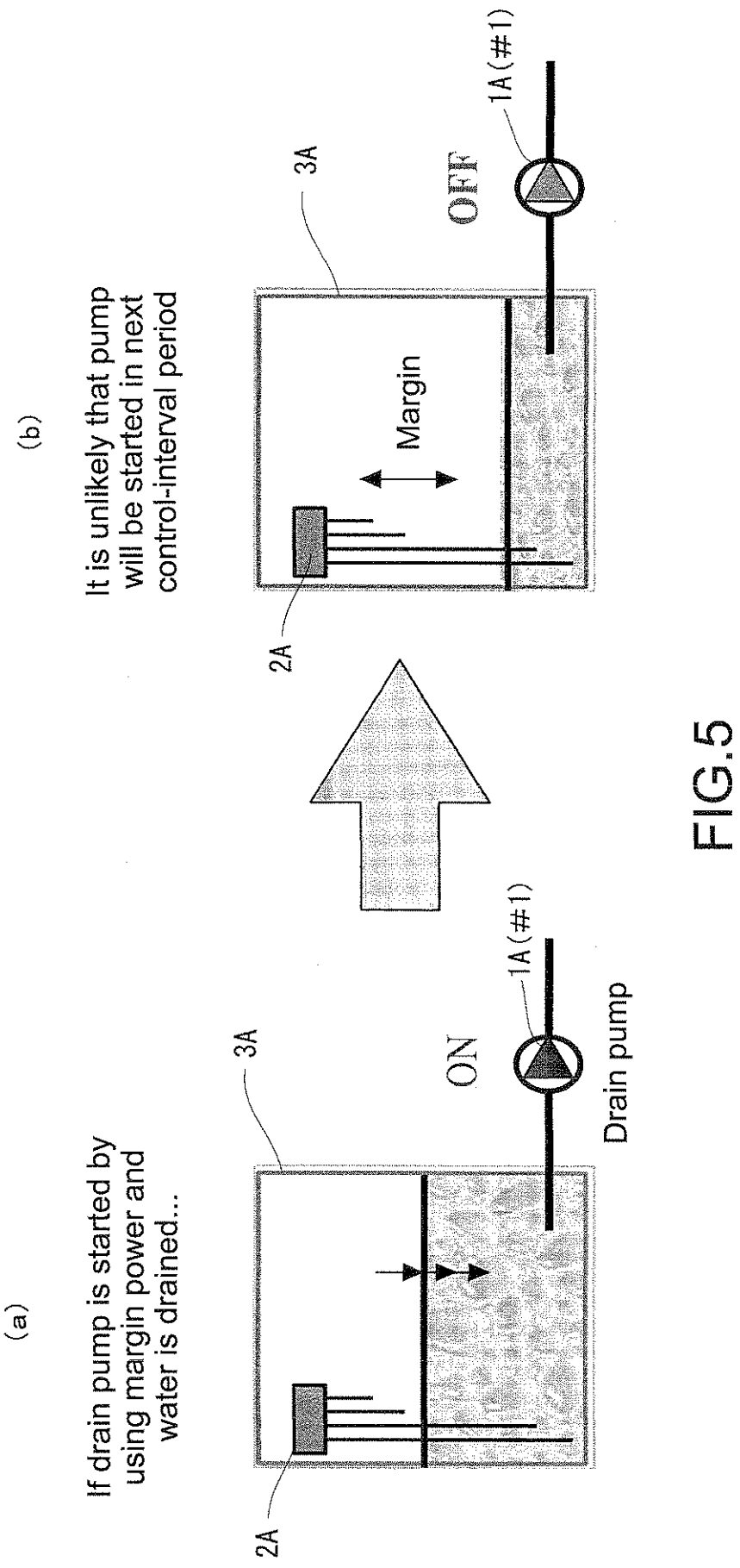
(a)
If drain pump is started by using margin power and water is drained...
3A
2A
ON
1A(#1)
Drain pump
(b)
It is unlikely that pump will be started in next control-interval period
3A
2A
Margin
OFF
1A(#1)

FIG.5

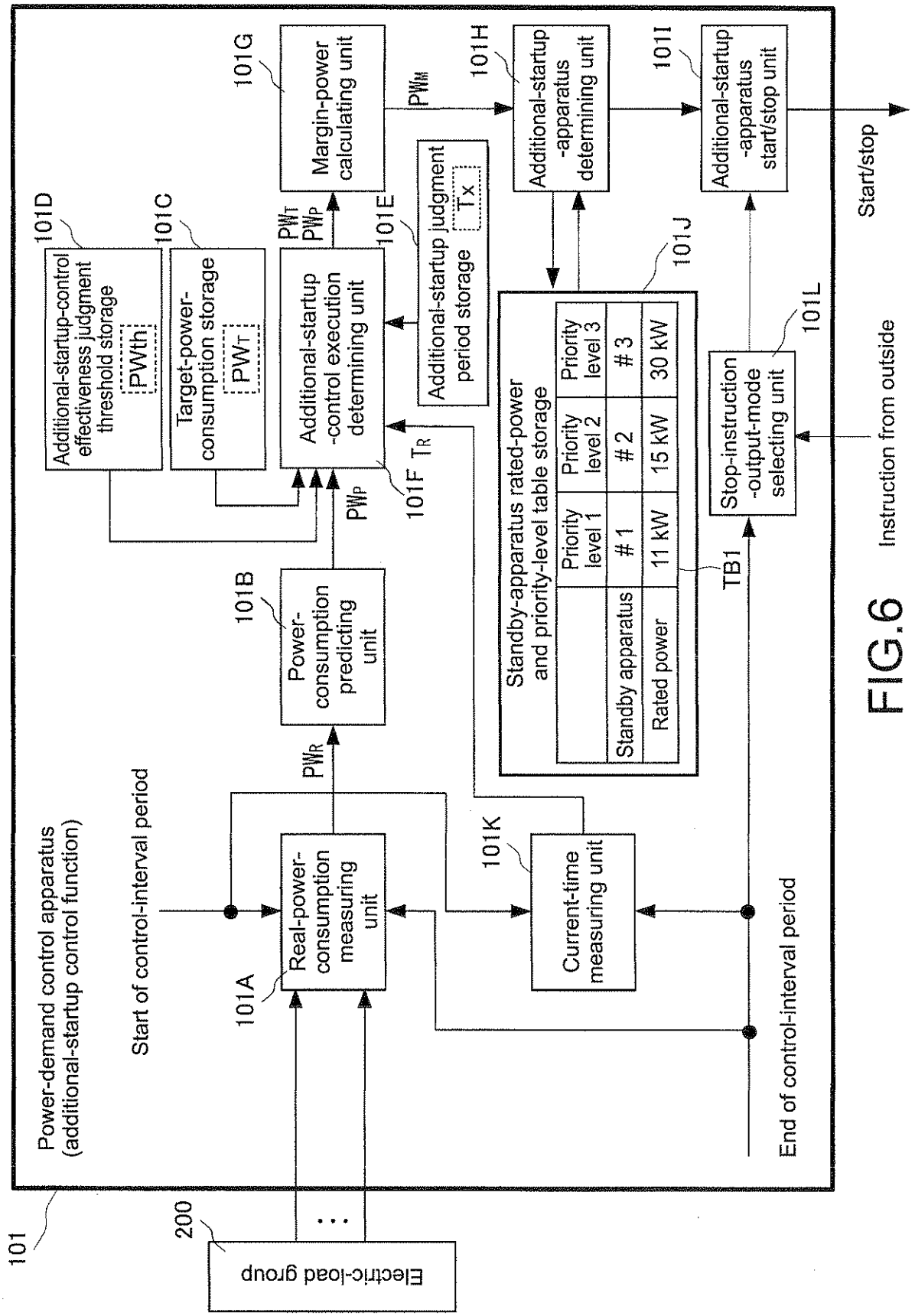
101
Power-demand control apparatus
(additional-startup control function)
200
Electric-load group
Start of control-interval period
End of control-interval period
101A
Real-power-consumption measuring unit
101B
Power-consumption predicting unit
101C
Target-power-consumption storage
PWT
101D
Additional-startup-control effectiveness judgment threshold storage
PWth
101E
Additional-startup -control execution determining unit
101F
Additional-startup judgment period storage
Tx
101G
Margin-power calculating unit
101H
Additional-startup -apparatus determining unit
101I
Additional-startup -apparatus start/stop unit
101J
Standby-apparatus rated-power and priority-level table storage
Standby apparatus
Rated power
Priority level 1
Priority level 2
Priority level 3
1
2
3
11 kW
15 kW
30 kW
TB1
101K
Current-time measuring unit
101L
Stop-instruction -output-mode selecting unit
PWR
PWP
PWT
PWM
TR
Start/stop
Instruction from outside

FIG.6

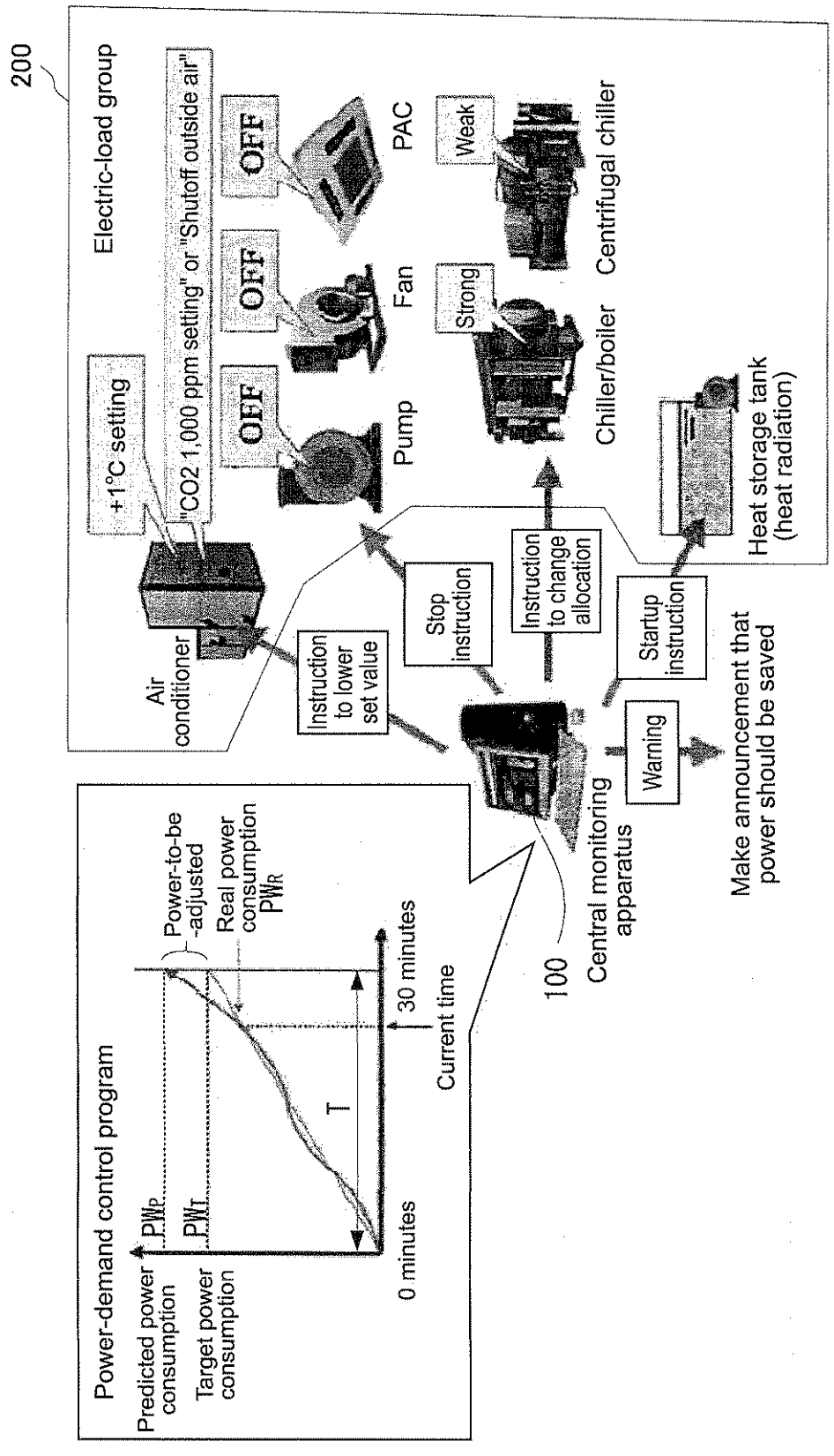
200
Electric-load group
+1°C setting
"CO2 1,000 ppm setting" or "Shutoff outside air"
OFF
OFF
OFF
Air conditioner
Pump
Fan
PAC
Weak
Strong
Chiller/boiler
Centrifugal chiller
Heat storage tank (heat radiation)
Instruction to lower set value
Stop instruction
Instruction to change allocation
Startup instruction
Warning
Make announcement that power should be saved
100
Central monitoring apparatus
Power-demand control program
Predicted power consumption
Target power consumption
Power-to-be-adjusted
Real power consumption
0 minutes
30 minutes
Current time
T

FIG.7

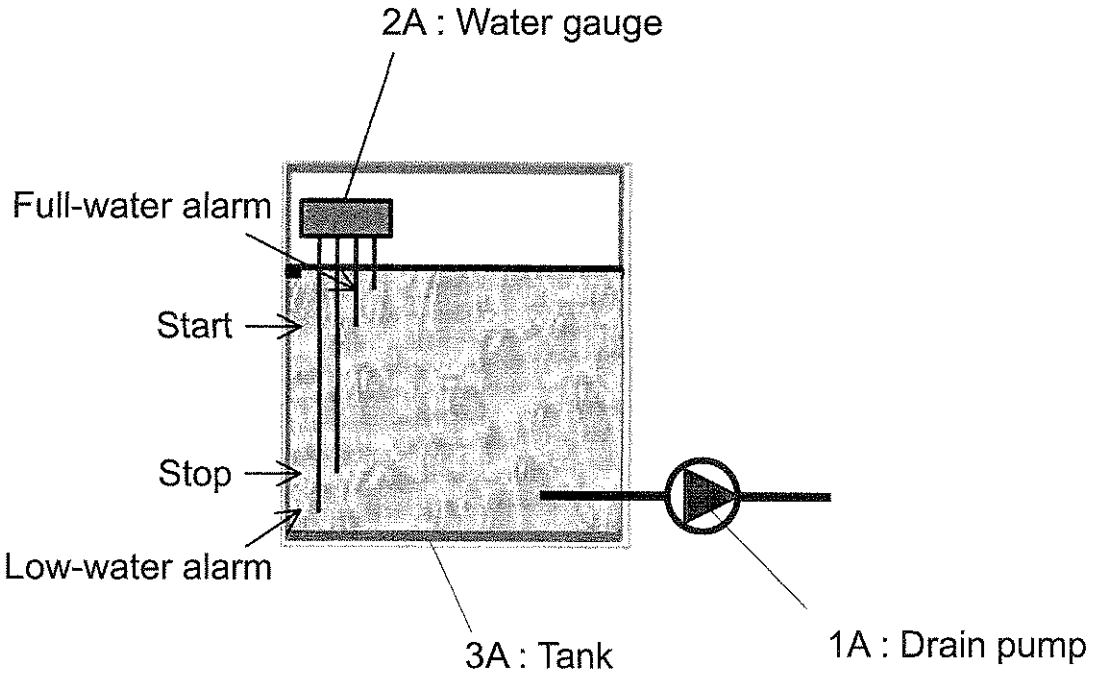
2A : Water gauge
Full-water alarm
Start
Stop
Low-water alarm
3A : Tank
1A : Drain pump

FIG.8

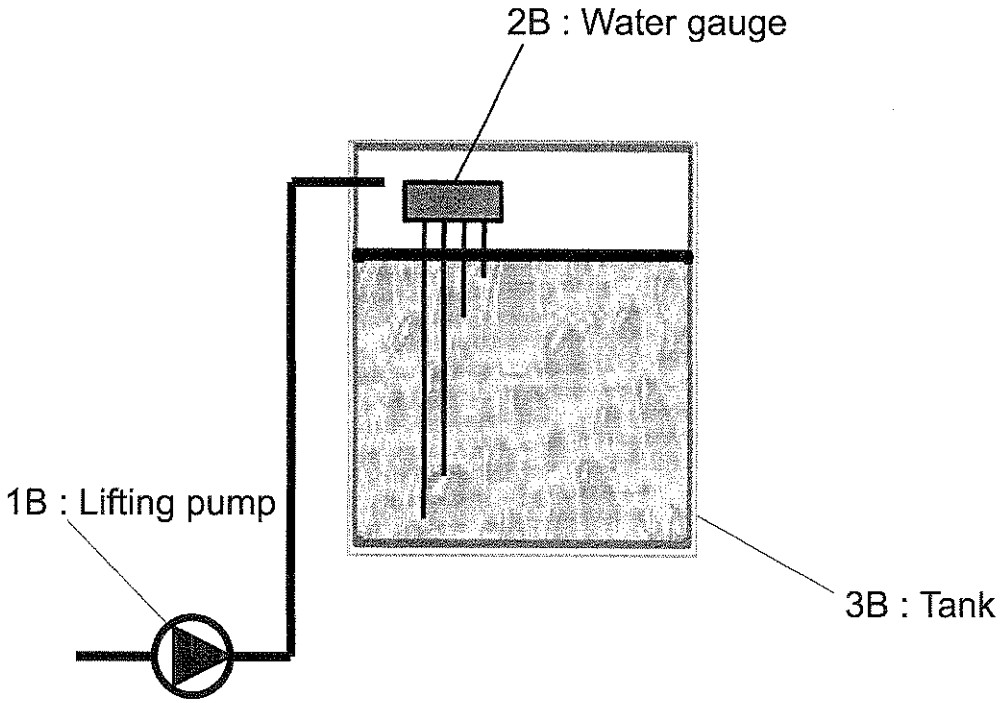
2B : Water gauge
1B : Lifting pump
3B : Tank

FIG.9