FIG. 1

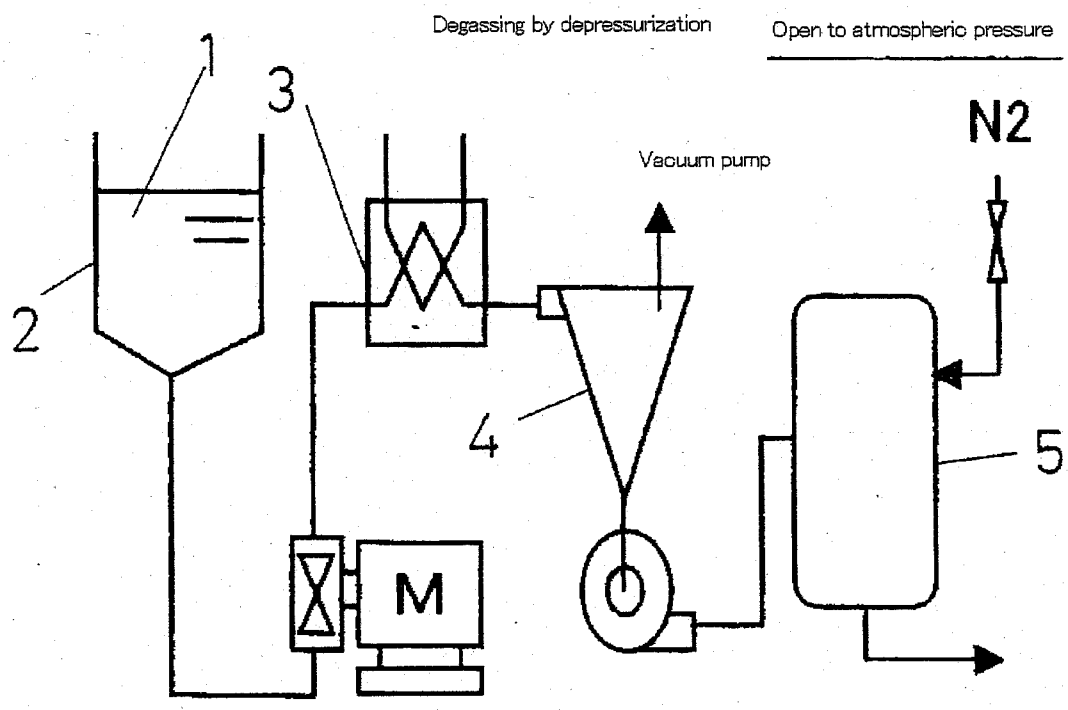
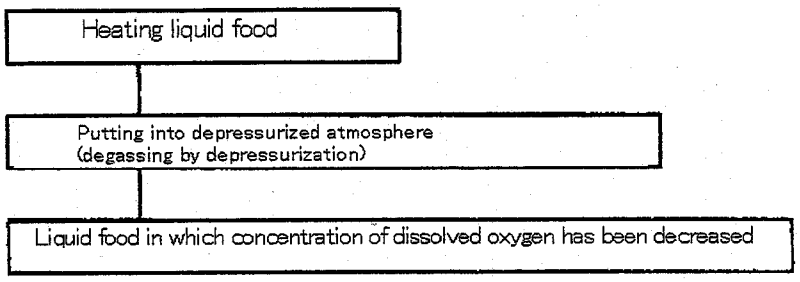

Degassing by depressurization
Open to atmospheric pressure
1
3
N2
Vacuum pump
2
4
5
M

FIG. 2

(a)


Heating liquid food
Putting into depressurized atmosphere
(degassing by depressurization)
Liquid food in which concentration of dissolved oxygen has been decreased

(b)

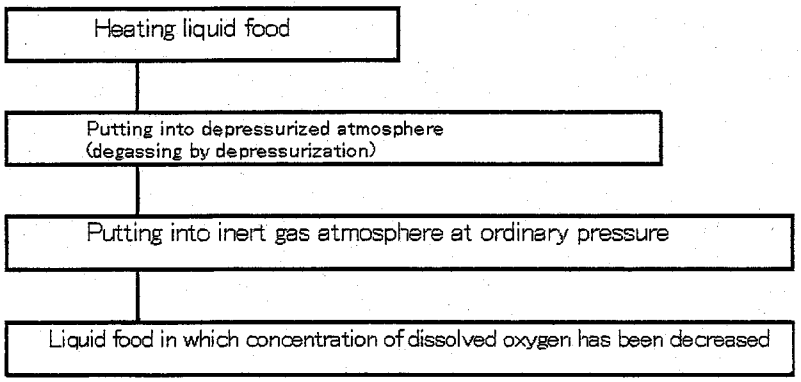
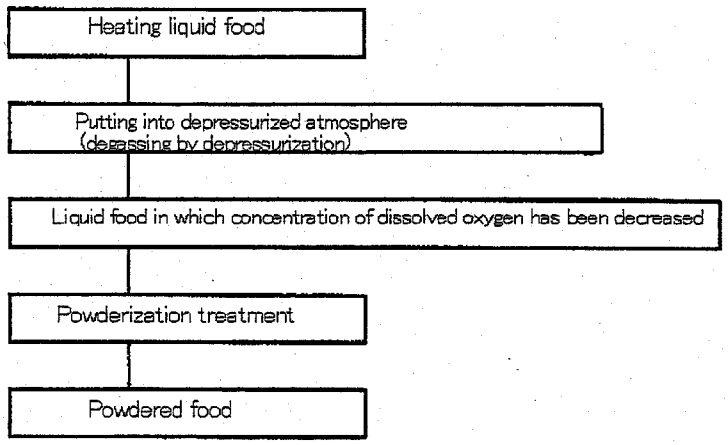

Heating liquid food
Putting into depressurized atmosphere
(degassing by depressurization)
Putting into inert gas atmosphere at ordinary pressure
Liquid food in which concentration of dissolved oxygen has been decreased

FIG. 3

(a)


Heating liquid food
Putting into depressurized atmosphere (degassing by depressurization)
Liquid food in which concentration of dissolved oxygen has been decreased
Powderization treatment
Powdered food

(b)

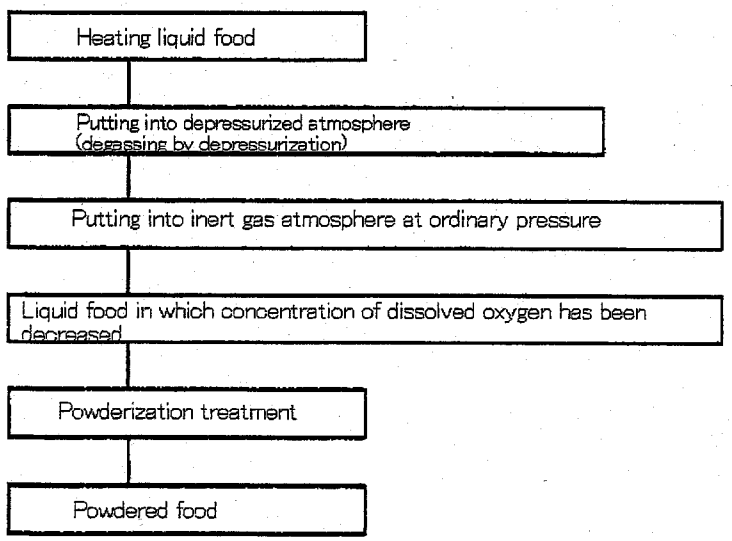
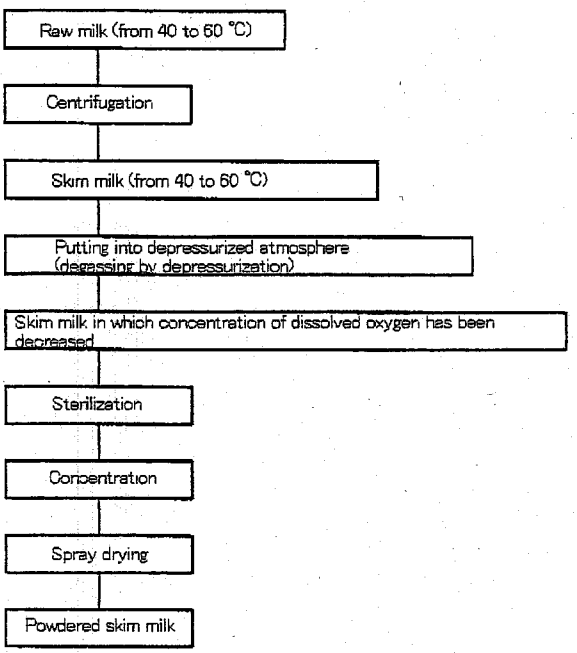

Heating liquid food
Putting into depressurized atmosphere (degassing by depressurization)
Putting into inert gas atmosphere at ordinary pressure
Liquid food in which concentration of dissolved oxygen has been decreased
Powderization treatment
Powdered food

FIG. 4

(a)


Raw milk (from 40 to 60 °C)
Centrifugation
Skim milk (from 40 to 60 °C)
Putting into depressurized atmosphere (degassing by depressurization)
Skim milk in which concentration of dissolved oxygen has been decreased
Sterilization
Concentration
Spray drying
Powdered skim milk

(b)

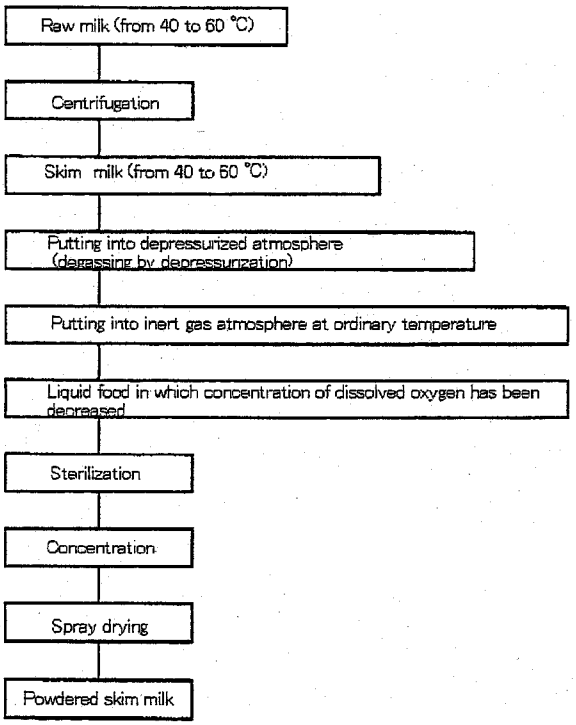

Raw milk (from 40 to 60 °C)
Centrifugation
Skim milk (from 40 to 60 °C)
Putting into depressurized atmosphere (degassing by depressurization)
Putting into inert gas atmosphere at ordinary temperature
Liquid food in which concentration of dissolved oxygen has been decreased
Sterilization
Concentration
Spray drying
Powdered skim milk

FIG. 5

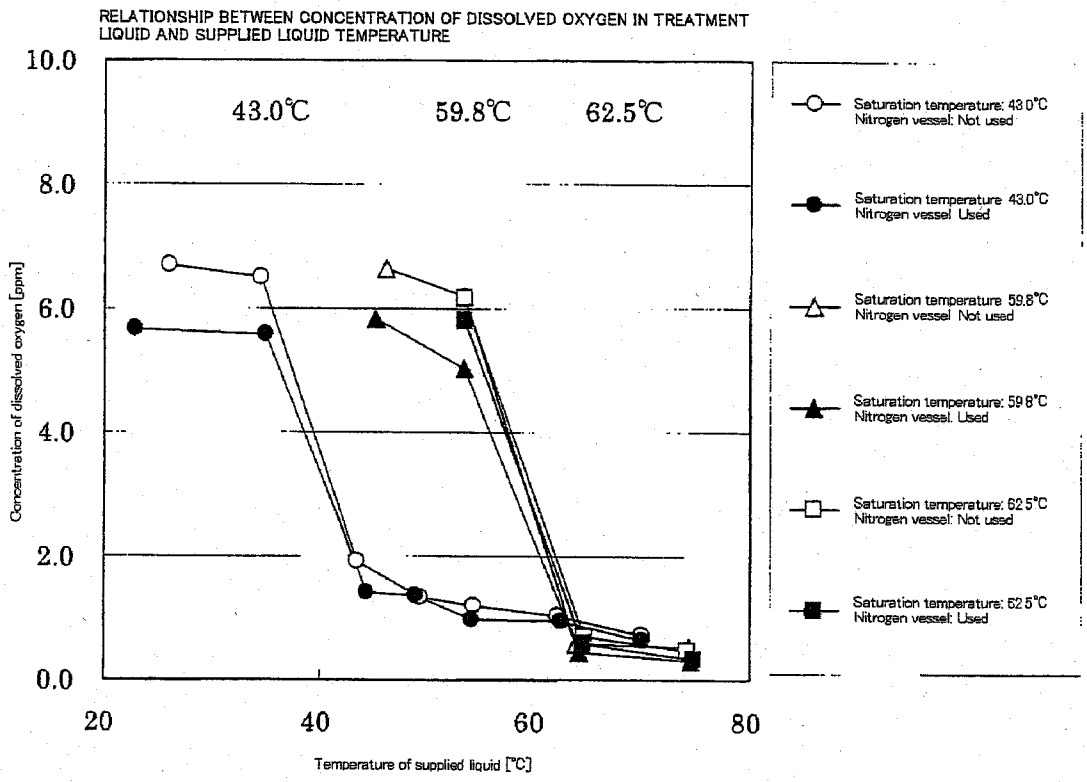
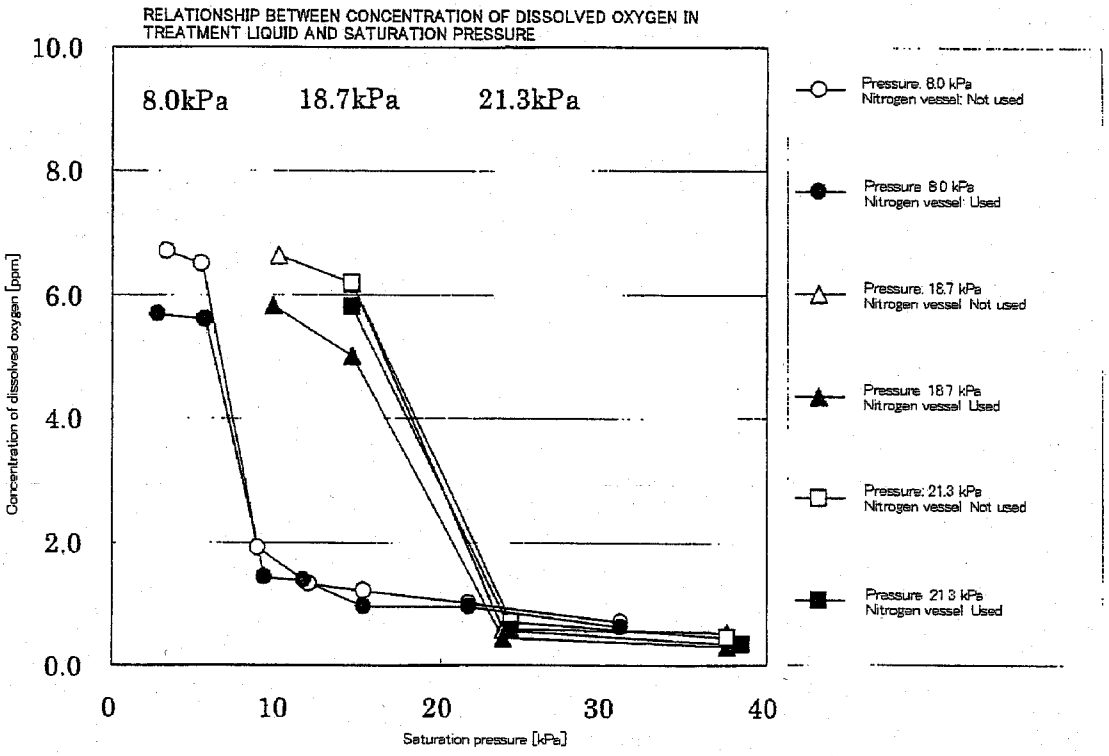

RELATIONSHIP BETWEEN CONCENTRATION OF DISSOLVED OXYGEN IN TREATMENT LIQUID AND SUPPLIED LIQUID TEMPERATURE
43.0℃
59.8℃
62.5℃
10.0
8.0
6.0
4.0
2.0
0.0
20
40
60
80
Concentration of dissolved oxygen [ppm]
Temperature of supplied liquid [℃]
Saturation temperature: 43.0°C Nitrogen vessel: Not used
Saturation temperature: 43.0°C Nitrogen vessel: Used
Saturation temperature: 59.8°C Nitrogen vessel: Not used
Saturation temperature: 59.8°C Nitrogen vessel: Used
Saturation temperature: 62.5°C Nitrogen vessel: Not used
Saturation temperature: 62.5°C Nitrogen vessel: Used

FIG. 6


RELATIONSHIP BETWEEN CONCENTRATION OF DISSOLVED OXYGEN IN TREATMENT LIQUID AND SATURATION PRESSURE
8.0kPa
18.7kPa
21.3kPa
10.0
8.0
6.0
4.0
2.0
0.0
0
10
20
30
40
Concentration of dissolved oxygen [ppm]
Saturation pressure [kPa]
Pressure: 8.0 kPa Nitrogen vessel: Not used
Pressure: 8.0 kPa Nitrogen vessel: Used
Pressure: 18.7 kPa Nitrogen vessel: Not used
Pressure: 18.7 kPa Nitrogen vessel: Used
Pressure: 21.3 kPa Nitrogen vessel: Not used
Pressure: 21.3 kPa Nitrogen vessel: Used