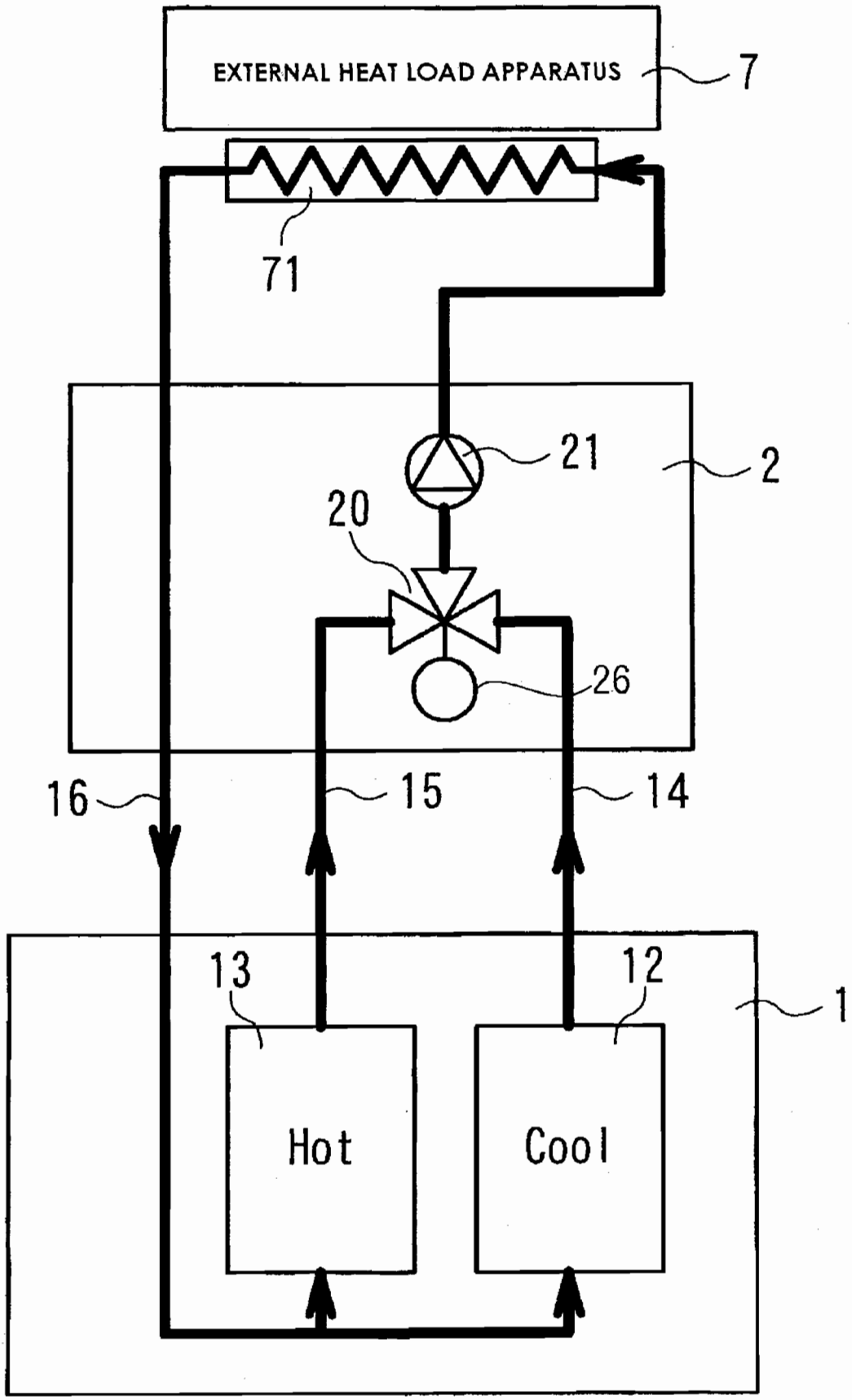

EXTERNAL HEAT LOAD APPARATUS
7
71
21
2
20
26
16
15
14
13
12
1
Hot
Cool

Fig. 1

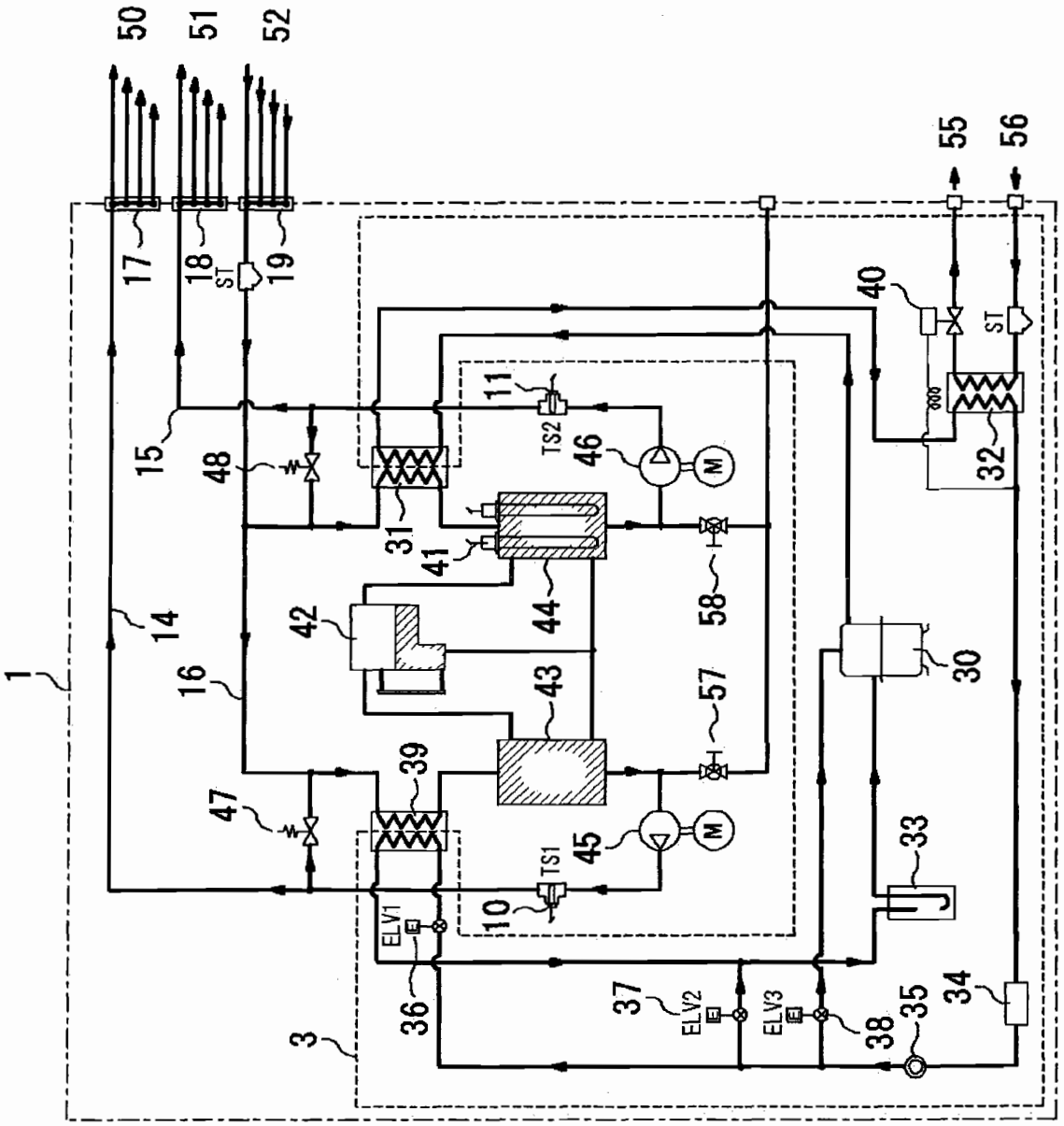

1
3
10
11
14
15
16
17
18
19
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
50
51
52
55
56
57
58
ST
TS1
TS2
ELV1
ELV2
ELV3
M

Fig.2

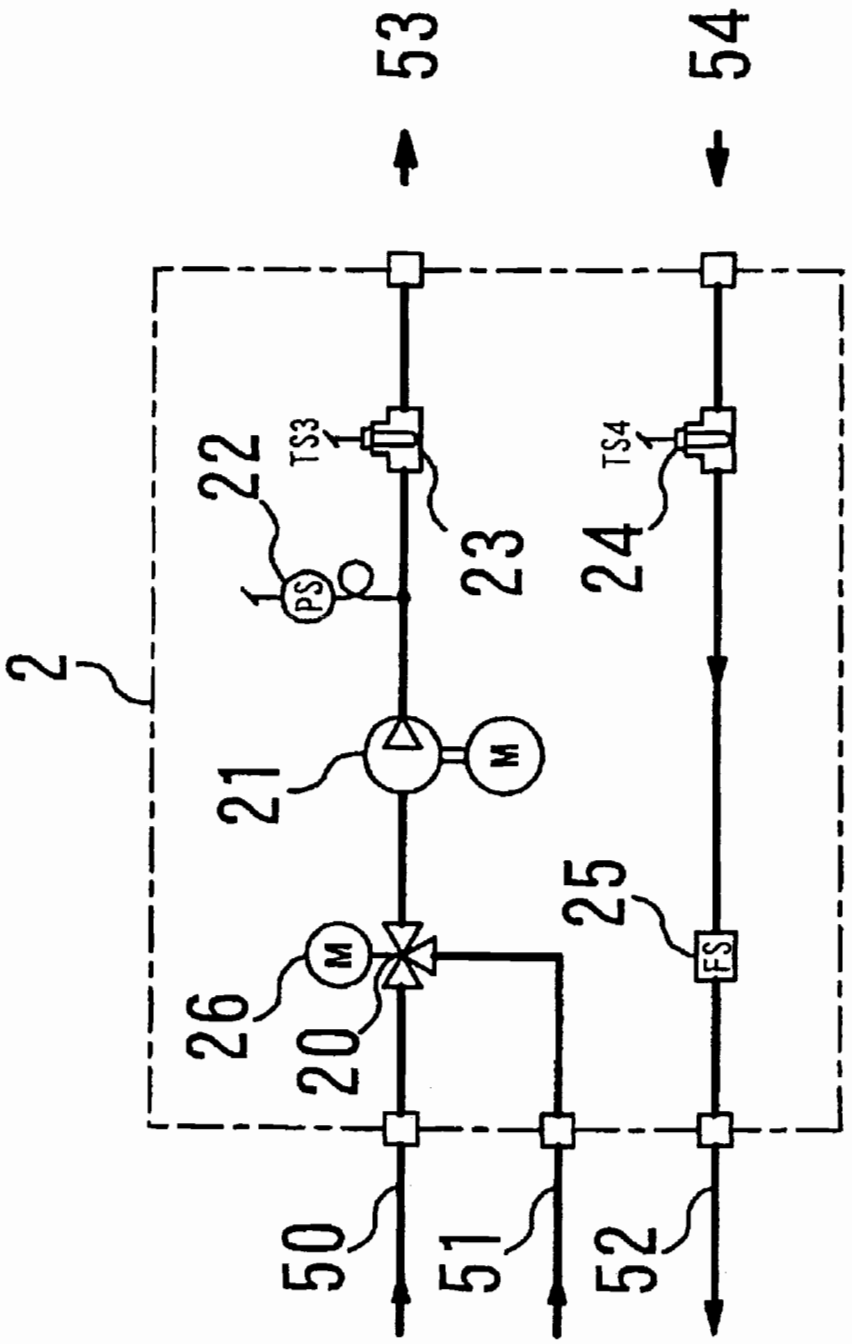


Fig.3

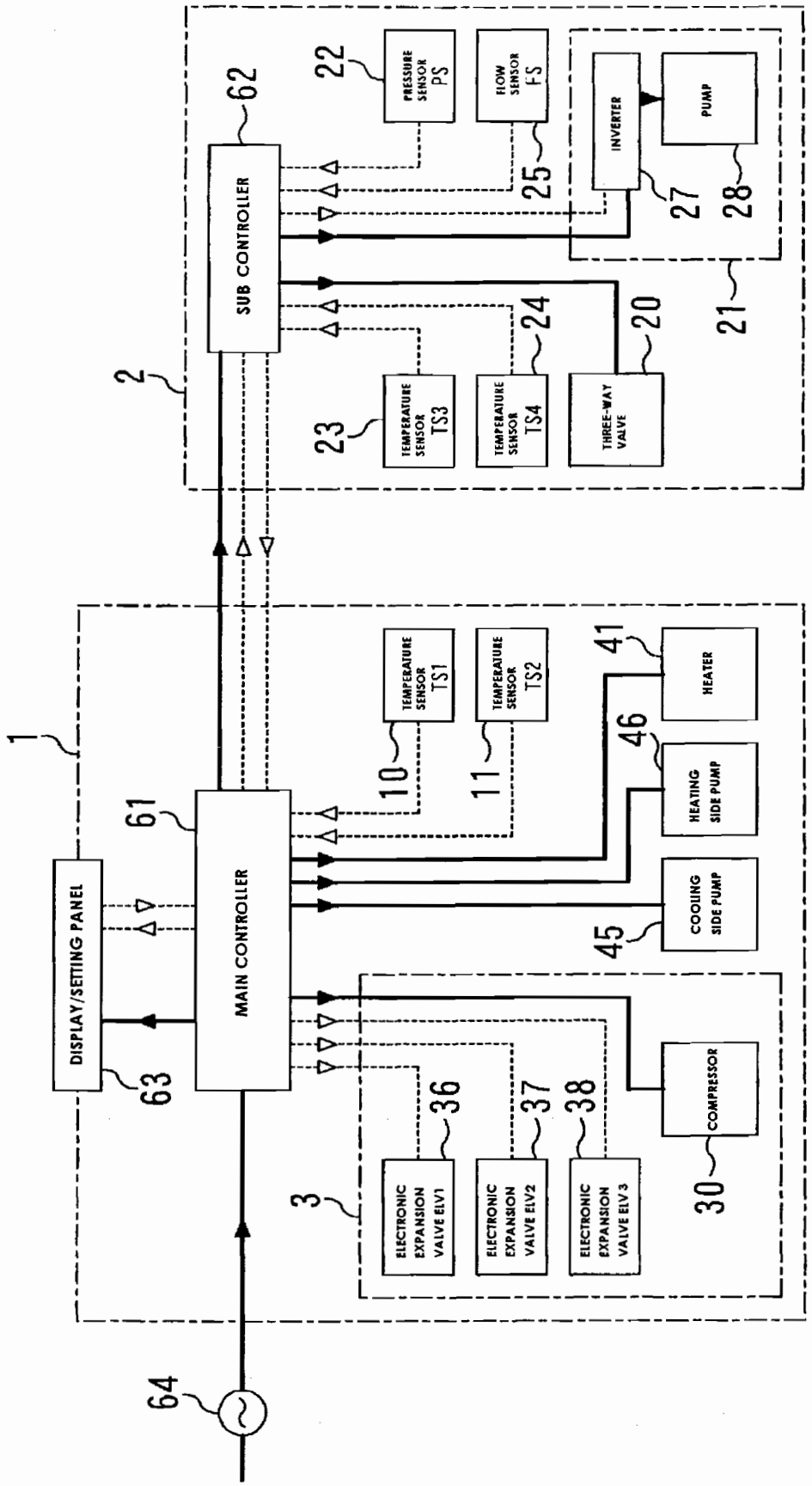

1
2
3
64
DISPLAY/SETTING PANEL
63
MAIN CONTROLLER
61
SUB CONTROLLER
62
TEMPERATURE SENSOR TS1
10
TEMPERATURE SENSOR TS2
11
TEMPERATURE SENSOR TS3
23
TEMPERATURE SENSOR TS4
24
PRESSURE SENSOR PS
22
FLOW SENSOR FS
25
THREE-WAY VALVE
20
INVERTER
27
PUMP
28
21
HEATER
41
HEATING SIDE PUMP
46
COOLING SIDE PUMP
45
ELECTRONIC EXPANSION VALVE ELV1
36
ELECTRONIC EXPANSION VALVE ELV2
37
ELECTRONIC EXPANSION VALVE ELV3
38
COMPRESSOR
30

Fig. 4

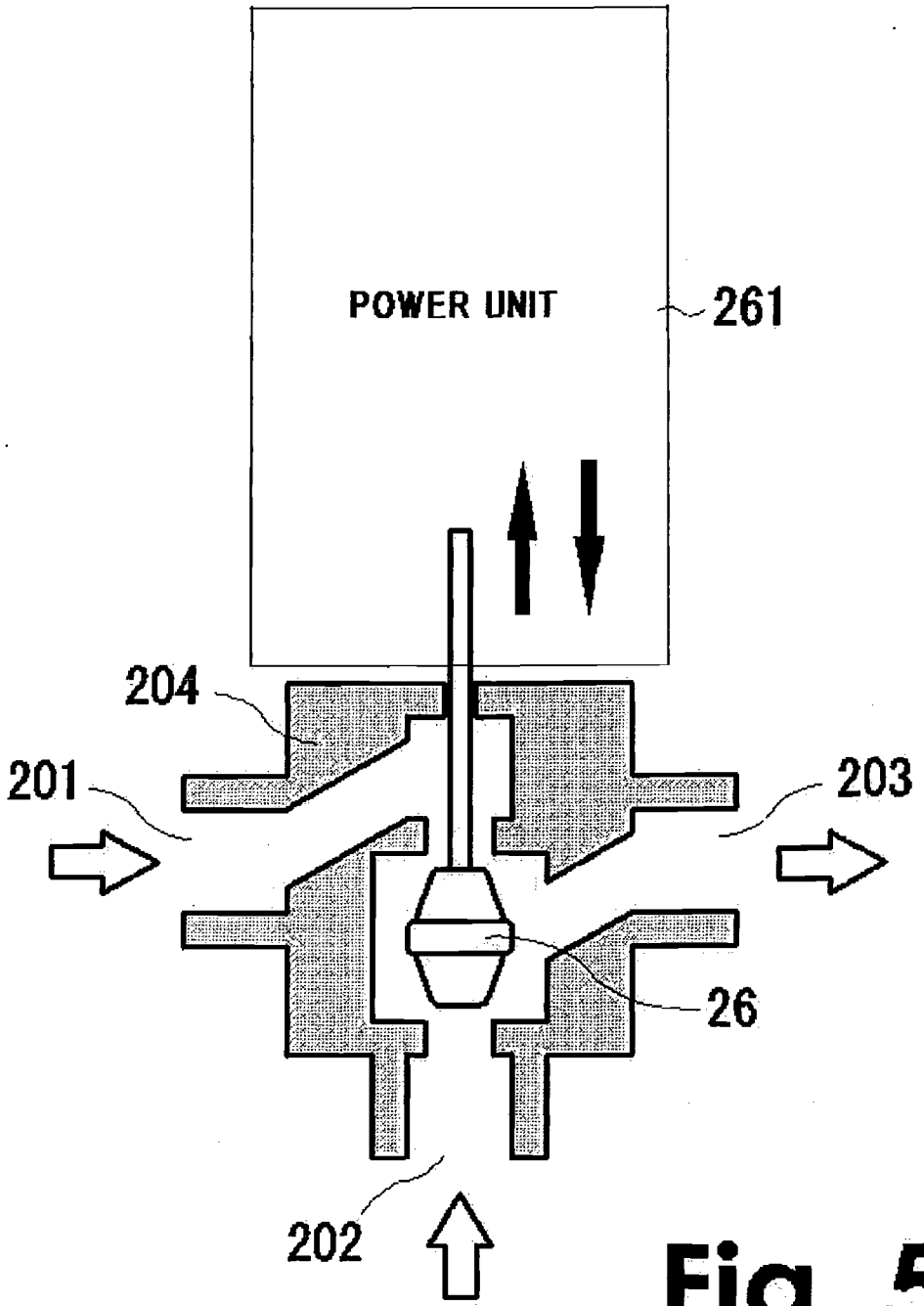


Fig. 5

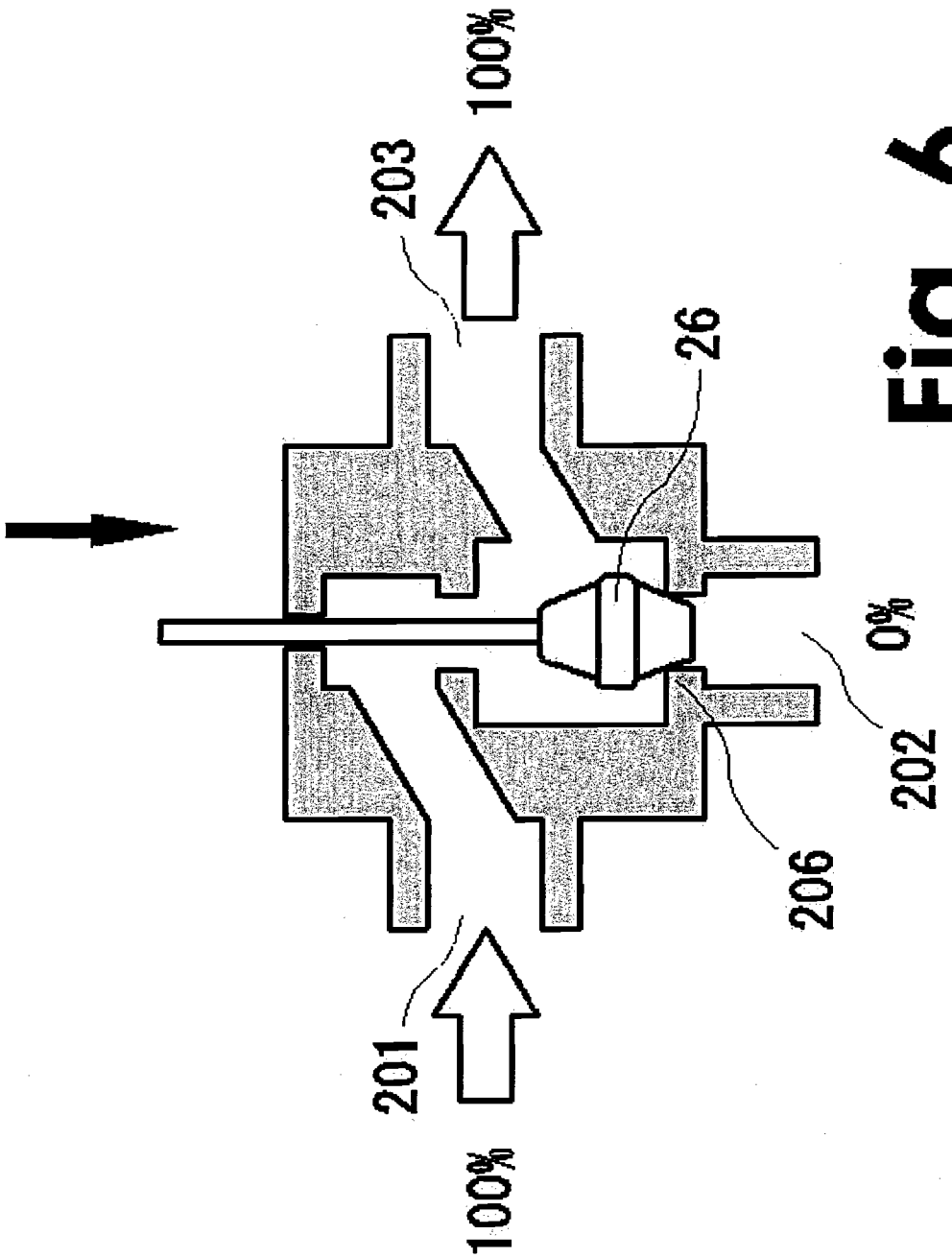


Fig. 6

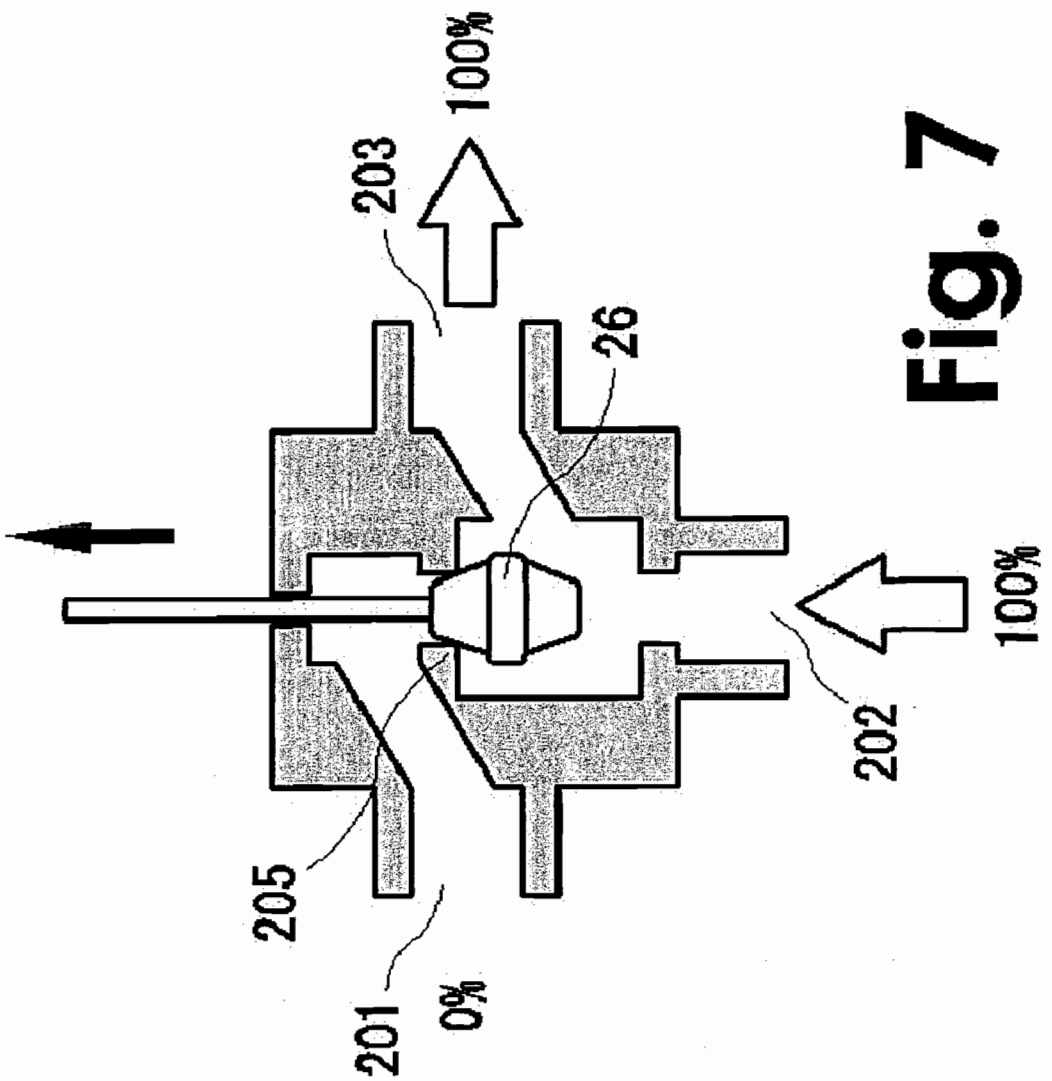


Fig. 7

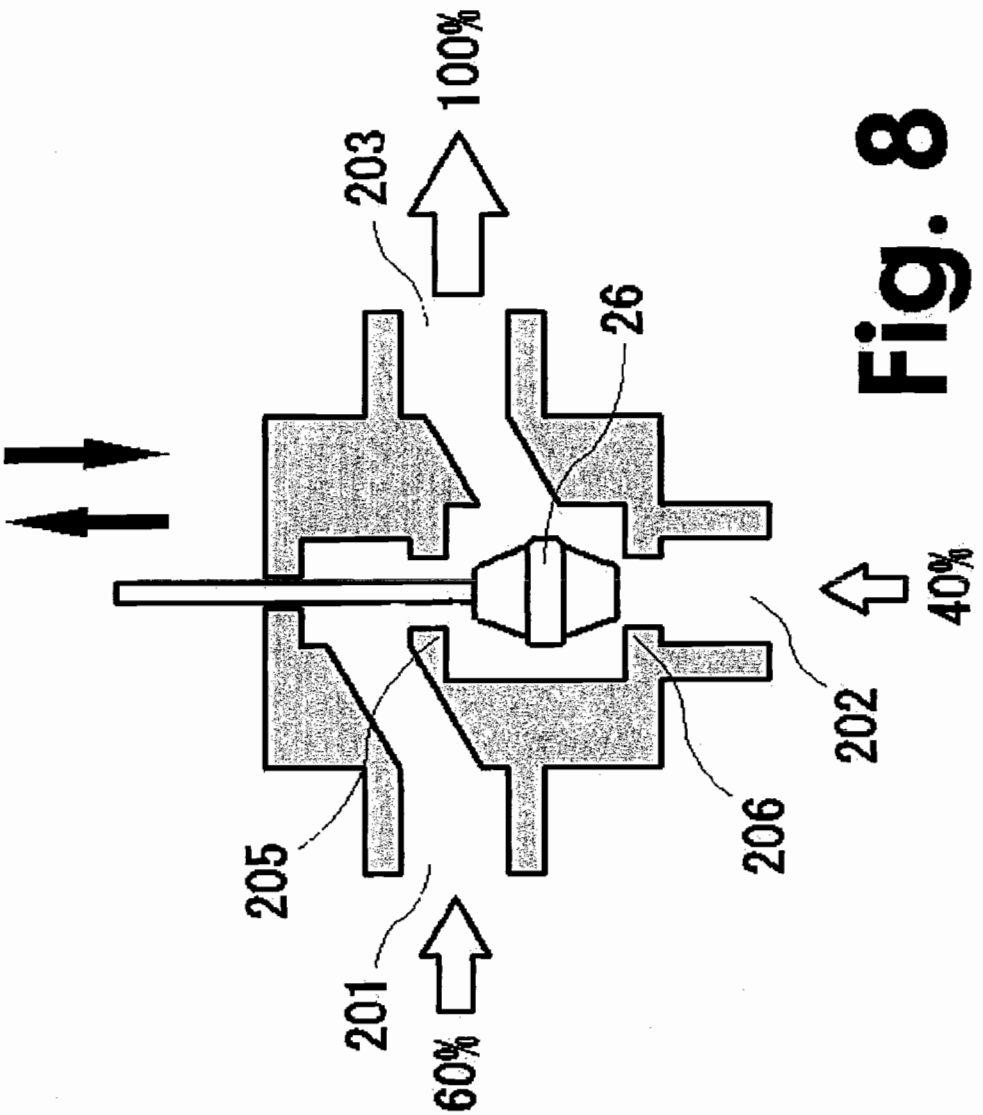


Fig. 8

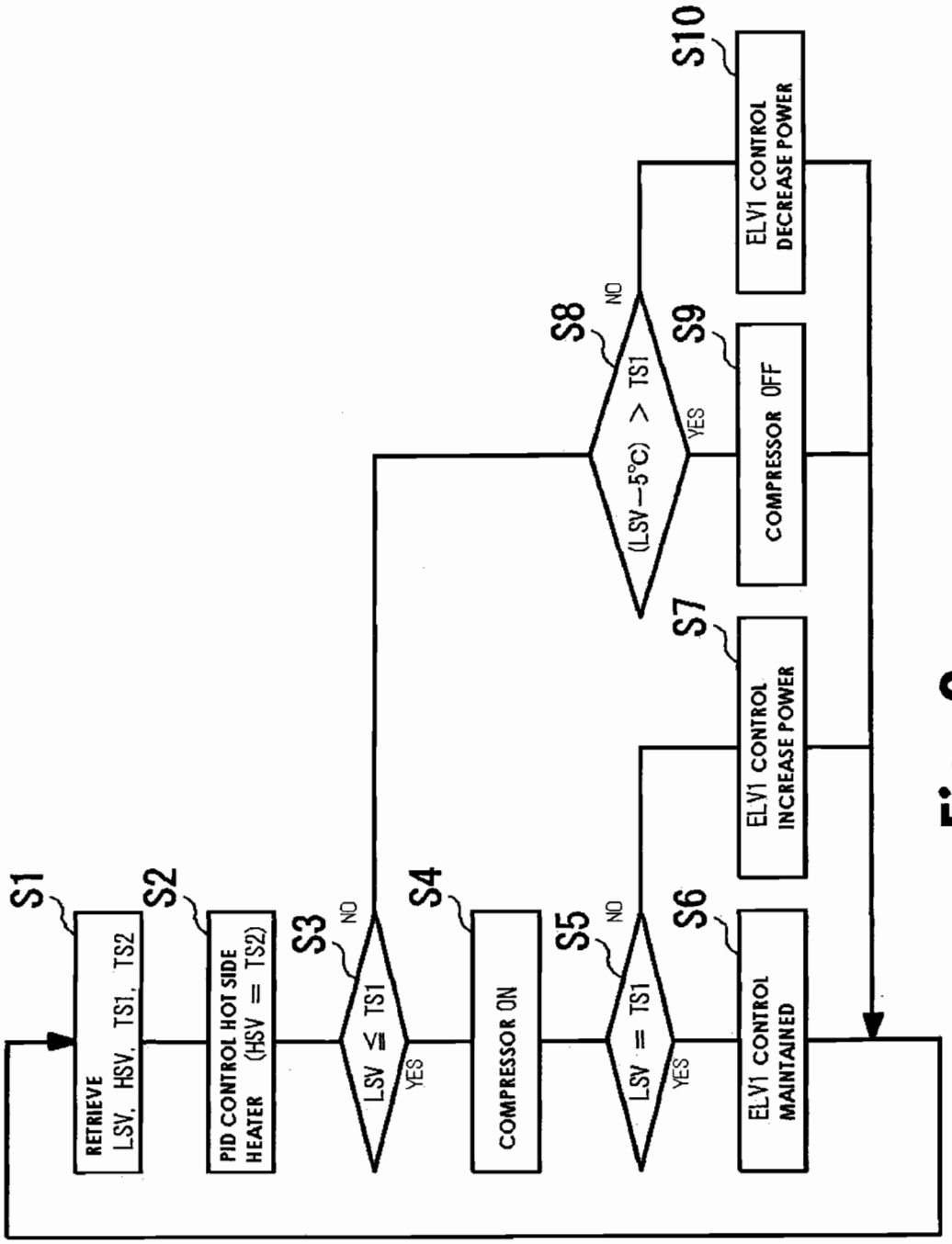

S1
RETRIEVE
LSV, HSV, TS1, TS2
S2
PID CONTROL HOT SIDE
HEATER (HSV = TS2)
S3
NO
LSV ≤ TS1
YES
S4
COMPRESSOR ON
S5
NO
LSV = TS1
YES
S6
ELV1 CONTROL
MAINTAINED
S7
ELV1 CONTROL
INCREASE POWER
S8
NO
(LSV−5°C) > TS1
YES
S9
COMPRESSOR OFF
S10
ELV1 CONTROL
DECREASE POWER

Fig. 9

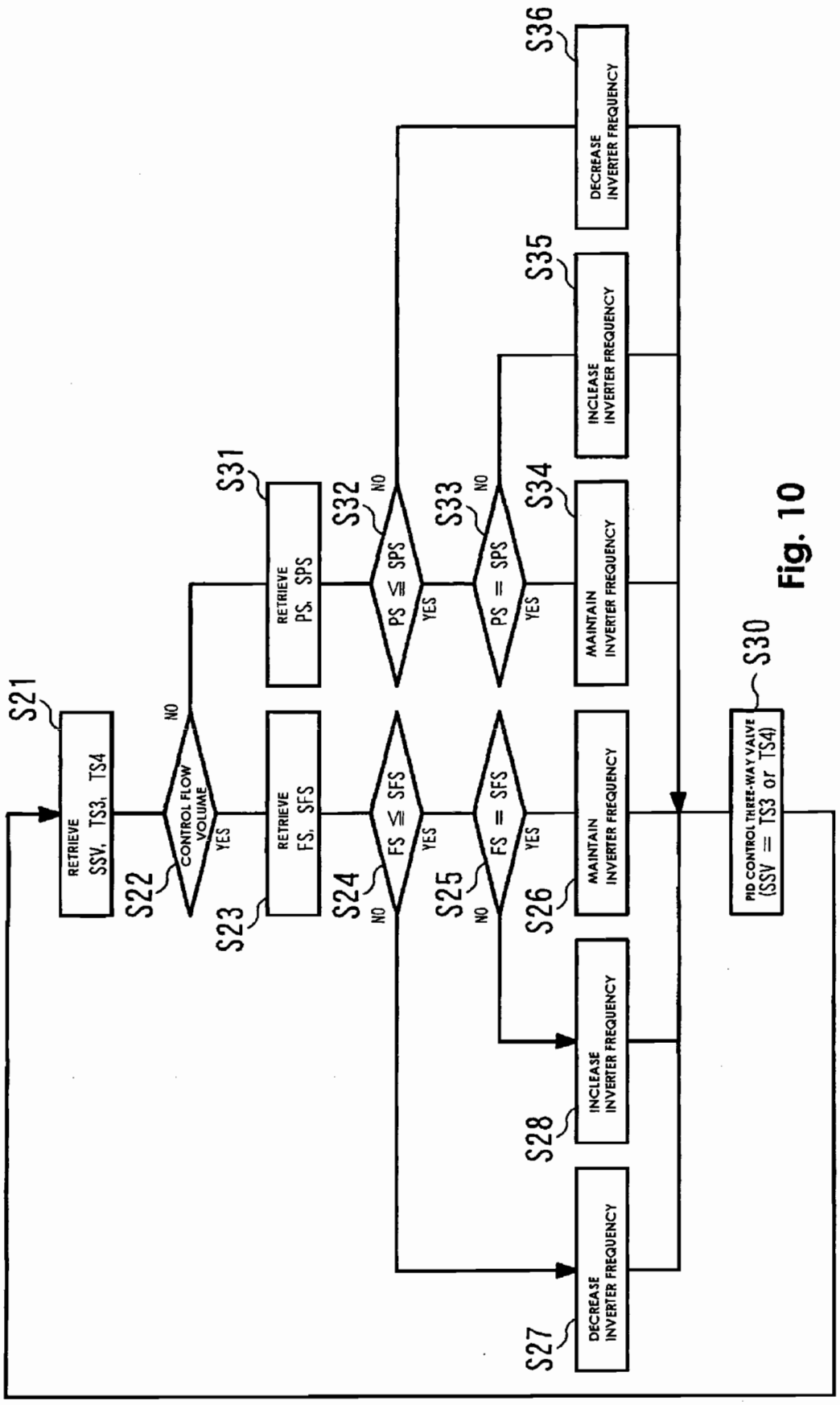

S21
RETRIEVE SSV, TS3, TS4
S22
CONTROL FLOW VOLUME
NO
YES
S23
RETRIEVE FS, SFS
S24
FS ≦ SFS
NO
YES
S25
FS = SFS
NO
YES
S26
MAINTAIN INVERTER FREQUENCY
S27
DECREASE INVERTER FREQUENCY
S28
INCLEASE INVERTER FREQUENCY
S30
PID CONTROL THREE-WAY VALVE (SSV = TS3 or TS4)
S31
RETRIEVE PS, SPS
S32
PS ≦ SPS
NO
YES
S33
PS = SPS
NO
YES
S34
MAINTAIN INVERTER FREQUENCY
S35
INCLEASE INVERTER FREQUENCY
S36
DECREASE INVERTER FREQUENCY

Fig. 10

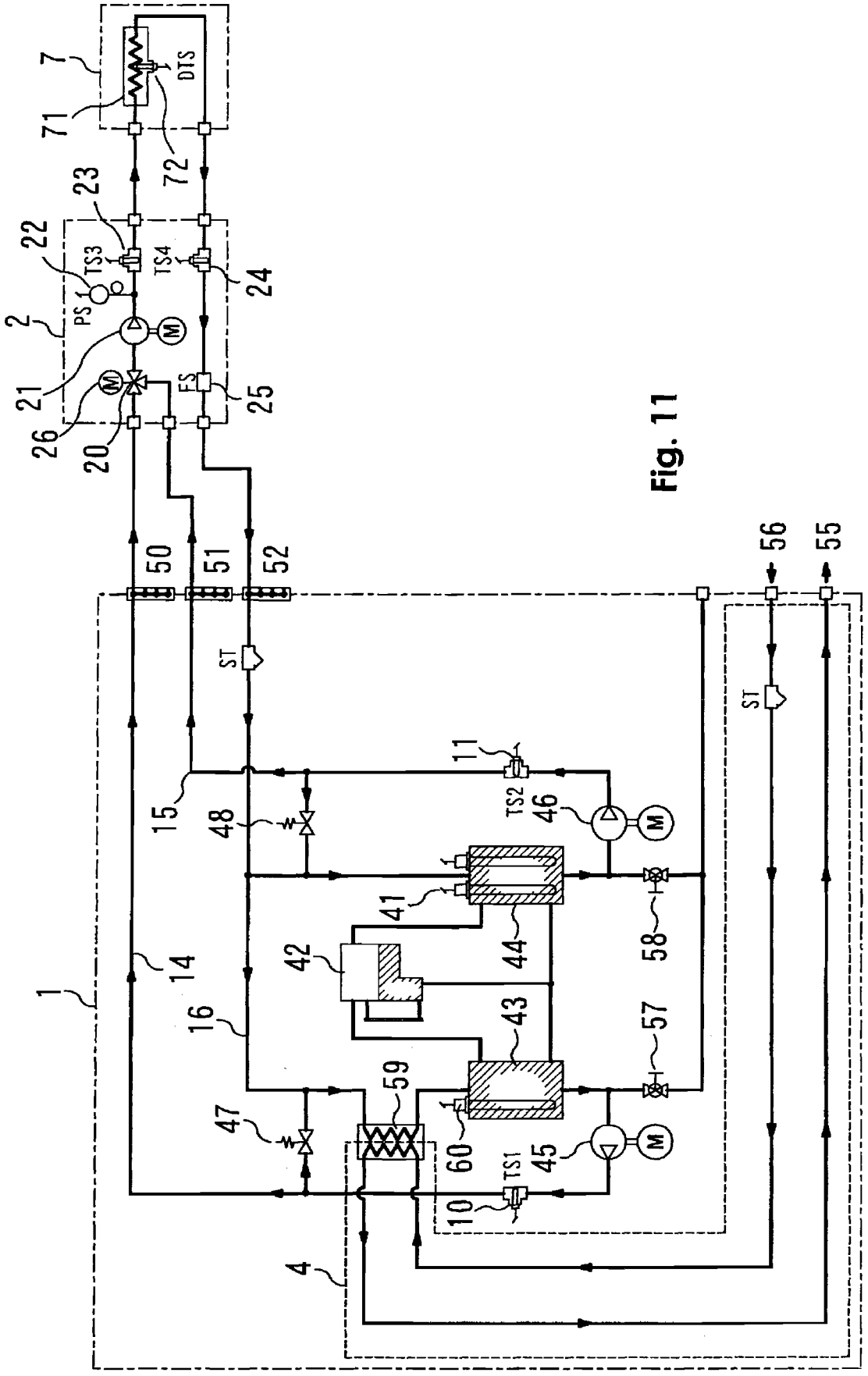

7
71
72
DTS
23
22
TS3
TS4
24
PS
2
21
26
20
ES
25
50
51
52
56
55
ST
11
TS2
46
15
48
41
42
44
58
14
1
16
43
57
59
47
60
TS1
45
10
4

Fig. 11

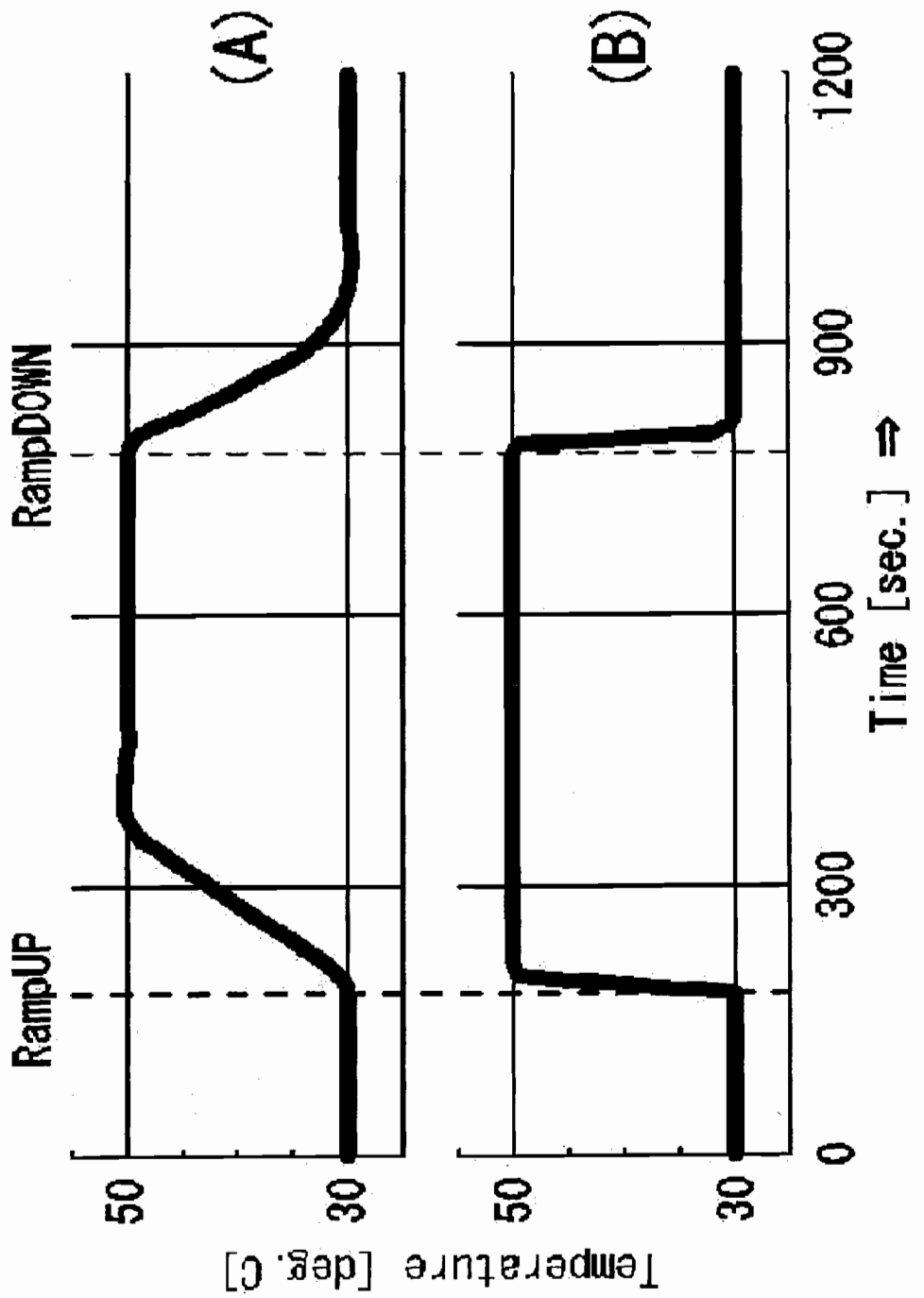

(A)
(B)
RampUP
RampDOWN
50
30
50
30
0
300
600
900
1200
Time [sec.] ⇒
Temperature [deg. C]

Fig. 12