

ABSTRACT OF THE DISCLOSURE:

A vacuum pump that allows for timely inspection and replacement of a temperature adjustment means, prevents unexpected stopping, and limits the maintenance cost, and a controller that controls the vacuum pump are proposed. The present invention relates to a vacuum pump for exhausting gas from an apparatus subjected to exhaustion. The vacuum pump includes: a temperature adjustment means for causing a predetermined area of the vacuum pump to have a predetermined temperature; an output control means configured to operate the temperature adjustment means; and an information output means configured to output information regarding ON/OFF of the temperature adjustment means obtained from the output control means.

FIG. 2

USER

200 CONTROL CIRCUIT

201 MAGNETIC BEARING CONTROL PORTION

202 MOTOR DRIVE CONTROL PORTION

203 TMS TEMPERATURE MEASUREMENT PORTION

204 PROTECTION FUNCTION PROCESSING PORTION

205 TMS OUTPUT CONTROL PORTION

206 CUMULATIVE COUNT INTERVAL MEASUREMENT PORTION

207 RECORD PROCESSING PORTION

208 NON-VOLATILE MEMORY

209 USER INTERFACE PROCESSING PORTION

210 INFORMATION OUTPUT PORTION

I/O SIGNAL

SERIAL COMMUNICATION

MAGNETIC BEARING

MOTOR

TMS TEMPERATURE SENSOR

TMS OUTPUT DEVICE

FIG. 3

CUMULATIVE COUNT INTERVAL MEASUREMENT

S1 IS OUTPUT STATE DIFFERENT FROM PREVIOUS STATE?

S2 CURRENT TIME - PREVIOUS TIME → DURATION

S3 IS OUTPUT STATE ON?

S4 AVERAGING PROCESSING OF ON DURATION
 S5 UPDATE PREVIOUS STATE TO OUTPUT STATE
 UPDATE PREVIOUS TIME TO CURRENT TIME
 S6 CUMULATIVE NUMBER COUNTER COUNT UP
 S7 AVERAGING PROCESSING OF OFF DURATION
 S8 ON DURATION + OFF DURATION → CYCLE TIME INTERVAL
 S9 AVERAGING PROCESSING OF CYCLE TIME INTERVAL

FIG. 4

ON DURATION
 ON STATE
 OFF STATE
 OFF DURATION
 CYCLE TIME INTERVAL
 TIME

FIG. 5

TEMPERATURE (°C)
 TIME

FIG. 6

OUTPUT DEVICE
 DURATION
 CYCLE TIME INTERVAL
 MIN
 SEC

FIG. 7

USER

200 CONTROL CIRCUIT

201 MAGNETIC BEARING CONTROL PORTION

202 MOTOR DRIVE CONTROL PORTION

203 TMS TEMPERATURE MEASUREMENT PORTION

204 PROTECTION FUNCTION PROCESSING PORTION

205 TMS OUTPUT CONTROL PORTION

206 CUMULATIVE COUNT INTERVAL MEASUREMENT PORTION

207 RECORD PROCESSING PORTION

208 NON-VOLATILE MEMORY

209 USER INTERFACE PROCESSING PORTION

210 INFORMATION OUTPUT PORTION

I/O SIGNAL

SERIAL COMMUNICATION

211 THRESHOLD VALUE

MAGNETIC BEARING

MOTOR

TMS TEMPERATURE SENSOR

TMS OUTPUT DEVICE

FIG. 8

USER

CONTROL CIRCUIT

INFORMATION OUTPUT PORTION

I/O SIGNAL

SERIAL COMMUNICATION

USER INTERFACE PROCESSING PORTION

PROTECTION FUNCTION PROCESSING PORTION

MAGNETIC BEARING CONTROL PORTION

MOTOR DRIVE CONTROL PORTION

TMS TEMPERATURE MEASUREMENT PORTION

TMS OUTPUT CONTROL PORTION

PUMP MAIN BODY

MAGNETIC BEARING

MOTOR

TMS TEMPERATURE SENSOR

TMS OUTPUT DEVICE