

Claims

1. Cooling system for contact cooling of a beverage container, the system comprising:
 - a cooling element;
 - a cooling contact body thermally conductively connected to the cooling element and arranged to be in thermally conductive contact with the container;
 - a sensor module arranged to provide a sensor signal having a sensor value indicative of a contact area between the cooling contact body and the container;
 - 10 - a processing unit arranged to control operation of the cooling element in response to the sensor signal.
2. Cooling system according to claim 1, wherein the processing unit is arranged to control the cooling element to be operative in a switched mode, wherein a first time interval during which the cooling element is instructed to operate is dependent on the sensor value.
3. Cooling system according to claim 2, wherein the processing unit is arranged to increase the first time interval with a decreasing contact area as indicated by the sensor value.
4. Cooling system according to any of the preceding claims, wherein the processing unit is arranged to
 - 25 - operate the cooling element at a first level to withdraw thermal energy from the cooling contact surface body until a first requirement has been met;

- operate the cooling element at a second level lower than the first level or switch off the cooling element until a second requirement has been met;

wherein:

- 5 - the amount of energy provided to the cooling element at the first level is increased as the contact area indicated by the sensor value decreases; and
- the amount of energy provided to the cooling element at the first level is decreased as the contact area indicated by the sensor value increases.

10

5. Cooling system according to any of the preceding claims, wherein:

- the sensor module comprises a temperature sensor arranged for sensing temperature of at least one of the container and the cooling contact body; and
- the processing unit is arranged to control operation of the cooling element based on change of the sensor value over time.

15

6. Cooling system according to claim 5, wherein the processing unit is arranged to:

20

- operate the cooling element at a first level to withdraw thermal energy from the cooling contact surface body until a first requirement has been met;
- operate the cooling element at a second level lower than the first level or switch off the cooling element until a second requirement has been met;
- determine a time period between operation of the cooling element at the second level or switching off the cooling element and reaching the second requirement;

25

- determining the first requirement based on the determined time period.
- 5 7. Cooling system according to claim 6, wherein the first requirement is at least one of:
- an amount of energy provided to the cooling element;
 - an amount of time;
 - a temperature sensed by the sensor module.
- 10 8. Cooling system according to claim 6 or 7, wherein the second requirement is at least one of:
- an amount of time;
 - temperature.
- 15 9. Cooling system according to any of the claims 6 to 8, wherein:
- the first requirement is a time period during which the cooling element is operated;
 - the second requirement is a temperature;
 - the time period as the first requirement is increased as the

20 determined time period decreases; and

 - the time period as the first requirement is decreased as the

25 determined time period increases.
10. Cooling system according to any of the preceding claims, further comprising an ambient temperature sensor for determining a temperature of ambient air around the cooling system.
11. Cooling system according to any of the preceding claims, wherein the sensor module comprises a contact sensor arranged to provide a

signal having a value indicative of a contact area between the container and the cooling contact body.

12. Cooling system according to claim 11, wherein the contact sensor is
5 at least one of:
- a conductivity measurement sensor;
 - a pressure sensor.
13. Beverage dispensing system comprising a cooling system according
10 to any one of the previous claims
14. Method of cooling a liquid in a container by contact cooling,
wherein:
- a container containing liquid is received against a contact surface
15 of a cooling system;
 - a cooling energy transfer rate between the contact surface and the
container is determined; and
 - the cooling energy supply to the cooling system is controlled by a
control unit of the cooling system based on said cooling energy
20 transfer rate.
15. Method of cooling according to claim 14, wherein the cooling energy
transfer rate is determined by:
- cooling the contact surface over a first period of time, and
25 - temporarily terminating cooling of the contact surface over a
second period, and measuring the temperature of the container
with at least one first sensor, wherein the duration of the second
period is measured between terminating cooling and reaching a
predetermined temperature of the container measured with said
30 first sensor,

wherein the cooling energy transfer rate is defined as the said duration of the second period.

16. Method of cooling according to claim 15, further comprising:

- 5 - repeating the first and second step at least once;
- wherein for each second period a cooling energy transfer rate is defined;

wherein consecutive cooling energy transfer rates are compared and:

- if the cooling energy transfer rate over at least two previous second
10 periods increases, i.e. the duration of the second period is increasing, decreasing supply of cooling energy to the cooling system for the following first period; whereas
- if the cooling energy transfer rate over at least two previous second
15 periods decreases, i.e. the duration of the second period is decreasing, increasing supply of cooling energy to the cooling system for the following first period.

17. Method of cooling according to any one of claims 14 - 16, wherein the temperature of the container is measured using a temperature
20 sensor in contact with an outer surface of the container, preferably with a contact sensor thermally isolated from the contact surface.

18. Method of cooling according to any one of claims 14 - 17, wherein a remaining volume of liquid in the container is measured or
25 calculated and the supply of cooling energy to the cooling system is controlled based on said remaining volume of liquid, at least below a threshold value for said remaining volume.

19. Method of cooling according to any one of claims 14 - 18, wherein
30 supply of cooling energy to the cooling system is controlled such

that a convection flow of liquid in the container is initiated and/or maintained by subsequent cooling and non-cooling of the contact surface.

- 5 20. Computer readable medium, comprising instructions which, when
executed by an electronic processing unit, enable the processing
unit to control a cooling system according to any one claims 1 - 12
comprising the electronic processing unit, a beverage dispensing
system of claim 13 comprising the electronic processing unit or
10 cause the electronic processing unit to carry out a method
according to any one of claims 14 - 19.