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**Datasheet for the decision  
of 21 December 2010**

**Case Number:** T 0517/09 - 3.2.04

**Application Number:** 01902940.4

**Publication Number:** 1251732

**IPC:** A01J 9/04

**Language of the proceedings:** EN

**Title of invention:**

Method and system for controlled cooling of small milk quantities

**Patentee:**

DeLaval Holding AB

**Opponent:**

GEA WestfaliaSurge GmbH

**Headword:**

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**Relevant legal provisions:**

EPC Art. 100(a), 56

**Relevant legal provisions (EPC 1973):**

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**Keyword:**

"Inventive step (no) (all requests)"

**Decisions cited:**

-

**Catchword:**

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Case Number: T 0517/09 - 3.2.04

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.04  
of 21 December 2010

**Appellant:**  
(Opponent)

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**Decision under appeal:**

Decision of the Opposition Division of the  
European Patent Office posted 14 January 2009  
rejecting the opposition filed against European  
patent No. 1251732 pursuant to Article 102(2)  
EPC.

**Composition of the Board:**

**Chairman:** M. Ceyte  
**Members:** A. de Vries  
T. Bokor

## Summary of Facts and Submissions

I. The Appellant (Opponent) lodged an appeal, received 26 February 2009, against a decision of the Opposition Division posted 14 January 2009 to reject the opposition against European patent No. 1 251 732, and simultaneously paid the appeal fee. The statement of the grounds of appeal was received 20 May 2009.

II. The opposition had been filed against the patent as a whole based among others on Article 100(a) in combination with Articles 56 EPC for lack of inventive step.

The Opposition Division held that the grounds mentioned did not prejudice the maintenance of the granted patent having regard in particular to the following document:  
D2: EP-A-0 471 598

III. During the appeal proceedings the Board considered the following further documents filed by the Appellant with the appeal:  
D14: DE-A-195 29 763  
D15: US-A-2 986 895

IV. Oral proceedings before the Board were duly held on 21 December 2010.

V. The Appellant requests that the decision under appeal be set aside and the patent be revoked in its entirety.

The Respondent (Proprietor) requests that the appeal be dismissed (main request), or, in the alternative, that the patent be maintained in amended form on the basis

of the first or fourth auxiliary request filed with letter of 19 November 2009, or on the basis of the second or third auxiliary request filed with the letter of 11 November 2010.

Both parties have requested oral proceedings.

VI. The wording of the independent claims of the requests is as follows:

*Main Request*

1. "A method for controlling the cooling of small milk quantities, milk spots, entering, with time intervals, a cooling tank (2) having at least a bottom wall portion (12) with a milk contacting cooling surface (12') within the tank being part of a cooling circuit, an agitator means (19) being provided within the tank for agitation of the milk in the tank, characterized by the following steps:

- a) providing a means (10) for measuring the milk quantity in the tank, and a temperature transducer (11) for monitoring the milk temperature in the tank,
- b) providing, in series in the cooling circuit, an evaporator (4) connected to the bottom wall portion of the tank, a compressor(5), and a condenser (7),
- c) controlling the temperature of the refrigerant in the evaporator by regulating the vaporizing pressure of the refrigerant, so that the temperature of the milk contacting cooling surface (12') is always at least slightly higher than 0°C, whereas the refrigerant temperature in the evaporator (4) is below 0°C when the compressor (5) is running,

d) monitoring, by said measuring means, the milk quantity in the tank, and, when said milk quantity turns out to be sufficient/insufficient for the agitator means (19) to work properly, starting/stopping the operation of the agitator means."

8. "A system for controlled cooling of small milk quantities, milkspots, entering, with time intervals, a milk cooling tank(2) having at least a bottom wall portion (12)comprising, on the milk contacting side thereof, a milk cooling surface (12') being part of an evaporator (4) in a cooling circuit, the tank containing an agitator means (19) being provided for agitation of the milk in the tank; a means (10) for measuring the milk quantity in the tank; said cooling circuit comprising, in series therein, the evaporator (4); a motor (13)-driven compressor (5) being connected to a refrigerant outlet (6) from the evaporator, and, through an interconnected condenser (7) and an expansion valve (8) downstream thereof, to a refrigerant inlet (9) to the evaporator (4), characterized by a temperature transducer (11) for monitoring the milk temperature in the tank, control means regulating the operation of the cooling equipment in dependence of the vaporizing pressure of the refrigerant when there is a small milk volume in the milk cooling tank (2) and the agitator means (19) cannot work properly, and a vapour pressure sensor (17;40)."

*Auxiliary Request 1*

Claim 1 is as in the main request, while claim 8 replaces the term "cooling equipment" by "cooling circuit".

*Auxiliary Request 2*

This request includes only method claims. Claim 1 is as in the main request.

*Auxiliary Request 3*

This request includes only system claims. Claim 1 corresponds to claim 8 of the main request.

*Auxiliary Request 4*

Claim 1 is as in auxiliary request 3 but replaces "cooling equipment" by "cooling circuit".

VII. The Appellant argued as follows:

Vis-à-vis D15 as closest prior art the method of claim 1 differs only in feature (c) of the control in response to refrigerant vaporizing pressure. This is however known to the skilled person, an engineer in refrigeration technology, from his common general knowledge in that field, as e.g. documented by D14. There is no link between features (c) and (d); control of the refrigerant temperature is independent of the level. The requirement of feature (c) that control is "always .... when the compressor is running" does not represent any clear limitation, as cooling must always

take place when the compressor is running. It does not exclude stopping both stirring and cooling at low level.

The same argumentation applies also to the claimed system, where the only difference over D15 resides in the control means regulating operation of the cooling equipment in response to vapour pressure rather than refrigerant temperature.

Alternatively, D2 can be considered as closest prior art for the claimed system. The stirrer contributes to the cooling action and is part of the cooling equipment. It is controlled in response to vapour pressure. Cooling continues also for very low amounts when the agitator may be above liquid level and "cannot work properly". This formulation does not imply that the agitator is stopped. Intermittent operation below 4°C implies a temperature sensor. The only difference - a level sensor - is standard in milk cooling tanks, see D2 itself and D15.

VIII. The Respondent argued as follows:

The invention can be summarized as cooling when the amount is too small for stirring, by vapour pressure responsive control such that no freezing occurs. The method of claim 1 thus cools when the agitator is stopped and at a reduced level. This is implicit in the temperatures specified in feature (c). The system of claim 8 similarly regulates the cooling equipment in response to vapour pressure when there is small milk volume and the agitator cannot work properly. This means that the agitator is stopped. Cooling equipment, when read in context and in the light of the

description, can only reasonably mean the cooling circuit per se, which does not include the agitator. The agitator does not generate cooling.

In D15 cooling takes place only if there is sufficient milk and the temperature is high enough, but no cooling when the level is too low. There is no incentive for the skilled person to modify this teaching and cool when the level is low and when the agitator cannot work properly.

Similarly, in D2 cooling stops at 4°C and there is no indication to adapt cooling below this point. There is no cooling without stirring as stirring always takes place, also at low levels. There is no suggestion to cool when the agitator cannot work properly. Even if regulation of cooling equipment in the system claim was to be read as referring to control of the agitator, it makes no sense to control it when it is stopped.



## Reasons for the Decision

1. The appeal is admissible.
2. *Late filed evidence*

The Respondent has not contested admissibility of documents D14 and D15. Their relevance is immediately apparent and the Board therefore exercises its discretion under Article 114(2) EPC in conjunction with Article 12(4) of the Rules of Procedure of the Boards of Appeal of the EPO to admit these documents into the procedure.

3. *Background*

The patent concerns cooling of milk in a cooling tank with a standard cooling unit and an agitator. Small quantities of milk ("milk spots") may freeze when fed into a nearly empty tank and the milk level is too low or shallow for effective stirring of the milk, specification paragraphs [0007] and [0008]. According to specification paragraph [0016], the idea is to monitor and control the pressure of refrigerant in the evaporator. Thus, the method of granted claim 1, includes a step (c) of "controlling the temperature of the refrigerant in the evaporator by regulating its vaporizing pressure of the refrigerant" to always produce desired cooling temperatures when the compressor is running, while the agitator is started/stopped in response to monitored milk quantity. The system of claim 8, on the other hand, has as a characterizing feature control means that regulate "operation of the cooling equipment in dependence of

the vaporizing pressure of the refrigerant when milk volume is small and the agitator cannot work properly".

4. *Inventive Step : method of claim 1 as granted (main, auxiliary requests 1,2)*

4.1 In the Board's view D15 represents the closest prior art for evaluating inventive step of the claimed method. D15's disclosure shares many constructional and functional features with the claimed method. In particular it is concerned with the same problem that occurs when milk that enters a tank intermittently and in small amounts, does so when the tank is empty and there is a risk of the milk freezing, column 4, lines 1 to 3.

Figure 1 of D15 in conjunction with column 2, lines 5 to 34, shows a milk cooling tank 10 with tubes or passages 21 in a bottom portion forming a milk contacting cooling surface as part of a cooling circuit, as well as an agitator 16 within the tank.

Tubes/passages 21 form the cooling circuit's evaporator connected in series with a compressor 25 and a condenser (in a cooling tower 64, see column 2, lines 62 to 65), feature (b) of method claim 1.

Furthermore, a level sensor 18 is provided in the tank for measuring milk quantity, column 2, lines 12 to 17, as is a temperature switch or transducer 74 that monitors milk temperature, column 3, lines 9 to 11, feature (a) of claim 1. In operation the level sensor 18 controls the motor 14 of the agitator via a switch 20 to start/stop the agitator when the level rises or drops above a given level, column 4, lines 45 to 46,

and is too shallow for proper agitation, column 5, lines 64 to 66 (feature (d)).

- 4.2 Claim 1, feature (c), requires control of refrigerant temperature *by regulating its vaporizing pressure so that the cooling surface temperature is always slightly above 0°C and the refrigerant temperature below 0°C when the compressor is running.*

D15 in contrast uses conventional thermostatic control of expansion valve 32 using thermostatic bulb 33 to keep the refrigerant temperature at the evaporator outlet (at 23) constant, column 2, lines 30 to 35. Cooling is halted when the milk level is too low to avoid freezing, see e.g. the paragraph bridging columns 3 and 4 in conjunction with column 3, lines 30 to 42 (the level switch 20 operates solenoid 31 to close refrigerant valve 30). D15 also does not mention any desired temperatures for the contact surface or the refrigerant.

Vapour pressure control in accordance with the temperature regime as in feature (c) is the only difference of the method of claim 1 over the method of operation of D15's cooling assembly.

- 4.3 As to the technical significance of vapour pressure control the Board firstly notes that claim 1 does not require this control or continued cooling for small milk amounts. Rather, control must take place "always ... when the compressor is running". This does not exclude that the compressor is stopped and cooling halted when the milk amount is small, as in the first embodiment, specification paragraph [0031] and figure 1.

Nor do the temperature values of feature (c) imply continued cooling when the milk amount is too small for stirring. They could be specific to other conditions that, besides milk amount, determine the overall cooling efficiency and the resulting relevant temperatures. These include, for example, cooling contact surface area, refrigerant heat capacity, or the heat transfer within the milk (depending on amount or rate of stirring), which, suitably chosen, may also produce similar temperature values for any amount of milk.

The significance of the claimed vapour pressure control lies elsewhere. Specification paragraph [0034] in connection with the variants of the embodiment of figure 4 may provide an answer. Vaporizing pressure may be lowered "when ... the heat transfer ... is improved" (lines 16 to 18) or may be controlled "so that the heat transfer becomes optimal without any risk of freezing" (lines 21 to 24 or 31 to 34). This suggests that vapour pressure control *per se* allows for the cooling circuit to be better attuned or optimized to the cooling requirements, in particular, but not necessarily only when the milk amount is small.

As noted the temperature values (which are not mentioned elsewhere in the patent, let alone explained) are also not intricately linked to small filling amount. They may at best be regarded as optimal values for other unspecified conditions, which by setting the temperature of the cooling contact surface above 0°C and thus above milk freezing point guarantee that under no circumstance will milk ever freeze.

In the light of the above the Board formulates the objective technical problem to be solved vis-à-vis D15 as *how to optimize cooling with respect to cooling requirements while avoiding any freezing of the milk in the tank.*

- 4.4 D14, see the sole figure and abstract, teaches the control of a general cooling circuit with, in series, an evaporator 4, a compressor 14, and a condenser 32, in response to the refrigerant vapour pressure sensed by sensor 16 in the outlet 48 of the evaporator 32. The sensor feeds into control means 18 which controls the compressor 14 to maintain the vapour pressure at a constant level (its set-point or "Sollwert"). This feedback control scheme offers "simple and reliable" control of cooling capacity, which allows the vapour pressure to be set to, for instance, "an ideal value that produces particularly advantageous conditions from a process-technical point of view", see the abstract, or column 3, lines 41 to 45, i.e. optimized to the process requirements. It applies to cooling circuits of the above general type, see the second and third paragraphs of column 1. Moreover, it corresponds to the specific control used in the embodiment of figure 4 of the appealed patent, see specification paragraph [0034], where control equipment 41 fed by pressure sensor 40 at the outlet of evaporator 4 regulates compressor speed to keep the vapour pressure constant.

- 4.5 It is a natural concern of the skilled person, a refrigeration engineer involved in the development of a milk cooling arrangement such as that of D15, to optimize cooling control. This is implicit in the

desire to maintain milk in the cooling tank at a predetermined, controlled temperature, see D15, column 1, lines 12 to 13 and 27 to 28.

Intent on optimizing the control of a milk cooling arrangement as in D15, the skilled person will as a matter of course draw on the teaching of D14 to replace the thermostatic control as in D15 by an optimized control scheme as in D14. In so doing he or she will set the reference vapour pressure (its set-point) to some optimal value attuned to the cooling requirements of his specific cooling system, one of which is to avoid freezing of milk in the tank. The values given in feature (c) of claim 1 can be regarded as the result of such routine optimization and are of no inherently inventive value. The method resulting from the obvious adoption of the D14 scheme and subsequent routine optimization is that of claim 1.

4.6 The Board concludes that the method of claim 1 as granted (main, first and second auxiliary requests) lacks inventive step, Article 100(a) with Article 52(1) and 56 EPC.

5. *Inventive Step : Independent claims to the system (main, auxiliary requests 1,3,4)*

5.1 The independent claims to the system (main request, auxiliary requests 1,3,4) offer alternative definitions of the main idea in terms of the cooling system itself. They differ from that underlying method claim 1 in a number of points: there is no longer any requirement as to the temperature regime, but the cooling circuit now includes an expansion valve and there is a vapour

pressure sensor. Finally, the control means now regulates the operation of the cooling equipment or circuit in dependence of refrigerant vapour pressure *when there is a small milk volume in the tank and the agitator cannot work properly*. The latter feature is understood to mean that cooling continues even when the amount of milk is too small and the level too shallow for satisfactory stirring, cf. specification paragraph [0008]. This does not mean that stirring is necessarily stopped, merely that it no longer has its intended effect if it were to continue.

5.2 The Board recalls that in D15, which also includes an expansion valve at 32 in the cooling system shown in figure 1, control is such as to stop cooling when the level is too shallow for proper stirring and stirring is in fact stopped. The vapour pressure sensor and the continued cooling at low level therefore represent further differences of the claimed system over D15, in addition to that of vapour pressure control noted in the previous section, but without the temperature regime requirement. The previous objective technical problem can be refined as follows: *how to optimize cooling to the cooling requirements and still cool the milk when the milk amount is too small for proper stirring*.

5.3 As argued previously, it is obvious for the skilled person, a refrigeration engineer, to adopt vapour pressure control as in D14 in a milk cooling system or scheme as in D15. This is because D14 offers cooling control that can be optimized or better attuned to the cooling requirements of the D15 type milk cooling system. One of those requirements is that cooling

should not be so much as to freeze the milk in the tank. D15 met this requirement in relatively roughshod manner by simply stopping cooling when the milk was most at risk of freezing, namely at low level when the agitator is also stopped, see above. That approach is based on the insight that without proper stirring the milk stratifies, see the paragraph bridging columns 5 and 6, giving reduced heat transfer within the milk so that the milk freezes onto the cooled walls of the tank, column 4, lines 1 to 3. In that case cooling exceeds demand and it is simply stopped. The overall desire to maintain the milk at a controlled low temperature, see column 1, first paragraph, remains, but is outweighed by the concern that freezing spoils the milk. Put otherwise, the skilled person would like to continue to cool, but cannot.

In obviously adopting the approach of D14 to control cooling to suit the cooling requirements of a system better than conventional thermostatic control allows, the skilled person, who has wanted to but could not cool when the milk amount was too small, now has a way of doing so. He or she will therefore as a matter of course abandon D15's rough approach, and replace it with continued cooling and a vapour pressure responsive control as in D14 that is optimized to allow cooling also when the level is low. The necessary adaptations of the control circuitry are straightforward, while the particular setting of the control values is routine, see above. The Board concludes that the system of independent claim 8 of the main and first auxiliary request, corresponding to claim 1 of the third and fourth auxiliary requests respectively, lacks inventive step, Articles 100(a) and 52(1) with Article 56 EPC.



5.4 In the above analysis the Board has, for the sake of argument, read "cooling equipment" in claim 8 of the main and identical claim 1 of the third auxiliary request to mean "cooling circuit", used in the main system claim of the other requests. It adds that a broader reading of "cooling equipment" - a term not used elsewhere in the patent - as encompassing all the basic elements of the cooling system that cool or assist cooling, such as the agitator, is however both possible and reasonable. D2, for example, in column 4, lines 22 to 27, lists the agitator 10 as forming part of the cooling system. The patent itself, see specification paragraph [0034], lines 13 to 19, links agitation with requisite vapour pressure and thus cooling effect. Vapour pressure responsive control of the cooling equipment in this broader reading thus also encompasses control of the agitator in response to vapour pressure.

5.4.1 Such control is disclosed in the milk cooling system of D2, shown generally in the sole figure and including a conventional cooling circuit with evaporator 2, compressor 4, condenser 5 and expansion valve 6. That system controls cooling of milk entering the tank 1 in intermittent, small amounts ("traite"), column 3, lines 23 to 28.

D2's main idea is to rotate the agitator 10 in the tank 1 at a first, lower speed when a small amount enters an empty tank, and at a second, higher speed when it enters a tank with already cooled contents, column 3, lines 29 to 47. This is detected in different ways. In a third embodiment, see column 5, lines 15 to 23, a

control means 15 selects the different agitation speeds in response to the pressure in the low pressure part 8 of the cooling circuit piping, i.e. the vapour pressure at the evaporator outlet. This necessarily involves an implicit vapour pressure sensor. The agitator *always* operates at one or the other of the two speeds, though, see column 5, lines 43 to 50, it does so intermittently when the storage temperature of ca. 4°C is achieved, implying the presence of a temperature sensor. It follows that the vapour pressure responsive control of the agitator as part of the cooling equipment continues (at the first, reduced speed) even if the milk amount is so small and the filling level so shallow that the agitator is no longer submerged and cannot stir properly.

- 5.4.2 The only feature of the system of the independent system claim as granted not disclosed in this embodiment of D2 is that of a level sensor. This constitutes the sole difference over this prior art.
- 5.4.3 A level sensor naturally provides information on the filling level of the tank, for example for display or as additional control input. That it is commonly used to this end in milk cooling systems behoves little comment. D2, in a second embodiment, see the paragraph bridging columns 4 and 5, and the figure at DN, and D15 at 18 in figure 1, see also above, provide examples. The inclusion of such a commonplace feature in a cooling system such as that of the third embodiment of D2 does not require any inventive insight. The system of claim 8 as granted (main request), which is identical to claim 1 of the auxiliary request 3, for

this reason additionally lacks inventive step,  
Article 100(1) with Articles 52(1) and 56 EPC.

6. The Board concludes that as the method of claim 1 and the system of claim 8 as granted (main request) lack inventive step, this opposition ground prejudices maintenance of the patent as granted. Nor do the amendments offered in the auxiliary requests remedy this defect, so that patent as amended also fails to meet the requirements of the EPC. Pursuant to Article 101(2) and (3)(b) EPC the Board must therefore revoke the patent.

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar

The Chairman

C. Eickhoff

M. Ceyte