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73 Octrooihouder(s):

CSK Food Enrichment B.V. te Leeuwarden.

72 Uitvinder(s):

Wieger Jan Koopmans te Leeuwarden.

Tette Hijlkema te JONKERSLAN.

Jan Kevelam te Ede.

Willem Cornelis Meijer te EDE.

74 Gemachtigde:

Dr. R. Jorritsma c.s. te Den Haag.

54 **Spray coating compositions for cheese.**

57 The present invention relates to a method for coating cheese which comprises applying a cheese coating composition to said cheese using a spraying device. The invention also provides a cheese coating composition which is especially suitable for use in the method. The cheese coating composition has relatively high polymer solids content and a relatively low viscosity at high shear rates which makes it very suitable for industrial application of a protective coating layer on a cheese.

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Spray coating compositions for cheese

Field of the invention

The present invention relates to a method for coating cheese which comprises applying
5 a cheese coating composition to said cheese using a spraying device. The invention also provides a cheese coating composition which is especially suitable for use in the method.

Background of the invention

10 Semi-hard and hard cheeses are commonly treated with a cheese coating composition in order to control mould growth and in addition to protect the cheese from mechanical damage, for example during handling or transportation. Such cheese coating compositions are herein referred to as protective cheese coatings. Protective cheese coatings are to be distinguished from cheese conditioning aids based on optionally
15 thickened fungicide suspensions, which merely provide mould control and essentially no mechanical protection. Protective cheese coatings require the presence of significant amounts of film-forming agents, especially of emulsion polymers.

Most cheese is industrially treated with a protective cheese coating using a machine
20 equipped with a rotating brush. An example of such a coating machine is provided in CH 677999. The rotating brush may conveniently be replaced by pieces of cloth mounted on a rotating shaft.

In industrial cheese coating processes involving a rotating brush or the like, protective
25 cheese coatings based on protective colloid-stabilized homo- or copolymer dispersions comprising vinylic esters and/or (meth)acrylic esters are typically used. Note that herein, the expression “protective colloid” is notionally unrelated to the term “protective cheese coating” defined above and refers to substances such as poly(vinyl alcohol), cellulose ethers and the like, which are suitable for producing stable polymer
30 emulsions in emulsion polymerisation processes. The expression “protective colloid” is also known as “Schutzkolloid” in German.

A ready-to-use protective cheese coating composition for use with a rotating brush coating machine is commercially available as, for example, Ceska WL 200.03.45,

commercially available from CSK Food Enrichment BV, The Netherlands. This product comprises a solids content of approx. 40 wt.% and has a Brookfield viscosity, when measured at room temperature, of 4500 mPa.s. This product is based on a poly(vinyl alcohol)-stabilised copolymer emulsion of vinyl acetate and dibutylmaleate, which emulsion may be suitably obtained as Mowilith® SDM 4230, ex Celanese Emulsions GmbH, Germany. Mowilith® SDM 4230 is a poly(vinyl alcohol)-stabilized copolymer emulsion of vinyl acetate and dibutylmaleate having a Brookfield viscosity, at room temperature, ranging between approx. 150.000 – 200.000 mPa.s and having a solids content of 45 wt.%.

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Whilst rotating brush coating machines are very effective in use, particular in view of their high throughput capacity, for some applications, it may be desirable to apply protective cheese coatings by spraying. In particular, in contrast to machine application using a rotating brush-like device, spray application allows quick changes to be made in between treatments of different types of cheeses each requiring different coating finishes in terms of gloss, colour and the like.

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WO 8603651 discloses a spray coating machine for applying a coating to a cheese. However, relatively little is known in the literature about protective spray coating formulations for cheese. Some hints are provided in WO/2006/056561, which discloses a peelable coating based on a water-borne dispersion and further comprising additives to lower the water vapour permeability, such as hydrophobic substances. Preferred water-borne emulsions are polymers or copolymers of polyethylene, poly(vinyl acetate – vinyl ester of carboxylic acid) or poly(acrylate) or mixture thereof. WO/2006/056561 further discloses that “Application [of these coatings] can be manual (e.g. with sponge or brush), semi-automatic or automatic (e.g. by brushing, dipping or spraying) depending on the number of foodstuffs to be treated. Specialised cheese coating and sausage coating machines are commercially available.” However, WO/2006/056561 does not provide any directions for optimizing the coating compositions for spray applications. Furthermore, spray applications are not disclosed in the Example.

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WO/2006/056561 further refers to “commercially available coating products such as Plasticoat[®], Delvocoat[®] or Premicoat[®]”

Plasticoat® is said to consist of a copolymer emulsion of vinyl acetate and “...is supplied in various viscosities and can be coated by hand or using a plastifying machine”; see http://www.dsm.com/en_US/html/dfs/dairy-products-preservation-pva-coatings.htm?DCSext.src=search. Furthermore it is mentioned that Plasticoat® is particularly suitable for coating of Northern European cheese, such as for example Gouda cheese. In this context the skilled person would immediately understand that Plasticoat® has been developed for a rotating brush coating machine (or indeed, synonymously, plastifying machine).

Premicoat® appears to relate to a range of natamycin-based coatings for dried and cured sausages, it is said to be a “patented formulation of Delvucid® and thickening agents”, cf. http://www.dsm.com/en_US/html/dfs/news_items/premicoat0108.htm. This publication is silent on the mode of application and on the presence of a polymer emulsion.

Delvocoat® is sold by DSM Food Specialties as “tailormade products ... suitable for spraying and brushing applications”. Delvocoat is said to “consist of high viscosity emulsion of PVA”; see http://www.dsm.com/en_US/html/dfs/dairy-products-preservation-superdex.htm. No product specifications or further technical information appears to be publicly accessible through internet databases. If anything, this prior art would prompt the skilled person to look for “high viscosity emulsion of PVA”.

It was found that rotating brush coat compositions available, such as water-borne cheese coating compositions based on high viscosity protective colloid-stabilized polymer emulsions such as Mowilith SDM 4230, appear unsuited *per se*. Using such compositions it is difficult or even impossible to achieve sufficient flow through a suitable nozzle.

In therefore appears that only a small amount of inconclusive information is available to the skilled person in order to allow him or her to formulate a *protective* cheese coating composition suitable for spraying.

Summary of the invention

It is an object of the present invention to provide a suitable protective spray coating formulation for cheese, especially for semi-hard or hard cheese.

It was determined that a decisive factor for allowing a high application rate at high polymer solids content is the high-shear viscosity of the emulsion, especially the viscosity measured at a shear rate of 1.10^3 s^{-1} at $20 \text{ }^\circ\text{C}$. The Brookfield viscosity appears of lesser importance. However, simultaneously, it is critical to maintain the amount of polymer solids in the spray coat composition at high levels, i.e. at a minimum total solid content of 38 %. At lower levels, the protective effect which could be obtained in a first coating treatment of a freshly brined cheese in terms of robustness is limited, particularly in a large scale industrial setting. In addition, extended drying times associated with lower polymer solids content should be avoided. Drying speed is of great importance in methods for coating of cheese comprising drying the coating and applying another coating layer to the cheese thus obtained. Accordingly the cheese receives several coating treatments. Such coating methods are widely employed for producing semi-hard or hard cheese, such as Gouda.

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It was found that these requirements cannot be met by merely diluting commercially available rotating brush cheese coating compositions based on protective colloid-stabilized vinylic ester copolymers such as Mowilith SDM 4230, since acceptable flow rates were only obtained when diluting to a polymer solids content of below ca. 38 wt.% with respect to the total weight of the composition.

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When further exploring flow rate as a function of shear viscosity and solid matter content, protective colloid-stabilized polymer emulsions were found which could be suitably employed in spray applications for coating cheese at even higher solids contents, *i.e.* at 38 wt.% or higher, whilst still allowing sufficient flow rates. These coating compositions having a minimum solids content of 38 wt.% can be suitably employed as protective coatings in an industrial environment.

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In a first aspect, the present invention relates to a method for coating cheese comprising spraying a water-borne cheese coating composition to a cheese, wherein the water-borne cheese coating composition comprises a protective colloid-stabilized polymer in an amount of 38-60 wt.% with respect to the weight of the composition, wherein said protective colloid-stabilised polymer is a polymer or a mixture of polymers obtainable

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by emulsion polymerisation in the presence of a protective colloid of (1) a monomer selected from the group consisting of a vinylic ester, an acrylic ester and a methacrylic ester or a mixture thereof, and (2) optionally one or more further monomer(s); and wherein said coating composition has a viscosity, when measured at 20 °C and at a shear rate of $1 \cdot 10^3 \text{ s}^{-1}$, of 300 mPa.s or less. The cheese coating composition preferably further comprises an additive selected from the group consisting of a colorant and a fungicide, or both.

In another aspect, the present invention relates to a water-borne cheese coating composition comprises a protective colloid-stabilized polymer in an amount of 38-60 wt.% with respect to the weight of the composition, wherein said protective colloid-stabilised polymer is a polymer or a mixture of polymers obtainable by emulsion polymerisation in the presence of a protective colloid of (1) a monomer selected from the group consisting of a vinylic ester, an acrylic ester and a methacrylic ester or a mixture thereof, and (2) optionally one or more further monomer(s); and wherein said coating composition has a viscosity, when measured at 20 °C and at a shear rate of $1 \cdot 10^3 \text{ s}^{-1}$, of 300 mPa.s or less. Preferably, the cheese coating composition further comprises an additive selected from the group consisting of a colorant and a fungicide, or both.

At the aforementioned conditions, the viscosity is preferably between 50 and 300 mPa.s, more preferably between 100 and 250 mPa.s.

The one or more further monomer(s) are preferably selected as an ethylenically unsaturated monomer, preferably a maleic or a fumaric diester or ethylene, or a mixture thereof. Optionally, an emulsifier may further be present in addition to the protective colloid. Preferably, the optional emulsifier is present in an amount of 10 wt.% or less with respect to the polymer solids content. Low emulsifier contents are desirable in view of adhesion of further coating layers.

The protective colloid-stabilized polymer is suitably and preferably obtainable as a so-called medium to low viscosity polymer emulsion, for example as a medium viscosity poly(vinyl ester) homo- or copolymer emulsion. It is noted that Mowilith SDM4230 is

a high-viscosity polymer emulsion. An example of a suitable and commercially available medium-viscosity polymer emulsion is Vinavil EVA 6615, a poly(vinyl acetate-co-ethylene) emulsion having a polymer solids content of ca. 60 wt.% and having a Brookfield viscosity at room temperature of 4000-8000 mPa.s.

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On a separate notice, it was found that all-emulsifier stabilized polymer emulsions generally have the above-mentioned desired characteristics to be applied in protective cheese coatings for spraying. Using such emulsions, spray coating formulations for cheese could be generated having sufficiently high solid matter content (e.g. between 10 38 and 50 wt.%) in order to provide a sufficiently thick and protective coating layer and whilst allowing a sufficient application rate. However, the presence of large amounts of surfactants and in addition the absence of protective colloids may negatively affect the adherence of further coating layers to be applied at a later stage during ripening, and especially of a wax layer which is sometime applied as a finishing layer to a coated 15 cheese in order to further protect it against mould growth and evaporative water loss.

Detailed description of the invention

Definitions

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Herein, the expression “polymer solids content” refers to the content of the protective colloid-stabilised polymer.

The term “water-borne cheese coating composition” is known to the skilled person and 25 implies that the cheese coating composition comprises a continuous aqueous phase and a polymer phase dispersed in the continuous phase. The water-borne cheese coating composition preferably comprises between *ca.* 30 and *ca.* 62 wt.% of water with respect to the total weight of the composition.

30 The term “protective colloid” is known to the skilled person (protect the dispersed phase from coalescence and separation) and preferably comprises a poly(vinyl alcohol), hydroxyethylcellulose, or poly(vinyl pyrrolidone), or a mixture thereof. The term “protective colloid” herein especially preferably relates to a poly(vinyl alcohol).

The protective colloid stabilised polymer

The protective colloid-stabilized polymer is preferably a polymer or mixture of
5 polymers obtainable by emulsion polymerisation, in the presence of a protective
colloid, of a vinyl ester comprising 4-18 carbon atoms and one or more monomers
selected from the group consisting of acrylic esters of saturated fatty acids having from
2-16 carbon atoms, ethylene, and maleic and fumaric mono- and diesters of saturated
10 alcohols having from 4-8 carbon atoms. Said polymer is most preferably a polymer or
mixture of polymers obtainable by emulsion polymerization, in the presence of a
protective colloid, of a monomer mixture comprising (1) vinyl acetate and
dibutylmaleate, (2) vinyl acetate and ethylene, (3) vinyl acetate and n-butylacrylate, or
(4) vinyl acetate and a vinyl versatate, wherein the monomer mixture comprises said
15 two different monomers in a total amount of at least 80 wt.%, more preferably of at
least 90 wt.% with respect to the weight of the monomer mixture. The protective
colloid-stabilized polymer may be a single polymer or a mixture of different polymers.

Preferably, the protective colloid-stabilised polymer is obtained or obtainable as a
polymer emulsion which - in the absence of further additives - has a Brookfield
20 viscosity, when measured at room temperature, of 9000 mPa.s or less at a solids content
of ca. 60 wt.% with respect to the weight of the polymer emulsion. Accordingly, these
polymer emulsions will have optimal rheological properties and is especially suited as a
basis for the water-borne coating composition. An example of such a colloid-stabilised
polymer emulsion is commercially available as Vinavil EVA 6615.

25 The protective colloid-stabilized poly(vinyl ester) homo- or copolymer emulsion is
preferably obtainable by polymerising a vinyl ester and optionally one or more further
monomer(s) in the presence of 0.5-8 wt.%, more preferably 0.5-5 wt.% of a poly(vinyl
alcohol), wherein the poly(vinyl alcohol) preferably has a degree of hydrolysis ranging
30 between 70-95 mole%. Preferred poly(vinyl alcohol)s will have a Brookfield viscosity,
when dissolved at 4 wt.% in an aqueous solution at 20 °C, of ca. 2 to ca. 50 mPa.s,
more preferably of 3 to 40 mPa.s or 4-30 mPa.s for higher solids emulsions.

The protective colloid will be present in the coating composition as dissolved protective colloid and/or as grafted protective colloid. Any dissolved protective colloid comprised by the water-borne cheese coating composition preferably relates to the protective colloid fraction which resides in the transparent or translucent supernatant obtainable by centrifugation the said coating composition, wherein said centrifugation comprises separation of said coating composition to obtain a pellet and a transparent or translucent supernatant. The water-borne cheese coating composition preferably comprises a concentration of dissolved protective colloid which is 5 wt.% or less, but preferably at least 0.25 wt%.

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Any grafted protective colloid comprised by an aqueous cheese coating composition preferably relates to the protective colloid fraction which resides in the pellet obtainable by centrifugation the said coating composition, wherein said centrifugation comprises separation of said coating composition to obtain a pellet and a transparent or translucent supernatant.

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The polymer solids content is preferably determined as at least 80 wt.%, more preferably at least 90 wt.%, even more preferably at least 95 wt.%, most preferably at least 98 wt.%, of the combustible non-dissolved solid matter obtainable according to a method comprising centrifugation of the aqueous cheese coating composition to form a pellet and a transparent or translucent supernatant, isolating the pellet and drying it at ca. 105 °C for approx. 1 hour. Herein, “combustible solid matter” has its ordinary meaning and preferably relates to the weight fraction of the isolated pellet which, after drying at ca. 105 °C for approx. 1 hour, is not present as ashes. The relative amount and/or identity of the polymer obtainable by emulsion polymerisation, and optionally of any grafted protective colloid is suitably determined by applying conventional analytical techniques, such as NMR and/or mass spectrometry, to the pellet material which is preferably dried at ca. 105 °C for approx. 1 hour before analysis. When the polymer solids is determined according to this method, it essentially consists of the total amount of polymerized monomers and any grafted protective colloid; preferably, the amount of grafted protective colloid is less than 10 wt.%, more preferably less than 6 wt.% with respect to the polymer solids content.

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The polymer solids content preferably provides at least 50 wt.%, more preferably at least 70 wt.%, most preferably at least 90 wt% of the total solids content of the water-borne cheese coating compositions. Accordingly, a dried coating layer having favourable properties can be formed, especially with regard to its protective properties.

5 The total solids content of the water-borne cheese coating composition is preferably determined according to a method based on ISO 1625 (2nd edition, 1998-02-15). Herein, a small amount of the coating composition is weighed onto a flat surface provided by a first culture dish (diameter \pm 60 mm), and a surface of a second culture
10 dish is pressed against the surface of the first culture dish, comprising the coating composition. The weights of the two culture disks are known to the nearest mg. A thin film of the coating composition is applied on the two surfaces of the culture dishes by gently moving the touching surfaces in circular or ellipsoidal orbits. The dishes are then separated to expose their coated surfaces to the atmosphere. The dishes are then transferred into an oven which is heated to 105°C, and are left at that temperature for
15 one hour. Afterwards, the dishes are transferred into a desiccator and allowed to cool to room temperature. The dishes are weighed with the attached films to the nearest 1 mg, and the solid matter content is calculated from the difference between the mass of the applied wet coating composition and the weight of the dry film.

20 The water-borne cheese coating composition preferably comprise ashes in an amount of less than 1 wt.%, more preferably less than 0.5 wt.% or 0.25 wt.% with respect to the total weight of the composition. Herein, ashes are preferably determined as the dry rest which is left after subjecting the coating compositions to thermal decomposition conditions, preferably in the presence of oxygen. Ashes can be suitably determined
25 preferably by subjecting said material to a temperature of approx. 400 °C for approx. 4 hours in an atmosphere containing oxygen. The lower the amount of ashes, the better the quality of a dried coating film.

The term “Brookfield viscosity” of a sample preferably relates to the viscosity of the
30 sample determined according to a method based on ISO 2555 (2nd edition, 1989-02-01; corrected and reprinted 1990-02-01). Herein, the viscosity of the sample is measured at room temperature (= 20-25 °C, preferably ca. 23 °C) using a Brookfield viscometer, preferably of type LVDV-E and preferably operated at speed 30 rpm, and preferably

using spindle number 4. The viscosity meter is levelled and the spindle is attached to the apparatus. The spindle is then immersed into the sample up to the mark on the spindle. The measurement is started and the result is taken at steady-state or after one minute, whichever is first.

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The optional emulsifier

The optional emulsifier is preferably an C8-C24 alkyl sulphate or an ethoxylated alcohol or a mixture thereof. The optional emulsifier is preferably a non-ionic emulsifier and is further preferably selected as an ethoxylated alcohol. The ethoxylated alcohol is preferably a C8-C24 alcohol ethoxylate comprising between 4 and 20 ethylene oxide units. The presence of an emulsifier, especially of an anionic emulsifier such as an alkyl sulphate, may negatively affect stability of the fungicide, especially of natamycin. The water-borne coating composition, in particular a water-borne cheese coating composition comprising natamycin, therefore preferably comprises an emulsifier, in particular an anionic emulsifier, in an amount of 0.1 wt.% or less, with respect to the total weight of the composition. The optional emulsifier may have been present during the preparation of the protective-colloid copolymer emulsion, i.e. together with the protective colloid, or it may have been added thereafter.

20 The water-borne coating composition

It is preferred that the water-borne coating composition has a polymer solids content of 38-50 wt.% or more preferably of 40-48 wt.% with respect to the total weight of the composition. At higher polymer solids content, risk of clogging of spray nozzles will increase during periods when the spraying device is not in operation. At lower polymer solids, drying of the coating composition is slowed down to industrially unacceptable rates.

Additives to the water-borne cheese coating composition

The water-borne cheese coating composition according to the invention preferably further comprises a pseudoplastic thickening agent in an amount of preferably 0.1-1 wt.% with respect to the total weight of the composition. Accordingly, sagging of the applied coating layer can be reduced or even prevented. The pseudoplastic thickening agent preferably comprises a polysaccharide gum. The polysaccharide gum is

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preferably a thickening agent selected from the group consisting of xanthan gum, locust bean gum, a carrageenan, and guar gum, or a mixture thereof. Most preferably the pseudoplastic thickening agent is xanthan gum. Preferably, the water-borne coating composition comprising the pseudoplastic thickening agent has a Brookfield viscosity, when measured at room temperature, of 1000-3500 mPa.s. The water-borne coating composition comprising the pseudoplastic thickening agent suitably has a viscosity, when measured at 20 °C and at a shear rate of $1 \cdot 10^3 \text{ s}^{-1}$, of between 50 and 300 mPa.s, most preferably of between 100 and 250 mPa.s.

10 The optional colorant is preferably one or more compounds selected from the group consisting of a carotene, annatto, carbon black, titanium dioxide, tartrazine chinoline yellow, sunset yellow, cochénille red, indigotine, brilliant black, and litholrubine. Especially preferred colorants are annatto, carbon black, titanium dioxide and a carotene.

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The optional fungicide is preferably one or more compounds selected from the group consisting of natamycin, acetic acid and propionic acid. In an embodiment, the fungicide is selected as acetic acid, propionic acid or mixtures thereof.

20 Further advantages of the method

It has been advantageously found that by using the method according to the present invention, cross-contamination with unwanted micro-organisms between cheeses is substantially reduced or even prevented. The invention therefore also relates to a use of a spraying device in a coating process for cheeses for reducing or preventing cross contamination with unwanted micro-organisms between said cheeses.

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The cheese

The cheese to be coated is preferably of the semi-hard or hard type.

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Examples

Two water-borne cheese coating compositions having polymer solids contents ranging between 25 and 60 wt.% were prepared by diluting two different food-grade polymer emulsions with increasing amounts of water.

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In the comparative example, Mowilith SDM 4230 (ex Celanese Emulsions GmbH, Germany) was used as the food-grade polymer emulsion. In the inventive example, Vinavil EVA 6615 (ex Vinavil, Italy) was used as the food-grade polymer emulsion.

- 10 The viscosity of the resulting water-borne cheese coating compositions was measured using a Paar MCR301 rheometer thermostated at 20 °C and equipped with a CP50 cone/plate geometry (separation $d = 0.046$ mm). The cheese coating compositions were initially subjected to a shear stress of 0.01 s^{-1} which was increased in 18 intervals to a shear stress of 1.10^4 s^{-1} . The Table summarises the measured viscosity at a shear stress
- 15 of 1.10^3 s^{-1} .

Comparative Example (Brush formulation; base Mowilith SDM 4230)		embodiment according to invention (Spray formulation; base Vinavil EVA 6615)	
s.c. / wt. %	$\eta / \text{Pa.s}$ @ 10^3 s^{-1}	s.c. / wt. %	$\eta / \text{Pa.s}$ @ 10^3 s^{-1}
		59	2.59
		54	0.7
		48	0.25
45	1.52	44	0.085
42	0.86	41	0.065
40	0.55	39	0.038
38	0.36	37	0.025
34.5	0.22	34	0.02
32.5	0.14		
30	0.09		
27	0.06		

(s.c. = polymer solids content in wt.% relative to the total weight of the composition)

- 20 Clearly the coating composition according to the inventive example shows much lower viscosities at 1.10^3 s^{-1} even if the polymer solids content is increased by 10 percent points. Furthermore at equal solid matter content the inventive coating composition has much improved flow rate in spray applications as compared with the brush formulation.

In addition, water-borne cheese coating compositions were prepared based on Vinavil EVA 6615 (total polymer solids content: 42-44 wt.%) and further comprising 0.2-0.3 wt.% of xanthan gum. The viscosity of these water-borne cheese coating compositions, when measured at 20 °C and at a shear rate of 1.10^3 s^{-1} , was determined between 100 and 250 mPa.s. These cheese coating compositions further comprised annatto and natamycin.

List of embodiments

1. A method for coating cheese comprising spraying a water-borne cheese coating composition to a cheese, wherein the water-borne cheese coating composition comprises a protective colloid-stabilized polymer in an amount of 38-60 wt.% with respect to the weight of the composition, wherein said protective colloid-stabilised polymer is a polymer or a mixture of polymers obtainable by emulsion polymerisation in the presence of a protective colloid of (1) a monomer selected from the group consisting of a vinylic ester, an acrylic ester and a methacrylic ester or a mixture thereof, and (2) optionally one or more further monomer(s); and wherein said coating composition has a viscosity, when measured at 20 °C and at a shear rate of $1 \cdot 10^3 \text{ s}^{-1}$, of 300 mPa.s or less.
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2. The method according to embodiment 1, which further comprises drying the spray-coated composition and spraying another layer of the water-borne cheese coating composition on the cheese.
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3. The method according to any one of the preceding embodiments, wherein the cheese is a semi-hard or hard cheese.
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4. A water-borne cheese coating composition comprises a protective colloid-stabilized polymer in an amount of 38-60 wt.% with respect to the weight of the composition, wherein said protective colloid-stabilised polymer is a polymer or a mixture of polymers obtainable by emulsion polymerisation in the presence of a protective colloid of (1) a monomer selected from the group consisting of a vinylic ester, an acrylic ester and a methacrylic ester or a mixture thereof, and (2) optionally one or more further monomer(s); and wherein said coating composition has a viscosity, when measured at 20 °C and at a shear rate of $1 \cdot 10^3 \text{ s}^{-1}$, of 300 mPa.s or less.
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5. The water-borne cheese coating composition according to embodiment 4 which comprises the protective colloid-stabilized polymer in an amount of 40-48 wt.% with respect to the weight of the composition.
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6. The water-borne cheese coating composition according to any one of embodiments 4-5, wherein the water-borne cheese coating composition has a viscosity, when measured at 20 °C and at a shear rate of $1 \cdot 10^3 \text{ s}^{-1}$, of 250 mPa.s or less.
- 5 7. The water-borne cheese coating composition according to any one of embodiments 4-6 which further comprises an additive selected from the group consisting of a colorant and a fungicide, or a mixture thereof.
- 10 8. The water-borne cheese coating composition according to any one of embodiments 4-7, wherein the protective colloid-stabilised polymer is a polymer or mixture of polymers obtainable by emulsion polymerisation, in the presence of a protective colloid, of (a) vinyl acetate and ethylene or (b) vinyl acetate and dibutylmaleate.
- 15 9. The water-borne cheese coating composition according to any one of embodiments 4-8, wherein the protective colloid comprises a poly(vinyl alcohol), hydroxyethylcellulose, or poly(vinyl pyrrolidone), or a mixture thereof.
- 20 10. The water-borne cheese coating composition according to any one of embodiments 4-9 which further comprises a pseudoplastic thickening agent in an amount of 0.1-1 wt.% with respect to the total weight of the water-borne cheese coating composition.
- 25 11. The water-borne cheese coating composition according to embodiment 10, wherein the pseudoplastic thickening agent comprises or preferably is xanthan gum.
- 30 12. The water-borne cheese coating composition according to any one of embodiments 4-11, wherein the fungicide is one or more compounds selected from the group consisting of natamycin, acetic acid and propionic acid.

13. The water-borne cheese coating composition according to embodiment 12, wherein the fungicide is natamycin.
- 5 14. The water-borne cheese coating composition according to any one of embodiments 4-9, wherein the colorant is one or more compounds selected from the group consisting of a carotene, annatto, carbon black, titanium dioxide, tartrazine, chinoline yellow, sunset yellow, cochénille red, indigotine, brilliant black, and litholrubine.
- 10 15. The method according to any one of embodiments 1-3, wherein the water-borne coating composition is defined in any one of embodiments 4-14.

GEWIJZIGDE CONCLUSIES

1. Werkwijze voor het coaten van kaas omvattend het verspuiten van een watergedragen kaascoatingsamenstelling op een kaas, waarin de watergedragen
5 kaascoatingsamenstelling een schutkolloid-gestabiliseerd polymeer omvat in een hoeveelheid van 38-48 gew.% met betrekking tot het gewicht van de samenstelling, waarin genoemd schutkolloid-gestabiliseerd polymeer een polymeer of mengsel van polymeren is verkrijgbaar door emulsiepolymerisatie in aanwezigheid van een schutkolloid van (1) een monomeer gekozen uit de groep bestaande uit een vinylester
10 een acrylester en een methacrylester of een mengsel daarvan, en (2) optioneel een of meer verdere monom(e)er(en); en waarin genoemde coatingsamenstelling een viscositeit heeft, wanneer gemeten bij 20 °C en een afschuifsnelheid van $1 \cdot 10^3 \text{ s}^{-1}$, van 300 mPa.s of minder.

- 15 2. Werkwijze volgens conclusie 1, verder omvattend het drogen van de gespuitcoate samenstelling en het opspuiten van nog een laag van de watergedragen coatingsamenstelling op de kaas.

- 20 3. Werkwijze volgens elk der voorgaande conclusies, waarbij de kaas een half-harde of harde kaas is.

- 25 4. Watergedragen kaascoatingsamenstelling omvattende een schutkolloid-gestabiliseerd polymeer in een hoeveelheid van 38-48 gew.% met betrekking tot het gewicht van de samenstelling, waarin genoemd schutkolloid-gestabiliseerd polymeer
25 een polymeer of mengsel van polymeren is verkrijgbaar door emulsiepolymerisatie in aanwezigheid van een schutkolloid van (1) een monomeer gekozen uit de groep bestaande uit een vinylester een acrylester en een methacrylester of een mengsel daarvan, en (2) optioneel een of meer verdere monom(e)er(en); en waarin genoemde coatingsamenstelling een viscosity heeft, wanneer gemeten bij 20 °C en een
30 afschuifsnelheid van $1 \cdot 10^3 \text{ s}^{-1}$, van 300 mPa.s of minder.

5. Watergedragen kaascoatingsamenstelling volgens conclusie 4 welke het schutkolloid-gestabiliseerde polymeer omvat in een hoeveelheid van 40-48 gew.% met betrekking tot het gewicht van de samenstelling.
- 5 6. Watergedragen kaascoatingsamenstelling volgens elk der conclusies 4-5 waarin deze een viscositeit heeft, wanneer gemeten bij 20 °C en een afschuifsnelheid van $1 \cdot 10^3 \text{ s}^{-1}$, van 250 mPa.s of minder.
7. Watergedragen kaascoatingsamenstelling volgens elk der conclusies 4-6 welke
10 verder een additief omvat gekozen uit de groep bestaande uit een kleurstof en een fungicide of een mengsel daarvan.
8. Watergedragen kaascoatingsamenstelling volgens elk der conclusies 4-7, waarin het schutkolloid-gestabiliseerde polymeer is een polymeer of mengsel van polymeren
15 verkrijgbaar door emulsiopolymerisatie, in aanwezigheid van een schutkolloid, van (a) vinylacetaat en ethyleen of (b) vinyl acetaat en dibutylmaleaat.
9. Watergedragen kaascoatingsamenstelling volgens elk der conclusies 4-8, waarin het schutkolloid omvat: een poly(vinyl alcohol), hydroxyethylcellulose, of poly(vinyl
20 pyrrolidon), of een mengsel daarvan.
10. Watergedragen kaascoatingsamenstelling volgens elk der conclusies 4-9 welke verder omvat een pseudoplastisch verdikkingsmiddel in een hoeveelheid van 0.1-1 gew.% met betrekking tot het totale gewicht van de kaascoatingsamenstelling.
25
11. Watergedragen kaascoatingsamenstelling volgens conclusie 10, waarbij het pseudoplastisch verdikkingsmiddel xanthaangom omvat, of bij voorkeur xanthaangom is.
- 30 12. Watergedragen kaascoatingsamenstelling volgens elk der conclusies 4-11, waarin het fungicide een of meer verbindingen is gekozen uit de groep bestaande uit natamycine, azijnzuur en propionzuur of een mengsel daarvan.

13. Watergedragen samenstelling volgens conclusie 12, waarin het fungicide is gekozen als natamycine.
14. Watergedragen kaascoatingsamenstelling volgens elk der conclusies 4-13, waarin de
5 kleurstof wordt gekozen als een of meer verbindingen gekozen uit de groep bestaande uit een caroteen, annatto, zwarte koolstof, titanium dioxide, tartrazine, chinolinegeel, zonnegeel of “sunset yellow”, cochenillerood, indigotine, briljant zwart en litholrubine.
15. Werkwijze volgens elk der conclusies 1-3, waarin de watergedragen
10 kaascoatingsamenstelling is gedefinieerd als in elk der conclusies 4-14.

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE P6031607NL						
Nederlands aanvraag nr. 2005010	Indieningsdatum 01-07-2010						
	Ingeroepen voorrangdatum						
Aanvrager (Naam) CSK Food Enrichment B.V.							
Datum van het verzoek voor een onderzoek van internationaal type 21-08-2010	Door de instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. SN 54761						
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)							
Volgens de internationale classificatie (IPC)							
<table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">A01J27/02</td> <td style="width: 33%;">A23C19/16</td> <td style="width: 33%;">C08F18/04</td> </tr> <tr> <td>C08F20/18</td> <td>C09D131/02</td> <td>C09D131/04</td> </tr> </table>		A01J27/02	A23C19/16	C08F18/04	C08F20/18	C09D131/02	C09D131/04
A01J27/02	A23C19/16	C08F18/04					
C08F20/18	C09D131/02	C09D131/04					
II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK							
Onderzochte minimumdocumentatie							
Classificatiesysteem	Classificatiesymbolen						
IPC	A01J A23C C08F C09D						
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen							
III.	GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES (opmerkingen op aanvullingsblad)						
IV.	GEBREK AAN EENHEID VAN UITVINDING (opmerkingen op aanvullingsblad)						

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek
NL 2005010

A. CLASSIFICATIE VAN HET ONDERWERP INV. A01J27/02 A23C19/16 C08F18/04 C08F20/18 C09D131/02 C09D131/04 ADD. Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.		
B. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen) A01J A23C C08F C09D Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden) EPO-Internal, BIOSIS, FSTA, WPI Data		
C. VAN BELANG GEACHTE DOCUMENTEN		
Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	US 2004/229997 A1 (PAPENFUHS BERND [DE] ET AL PAPENFUHS BERND [DE] ET AL) 18 november 2004 (2004-11-18)	1-15
Y	* conclusies 1-24 *	1-3
T	N.N.: "Vinavil EVA 6615 - Technical data sheet", 7 februari 2011 (2011-02-07), XP002620878, Gevonden op het Internet: URL: http://www.vinavil.com/public/1/SchedeTecniche/en_vinavileva6615.pdf [gevonden op 2011-02-07] * het gehele document *	1-15
-/--		
<input checked="" type="checkbox"/> Verdere documenten worden vermeld in het vervolg van vak C.		
<input checked="" type="checkbox"/> Leden van dezelfde octroofamilie zijn vermeld in een bijlage		
° Speciale categorieën van aangehaalde documenten *A* niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft *D* in de octrooiaanvraag vermeld *E* eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven *L* om andere redenen vermelde literatuur *O* niet-schriftelijke stand van de techniek *P* tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur		
T na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding *X* de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur *Y* de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht *&* lid van dezelfde octroofamilie of overeenkomstige octrooipublicatie		
Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid 7 februari 2011		Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type
Naam en adres van de instantie European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		De bevoegde ambtenaar Heirbaut, Marc

**ONDERZOEKSRAPPORT BETREFFENDE HET
 RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
 VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
 de stand van de techniek
NL 2005010

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN		
Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
Y,D	WO 86/03651 A1 (MEJERISELSKABET DANMARK AMBA [DK]; PERFORA AS [DK]) 3 juli 1986 (1986-07-03) in de aanvraag genoemd * het gehele document * -----	1-3
A	EP 1 642 504 A1 (CSK FOOD ENRICHMENT B V [NL]) 5 april 2006 (2006-04-05) * het gehele document * -----	1-15
A	EP 0 986 965 A1 (JANSSEN PHARMACEUTICA NV [BE]) 22 maart 2000 (2000-03-22) * het gehele document * -----	1-15

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2005010

In het rapport genoemd octrooigescrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
US 2004229997	A1	18-11-2004	AT 366266 T 15-07-2007
			CA 2463199 A1 16-10-2004
			CN 1539897 A 27-10-2004
			DE 10317489 A1 18-11-2004
			DK 1469017 T3 08-10-2007
			EP 1469017 A2 20-10-2004
			ES 2290580 T3 16-02-2008
			MX PA04003521 A 06-06-2005
			NO 20041403 A 18-10-2004
			PT 1469017 E 10-10-2007
			WO 8603651
EP 0207109 A1 07-01-1987			
ES 8705743 A1 01-08-1987			
FI 863273 A 12-08-1986			
EP 1642504	A1	05-04-2006	AT 447850 T 15-11-2009
			DK 1642505 T3 01-02-2010
EP 0986965	A1	22-03-2000	AU 6327899 A 10-04-2000
			WO 0016644 A1 30-03-2000
			EP 1113727 A1 11-07-2001
			NO 20011285 A 16-05-2001
			PL 346657 A1 25-02-2002
			ZA 200102177 A 15-03-2002



OCTROOICENTRUM NEDERLAND

WRITTEN OPINION

File No. SN54761	Filing date (day/month/year) 01.07.2010	Priority date (day/month/year)	Application No. NL2005010
International Patent Classification (IPC) INV. A01J27/02 A23C19/16 C08F18/04 C08F20/18 C09D131/02 C09D131/04			
Applicant CSK Food Enrichment B.V.			

This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the application
- Box No. VIII Certain observations on the application

	Examiner Heirbaut, Marc
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WRITTEN OPINION

Application number

NL2005010

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - a sequence listing
 - table(s) related to the sequence listing
 - b. format of material:
 - on paper
 - in electronic form
 - c. time of filing/furnishing:
 - contained in the application as filed.
 - filed together with the application in electronic form.
 - furnished subsequently for the purposes of search.
3. In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes: Claims	1-3
	No: Claims	4-15
Inventive step	Yes: Claims	
	No: Claims	1-15
Industrial applicability	Yes: Claims	1-15
	No: Claims	

2. Citations and explanations

see separate sheet

WRITTEN OPINION

Application number
NL2005010

Box No. VII Certain defects in the application

see separate sheet

Section V

1 Reference is made to the following prior art documents (D):

- D1 US 2004/229997 A1
- D2 N.N.: "Vinavil EVA 6615 - Technical data sheet", Gevonden op het Internet:
URL:http://www.vinavil.com/public/1/SchedeTecniche/en_vinavileva6615.pdf
[gevonden op 2011-02-07]
- D3 WO 86/03651 A1 in de aanvraag genoemd
- D4 EP 1 642 504 A1
- D5 EP 0 986 965 A1

Document **D1** discloses a food-coating composition comprising an aqueous copolymer poly(vinyl ester) dispersion which comprises (1) 100 parts by weight of a copolymer of from 40 to 95% by weight of vinyl esters of aliphatic saturated carboxylic acids, from 5 to 60% by weight of maleic esters and/or fumaric esters of monohydric aliphatic alcohols having a chain length of C1-C18 and optionally other co-monomers, (2) from 0.1 to 1.0 parts by weight of an emulsifier, (3) from 0 to 0.45 parts by weight of a cellulose ether. Preferably, the protective colloid is polyvinyl alcohol. Preferably, the solids content of the dispersion is in the range from 40 to 55% by weight. Said composition has a consistently high viscosity and it is distinguished by a markedly improved film glossiness and thus an improved visual appearance of the coated food, particularly a hard cheese.

Document **D2** discloses that the composition is a dispersion of a vinyl acetate-ethylene copolymer with 60% solids, using polyvinyl alcohol as a dispersing system. It is suitable for cheese coating.

Document **D3** discloses a machine for applying a coating to cheeses and comprising a conveyor on which the cheeses are moved below and past a plurality of nozzles for spraying coating material, as well as means for distributing the applied material over the cheeses, characterised by stop means to stop each cheese in a pre-determined

position and means to generate, in this position, relative movement between the cheese and a rolling or scraping distributing means in contact with each other. Polyvinyl acetate polymers are explicitly referred to as suitable coating materials.

Document **D4** discloses an additive for a cheese coating composition which is selected from the group consisting of hydrophilic polymers such as caseins, starches, modified starches, cellulose derivatives such as cellulose ethers, alginates, naturally occurring gums, such as gum arabic, fermentation produced polysaccharides such as xanthan gum. Said additive allows an improved adhesion of an outer layer of cheese wax of mineral origin.

Document **D5** discloses an aqueous emulsion for coating a food product, particularly cheese, which comprises: (a) polyvinyl acetate or a copolymer of polyvinyl acetate with dibutyl maleic acid; and (b) the antifungal imazalil sulfate, which replaces natamycin.

Particular reference is made to the passages of said prior art documents and the combination of features taught therein as indicated in the search report.

2 The subject-matter of present independent claim 1 (method) meets the requirements of novelty.

None of the prior art documents cited in the search report teaches the subject-matter having the combination of features indicated in said claim, in particular the application by spraying of the specific water-borne cheese coating composition.

3 The subject-matter of present independent claim 4 (composition) does not meet the requirements of novelty in the light of prior art document **D1** and the public prior use of Vinavil EVA 6615, as reflected by document **D2**.

Reference is made to the description of the disclosure of said documents *supra*.

The present description (page 6, paragraph 1; page 7, paragraph 2) confirms that Vinavil EVA 6615 is a medium-viscosity polymer emulsion of the poly(vinyl acetate-co-ethylene) type having a polymer solids content of ca. 60wt% and a Brookfield viscosity at room temperature of 4 000-6 000 mPa.s, and that it was commercially available at the date of filing of the present application. Consequently, the public prior use of Vinavil 6615 is novelty-destroying for the subject-matter of present independent claim 4. Furthermore, it is considered that the high-shear viscosity recited in present independent claim 4 is implicitly disclosed in document D1 and is also inherently a property of Vinavil EVA 6615, as the type of polymer and the percentage amount disclosed fall within the scope of said claim.

4 The subject-matter of present independent claim 1 (method) does not meet the requirements of inventive step in the light of the teachings of any of prior art documents **D1** or **D2** as closest prior art in combination with document **D3**.

4.1 Document D1 and D2 are both considered to represent the closest prior art, as they disclose water-borne cheese coating compositions as claimed. Reference is made to the description of the disclosure of said documents *supra*, and to the observations made in paragraph 3. Consequently, the skilled person seeking to solve the technical problem underlying the present application would have considered the teachings of these documents.

The subject-matter of present independent claim 1 differs from the teaching of documents D1 and D2 in that it is specified that the water-borne cheese coating compositions are administered by spraying the cheese coating composition.

No unexpected technical effects or advantages have been demonstrated to be obtained by administration by spraying said cheese coating composition.

Consequently, the objective technical problem facing the skilled person at the filing date of the present application was to provide an alternative method of administration of the known water-borne cheese coating compositions.

The solution provided in independent claim 1, by the selection of spraying as the administration method of said composition, was obvious in the light of a combination of the teaching of any of documents D1 or D2 with the teaching of document D3, which discloses spraying of cheese coating compositions, such as polyvinyl acetate-based compositions. The skilled person would have considered the teachings of document D3, as it is also related to administration of cheese-coating compositions. He would have had no difficulty to apply the cheese coating composition disclosed in D1-D2 with the method of D3, as there is no inherent incompatibility.

4.2 It is observed that the working example demonstrates that not all claimed embodiments solve the technical problem underlying the present application. Indeed, the formulations comprising 54 and 59 wt% of Vinavil VA 6615 display a viscosity at a shear stress of $1 \cdot 10^3 \text{ s}^{-1}$ of 700 and 2 590 mPa.s respectively, well above the claimed upper limit of 300 mPa.s. Consequently, no inventive step can be acknowledged for these claimed embodiments.

4.3 Furthermore, the solution of the technical problem underlying the present application has only been demonstrated for the embodiment in which the polymer is obtainable by emulsion polymerisation of vinyl acetate and ethylene, in the presence of polyvinyl alcohol as the protective colloid (i.e. the subject-matter of present claim 9). For the plethora of other claimed embodiments, no proof has been offered, and extrapolation of the results obtained with the above indicated polymer to all of these sig-

nificantly different types of polymers does not appear to be warranted. Consequently, no inventive step can be acknowledged for the embodiments other than those of present claim 9.

4.4 As indicated above, it is considered that the coating compositions disclosed in prior art documents D1-D2 inherently have a high-shear viscosity falling within the range claimed, as they contain the polymers claimed in amounts as claimed. If the Applicant would argue that this is not the case, it appears that essential features required for solving the technical problem underlying the present application are missing from the independent claims.

5 The dependent claims do not appear to contain any features which, in combination with the features of the independent claims to which they refer, meet the requirements of novelty and inventive step. Reference is made to the description of the disclosure of said documents *supra*. Furthermore, it is stressed that dependent claims are only allowable if appended to (a) patentable independent claim(s). It is pointed out that the use of a pseudoplastic thickening agent to improve the adhesive properties of the cheese coating composition was known from document **D4** (cf. present claims 10-11), and that the addition of a fungicide was known from document **D5** (cf. present claim 12-13).

6 The present application meets the requirements of industrial applicability, as it can be applied in the food industry.

Section VII

The relevant background art disclosed in the prior art documents **D4-D5** has not been mentioned in the description, nor have these documents been identified therein.