

**(12) PATENT**  
**(19) AUSTRALIAN PATENT OFFICE**

**(11) Application No. AU 199717839 B2**  
**(10) Patent No. 711208**

(54) Title  
Process for the preparation of chocolate and similar products

(51)<sup>6</sup> International Patent Classification(s)  
A23G 001/18

(21) Application No: 199717839 (22) Application Date: 1997 .04 .10

(30) Priority Data

(31) Number (32) Date (33) Country  
96200986 1996 .04 .12 EP

(43) Publication Date : 1997 .10 .16  
(43) Publication Journal Date : 1997 .10 .16  
(44) Accepted Journal Date : 1999 .10 .07

(71) Applicant(s)  
Societe Des Produits Nestle S.A.

(72) Inventor(s)  
Pierre Ducret; Hans-Juergen Wille; Junkuan Wang; Katrin Holz

(74) Agent/Attorney  
BALDWIN SHELSTON WATERS,Level 21,60 Margaret Street,SYDNEY NSW 2000

**Abstract**

In order to manufacture chocolate or a similar product with the incorporation of 3 to 20 wt.% of water, chocolate or a product similar to chocolate, if necessary tempered  
5 beforehand, and a composition containing water are introduced into an extruder in which the mixture is mixed at a controlled temperature, and the mixture is then passed through a nozzle such that the chocolate mass emerging is at a temperature of 0 to 28°C.



- 1 -

AUSTRALIA

PATENTS ACT 1990

TRUE COPY

COMPLETE SPECIFICATION



We certify that the following 11 pages are a true and correct copy of the description of claims of the original complete specification in respect of the invention entitled:



"PROCESS FOR THE PREPARATION OF CHOCOLATE AND SIMILAR PRODUCTS"



Name of Applicant/s: Societe Des Produits Nestle S.A.



Signature:

by 

Fellow Institute of Patent Attorneys of Australia  
of SHELSTON WATERS  
(File: 19593.00)

**Process for the preparation of chocolate and similar products**

The invention relates to the preparation of chocolate and similar products with the incorporation of water.

- 5 Chocolate is composed of a fatty phase, cocoa butter and, if necessary, lactic fat, containing essentially solid compounds, for example, cellulose fibres, sugar crystals and dispersed proteins. In the preparation of chocolate, the finely ground or refined cocoa powder is converted to a
- 10 fluid suspension of sugar, cocoa and, if necessary, milk powder in the fatty phase by the operation of conching. The water content of a chocolate is approximately 1 wt.% before conching and <1% after this operation which causes evaporation of the water.
- 15 In the field of confectionery/chocolate-making, there is considerable interest in increasing the heat resistance of chocolate and reducing its calorie content. Various methods have been proposed for achieving these results.
- 20 One method involved the direct incorporation of water or humectants, for example, glycerol. This method of incorporation gives rise to a considerable and rapid increase in the viscosity, due to the fact that said compounds react with the sugar which is dispersed in the lipid phase of the chocolate, to form agglomerates. The
- 25 chocolate thus transformed is practically impossible to handle and produces a coarse, sandy sensation in the mouth. Even the subsequent removal of the water does not alter this degraded texture.
- 30 Other methods involved adding hydrated substances, foams, syrups, gels, or water-in-oil or oil-in-water emulsions. An example of such an approach is provided by the process

described in US-A-5160760, according to which an emulsion of a solution of carbohydrate and a fat is prepared in the presence of an emulsifier, after which the emulsion is mixed with a tempered mass of chocolate.

An object of the invention is to incorporate water in chocolate while circumventing the difficulty created by increasing the viscosity or at least to ameliorate that difficulty.

According to one aspect the invention consists in a process for the preparation of chocolate and similar products, wherein chocolate or a product similar to chocolate and a composition containing water are introduced into an extruder in which the mixture is mixed at a controlled temperature, and the mixture is then passed through a nozzle, with the result that the chocolate mass emerging is at a temperature of 0 to 28°C.

In the context of the invention, the term "product similar to chocolate" means a confectionery product of which the composition is similar to that of chocolate owing to the fact that all or part of the cocoa butter is replaced by a fat of vegetable origin or a mixture of fats of vegetable origin in common use in confectionery and the physical/chemical properties of which are similar or equivalent to those of cocoa butter. Consequently, the term chocolate will be employed hereinafter to designate chocolate and products similar thereto.

In the context of the invention, a composition containing water may be an emulsion or a dispersion of a thickening or gelling substance in water. The gelling agent used may be, for example, a carrageenan, a gellan, a gum, gelatin or microcrystalline cellulose. The use of microcrystalline cellulose is preferred because it contains no calories and produces an improved sensation in the mouth. Such a -----



composition may contain a polyol, for example, glycerol, if an improvement in the microbiological stability of the chocolate is desired. It may advantageously contain water-soluble substances, for example, flavourings, preservatives, active substances, trace elements and/or vitamins.

Advantageously, an aqueous gel is prepared by dispersing the desired quantity of microcrystalline cellulose, representing 5 to 20 wt.% and preferably 5 to 8 wt.% of the composition, in water by means of a high-speed mixer. If necessary, preservative salts, for example, sodium benzoate and potassium sorbate are added to the aqueous composition prior to the addition of the gelling agent. Finally, the other water-soluble constituents are added after the gelling agent has been suitably dispersed. It is possible to add glycerol, for example, to reduce the activity of the water, for example in a quantity of about 10 wt.% of the aqueous composition. It is also possible to add an emulsifier thereto, for example, lecithin, a fatty acid and polyglycerol ester, or a mixture of such emulsifiers so as to improve the distribution of the aqueous composition in the chocolate mass and thereby to ensure greater microbiological stability of the end product.

As a variant, it is possible to use an emulsion as the composition containing water, for example, a cream or an evaporated or condensed milk.

By incorporating water, it is possible to prepare functional chocolates with nutritional value, for example, by incorporating calcium therein, for example in the form of calcium lactate and vitamin, for example, vitamin C.

To implement extrusion, it is possible to use a single screw or twin screw extruder with a double jacket barrel fitted with cooling means. A twin screw extruder which achieves a

better mixing of the components is preferred. The screws may be composed of successive sectors where their shape varies from one sector to another, for example, from the point of view of the orientation of the threads and their pitch. The configuration of the screws is preferably adapted to maximise mixing and pumping of the mass towards the outlet nozzle whilst limiting shear. It is possible to provide intermediate agitation zones, for example by single or double lobed discs with a positive orientation having a transport effect, or a negative orientation having a return effect, or a sector with an inverse screw pitch giving rise to return. The screws may rotate in opposite directions or preferably in the same direction. The speed of the screws is 50 to 500 rpm, and preferably 250 to 400 rpm. The barrel and, if necessary, the screw(s) are fitted with cooling means composed of a double jacket with, preferably, one autonomous cooling circuit per sector, with valves to regulate the flow of coolant and, if necessary, a cooling circuit for the screw(s), allowing modulated temperature regulation. The outlet nozzle may have various configurations and a cutting element may be provided at the outlet of the extruder, for example, allowing the chocolate mass to be formed, for example, into single portions, bars or slabs.

It is possible to introduce the chocolate into the extruder in the coarsely ground state or in powder form. It may be dark chocolate, milk chocolate or white chocolate, that is, the mass does not contain any non-fat cocoa solids. The chocolate has preferably been tempered beforehand. Said mass is introduced in a controlled manner into the extruder, for example, by means of a distribution hopper fitted, for example, with a forcing screw.

The composition containing water, preferably in the form of a pumpable gel or emulsion, may be introduced into the

extruder by means of a metering pump. The temperature of the barrel is adjusted such that the mass leaving the apparatus has a temperature of 0 to 28°C and preferably 18 to 22°C.

5 The chocolate leaving the extruder takes the form of a highly plastic mass rather than a mass in the form of a viscous fluid, but this plasticity declines with time and, after about 30 minutes to a few hours, the chocolate becomes brittle. The duration of this physical transformation  
10 depends on the water content and the extrusion conditions. The end product thus has a consistency ranging from hard to soft depending on whether it contains 3 to 20 wt.% of water.

As a variant, which is not preferred, it is possible to  
15 pre-mix the liquid chocolate mass with the composition containing water and to introduce the pre-mix into the extruder.

The liquid chocolate mass and the composition containing  
20 water may also be introduced separately directly into the extruder, in which case it is preferable to use a twin screw extruder due to its better mixing capacity.

The product obtained contains fewer calories, has a similar  
taste and better heat resistance than a standard chocolate.  
It may act as a vehicle for nutritional or functional  
25 constituents, for example, humectants or flavourings, or biologically active substances. It is used preferably as a casing or centre, coated with tempered chocolate, without incorporated water, or introduced into a moulded shell of tempered chocolate without incorporated water.

30 The examples below, in which the percentages and parts are based on weight, unless otherwise indicated, illustrate the invention.

**Example 1**

A gelled aqueous composition is prepared by dispersing 6% of microcrystalline cellulose (Avicel RC-591 F<sup>®</sup>) in 84% of water with vigorous agitation in a high-speed mixer and, once the gel has formed, 10% of glycerol are added thereto.

The chocolate in powder form (particle size < or = 1 mm), tempered beforehand, is introduced by means of a controlled distribution hopper into an extruder with twin screws rotating in the same direction fitted with a cooling system, into which the gelled aqueous composition is injected by means of a metering pump. By way of comparison, the same chocolate powder alone is extruded. The extrusion parameters and the texture of the extrudate are given in Table 1 below. The chocolate obtained is creamier and less bitter than the chocolate used as a reference.



Table 1

Chocolate (%)	Gel (%)	Chocolate flow (kg/h)	Gel flow (kg/h)	Speed of screws (rpm)	Outlet temp. of extrudate (°C)	Texture of extrudate
80	20	8	2	400	19	soft. keeps its shape
85	15	8.5	1.5	400	20	fairly soft
90	10	13.5	1.5	400	20	slightly soft
93	7	10	0.75	300	21	solid
95	5	9.5	0.5	250	25	solid
Comparison						
100	0	7	0	400	9	solid

**Example 2**

5 The procedure is the same as in Example 1 except that 0.05% of sodium benzoate and 0.05% of potassium sorbate are added to the gel as preservatives. The physical characteristics of the products obtained are similar to those of the chocolates prepared according to Example 1.

**Example 3**

10 The procedure is the same as in Example 2, except that 5% of calcium lactate is added to the gel, which corresponds to 1% of calcium lactate (0.13% of calcium) incorporated in the chocolate. This level of calcium lactate had no effect on the organoleptic qualities of the chocolate. The composition of the gel is as follows: water 79.8%,

microcrystalline cellulose 5.7%, glycerol 9.5%, sodium benzoate 0.05%, potassium sorbate 0.05%, calcium lactate 0.5%. The extrusion conditions and the compositions of the products are given in Table 2 below.

5

**Table 2**

Chocolate (%)	Gel (%)	Chocolate flow (kg/h)	Gel flow (kg/h)	Speed of screws (rpm)	Outlet temp. of extrudate (°C)	Calcium content of chocolate (%)
80	20	8	2	350	20	0.13
85	15	8.5	1.5	400	21	0.1
90	10	9	1	350	21	0.06

**Example 4**

The procedure is the same as in Example 2 except that 0.35% of ascorbic acid is added to the gel, which corresponds to 52.5 mg of vitamin C in 100 g of chocolate with 15% of gel in the chocolate. The gel thus has the following composition: water 83.55%, microcrystalline cellulose 6%, glycerol 10%, sodium benzoate 0.05%, potassium sorbate 0.05%, ascorbic acid 0.35%. The extrusion conditions and the compositions of the products are given in Table 3 below.

15

**Table 3**

Chocolate (%)	Gel (%)	Chocolate flow (kg/h)	Gel flow (kg/h)	Speed of screws (rpm)	Outlet temp. of extrudate (°C)	Vitamin C content of chocolate (mg/100g)
85	15	5.7	1	400	21	52.5
90	10	7.2	0.8	300	20	35

**Example 5**

The procedure is the same as in Example 2 except that 2% of lecithin is added to the gel. To this end, the emulsifier is first dispersed in glycerol, then the dispersion is mixed  
 5 with the gel. The gel thus has the following composition: water 82.2%, microcrystalline cellulose 5.9%, glycerol 9.8%, sodium benzoate 0.05%, potassium sorbate 0.05%, lecithin 2%.

The chocolate obtained has a smooth surface and a slightly sticky texture. The extrusion conditions and the  
 10 compositions of the products are given in Table 4 below.

**Table 4**

Chocolate (%)	Gel (%)	Chocolate flow (kg/h)	Gel flow (kg/h)	Speed of screws (rpm)	Outlet temp. of extrudate (°C)	Texture of the extrudate
85	15	5.7	1	400	19	soft, smooth surface

By proceeding as above but using 2% of esters of polyglycerol and fatty acids (Sunsoft 818 SX<sup>®</sup>, Taiyo Kagaku Co. Ltd, Japan) instead of lecithin as emulsifier, a  
 15 chocolate having the same characteristics as those given in Table 4 above is obtained.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A process for the preparation of chocolate and similar products, wherein chocolate or a product similar to chocolate and a composition containing water are introduced into an extruder in which the mixture is mixed at a controlled temperature, and the mixture is  
5 then passed through a nozzle with the result that the chocolate mass emerging is at a temperature of 0 to 28°C.
2. A process according to claim 1, wherein the composition containing water is an emulsion or a dispersion of a thickening or gelling substance in water.
3. A process according to claim 2, wherein the dispersion contains microcrystalline  
10 cellulose as the gelling substance.
4. A process according to any one of the preceding claims, wherein the composition containing water comprises a polyol.
5. A process according to claim 4, wherein the polyol is glyccrol.
6. A process according to any one of the preceding claims, wherein the composition  
15 containing water contains water-soluble substances, particularly flavourings, preservatives, active substances, trace elements and/or vitamins.
7. A process according to any one of the preceding claims, wherein the chocolate or product similar to chocolate is tempered prior to its introduction into the extruder.
8. A process according to any one of the preceding claims, wherein a twin screw  
20 extruder fitted with cooling means is used.
9. A process according to claim 8, wherein the cooling is adjusted such that the mass leaving the apparatus has a temperature of 0 to 28°C.
10. A process according to claim 9, wherein the temperature is 18 to 22°C.
11. A process according to any one of claims 1 to 7, wherein the chocolate leaving the  
25 extruder contains 3 to 20 wt.% of water, its consistency ranges from hard to soft depending on the increase in its water content, it takes the form of a highly plastic mass,



and that this plasticity declines with time and in that after about 30 minutes to a few hours the chocolate becomes brittle.

12. The use of the chocolate obtained by implementing the process according to one of claims 1 to 11 in a confectionery/chocolate product as a casing or centre coated with  
5 tempered chocolate without incorporated water, or introduced into a moulded shell of tempered chocolate without incorporated water.

13. A process according to claim 1 substantially as herein described with reference to any one of the examples.

14. A chocolate or similar product when obtained by the process of any one of claims  
10 1 to 11 or 13.

DATED this 25th Day of May 1999

SOCIETE DES PRODUITS NESTLE S.A.

Attorney: PAUL G. HARRISON  
Fellow Institute of Patent Attorneys of Australia  
of BALDWIN SHELSTON WATERS

12

13

14

