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CA 2179308 C 2005/07/12

(11)(21) **2 179 308**

(12) **BREVET CANADIEN
CANADIAN PATENT**

(13) **C**

(86) Date de dépôt PCT/PCT Filing Date: 1994/12/14
(87) Date publication PCT/PCT Publication Date: 1995/06/29
(45) Date de délivrance/Issue Date: 2005/07/12
(85) Entrée phase nationale/National Entry: 1996/06/17
(86) N° demande PCT/PCT Application No.: EP 1994/004165
(87) N° publication PCT/PCT Publication No.: 1995/017099
(30) Priorités/Priorities: 1993/12/22 (93203627.0) EP;
1994/08/16 (94202330.0) EP

(51) Cl.Int.⁶/Int.Cl.⁶ A21D 10/02, A21D 2/26, A23P 1/08,
A21D 13/08, A21D 6/00
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(54) Titre : PATES PRETES A CUIRE
(54) Title: READY-TO-BAKE DOUGHS

(57) **Abrégé/Abstract:**

Improved ready-to-bake frozen, laminated doughs comprise: a flour component and (on flour); 45-70 wt.% water, 5-10 wt.% yeast, 0.1-4.0 wt.% emulsifier; the flour-component being composed of: 80-99 wt.% natural flour, 20-1 wt.% artificial flour; the artificial flour consisting of: 30-70 wt.% protein, 70-30 wt.% modified starch. The laminated product has 8-80 fatlayers and contains (on flour) 35-85 wt.% fat.





INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶: A21D 13/08, 6/00, 2/18, 2/26, 10/02	A1	(11) International Publication Number: WO 95/17099 (43) International Publication Date: 29 June 1995 (29.06.95)
(21) International Application Number: PCT/EP94/04165 (22) International Filing Date: 14 December 1994 (14.12.94) (30) Priority Data: 93203627.0 22 December 1993 (22.12.93) EP <i>(34) Countries for which the regional or international application was filed:</i> NL et al. 94202330.0 16 August 1994 (16.08.94) EP <i>(34) Countries for which the regional or international application was filed:</i> NL et al. (71) Applicant (for all designated States except AU BB CA GB IE LK MN MW NZ SD): UNILEVER N.V. [NL/NL]; Weena 455, NL-3013 AL Rotterdam (NL). (71) Applicant (for AU BB CA GB IE LK MN MW NZ SD only): UNILEVER PLC [GB/GB]; Unilever House, Blackfriars, London EC4 4BQ (GB).		(72) Inventors: SANDERS, Johannes, Cornelis; Madridweg 105, NL-3137 AJ Vlaardingen (NL). HEMELAAR, Maria, Johanna, A., T.; Delfgaauwstraat 51c, NL-3037 LJ Rotterdam (NL). DIJKSHOORN, Jacobus; Cipressendreef 18, NL-3137 PD Vlaardingen (NL). HAMELEERS-v. BILSEN, Daniëlle, Gertrude, J., L.; Arthur van Schendelstraat 647, NL-3511 MZ Utrecht (NL). (74) Common Representative: UNILEVER N.V.; Patent Division, P.O. Box 137, NL-3130 AC Vlaardingen (NL). (81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ). 2179308 Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
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Improved ready-to-bake frozen, laminated doughs comprise: a flour component and (on flour); 45-70 wt.% water, 5-10 wt.% yeast, 0.1-4.0 wt.% emulsifier; the flour-component being composed of: 80-99 wt.% natural flour, 20-1 wt.% artificial flour; the artificial flour consisting of: 30-70 wt.% protein, 70-30 wt.% modified starch. The laminated product has 8-80 fatlayers and contains (on flour) 35-85 wt.% fat.		

READY-TO-BAKE DOUGHS

In order to come to more convenient dough-systems, that enables a baker to prepare a dough on one day and to bake a dough-product made from it on a later day, several solutions have been given in the prior art.

In our European Patent 493,850 we have disclosed preproofed, frozen croissants that can be baked without thawing, that contain a gelatin-relating compound in order to retain the CO₂, developed by the proofing in the frozen dough-system. Above products however, mean that a proofing-process has still to be performed resulting in frozen, proofed dough-systems that are very vulnerable during transportation. Moreover the total volume that must be transported is higher for proofed than for unproofed doughs.

An even more convenient solution would be, if dough systems could be found that contain a leavener, such as yeast, but that do not need to be preproofed. After freezing of the dough-system it should be possible to obtain baked products with good specific volume and ovenspring without thawing and proofing of the dough system prior to baking. In the prior art some systems and processes are disclosed, which would lead to such so called ready-to-bake dough systems. E.g. in WO 92/18010 or DE 4,118,024 laminated dough-systems are disclosed, wherein a dough is made from flour, yeast and liquid, the dough is kneaded and laminated with fat. Essential is that the fat is not present in the dough, but is only incorporated in the laminated product as laminate-fat. Another essential feature of the products and the process is, that the number of fatlayers present in the laminated dough, is increased with 10 to 50%, compared with the normal number of 12 to 36 fatlayers present in the conventional laminated dough-systems. Simultaneously the amount of yeast applied is 10-50% higher than

conventionally applied. We found that above process leads to products that display slightly better specific volumes and ovenspring than products made according to the more conventional techniques. However, the s.v. and ovenspring of the products were still inacceptably low for the baker and the consumer (see our comparative examples). Another solution was presented in EP 561,702. According to this patent-application ready-to-bake frozen croissants were made, wherein the total amount of fat-layers was greater than 50. Those products can contain three additives, i.e.

- an acidifier
- a thickener or gelatinizing agent
- a lipolytic enzyme.

As examples of the thickeners and gelatinizing agents are mentioned: carboxymethyl cellulose (also illustrated in the example), guar gum, xanthan or alginate. We found (cf. our comparative examples) that products made according to this EP-application did not yet meet the standards set by the baker and the consumer.

Therefore we performed a study in order to find out, whether we could make ready-to-bake, frozen, laminated doughs that display upon baking (without thawing and proofing) an ovenspring of at least 2.2 ml/g and in particular at least 4.5 ml/g (using: 50 gram product). The products obtained after baking should display specific volumes of at least 3.5 ml/g, preferably at least 5 ml/g and in particular at least 6 ml/g (again using: 50 gram product). This study resulted in our invention. We found that such products can be obtained, when the flour-component of our dough is constituted of two components, i.e. 1) of a natural flour and 2) of an artificial flour. The artificial flour being composed of a protein, in particular a gelatin-relating compound and a modified starch.

Therefore, our invention concerns ready-to-bake, frozen, laminated dough, comprising consecutive layers of dough and fat, wherein the dough comprises:

- a flour-component, and (on flour):
 - 45 - 70 wt% of water
 - 5 - 10 wt% of yeast
 - 0.1 - 4.0 wt% of emulsifier

wherein the flour-component is composed of:

- 80 - 99 wt% of natural flour and
- 20 - 1 wt% of "artificial flour"

and wherein the artificial flour consists of:

- 30 - 70 wt% of a protein, in particular a gelatin-relating compound and
- 70 - 30 wt% of a modified starch,

while the laminated product contains 8-80, preferably 16-60 fatlayers and the total fat-content of the product (on flour) is 35-85 wt%, preferably 35-50 wt%.

As can be concluded from above, it is advantageous when the number of fatlayers present is restricted, while the fat-content of the product is limited.

As proteins can be used gluten, whey-proteins, egg-proteins and caseinates and mixtures thereof.

Very suitable products are obtained, when a gelatin-relating compound is applied, in particular if selected from the group, consisting of: gelatin with a bloom-rate of 50 - 400; non-gelling gelatin with a bloom-rate of 0 - 50; hydrolyzed gelatin and gelatin-precursors, such as collagen.

The starch-component of our artificial flour must be a modified starch. Preferred modified starches are the heat-stable modified starches, in particular the cross-linked

starches. A typical example being a cross-linked waxy maize starch, this starch can either be pregelatinized or not. Suitable modified starches can be selected from the following group (although not restricted to this group) UltratexTM-2, Instant ClearjelTM, PurefloTM, ThermfloTM, NationalTM 780188, FirmtexTM, HifloTM, National FrigexTM, National FrigexTM HV, National FrigexTM L.V.; PurityTM VL, CollfloTM 67, PurityTM HPC, ThermtexTM (all from National Starch); ClearamTM CH-30 (from Roquette) and from Avebe the FarinexTM-type products: VA 70; VA 100T; CAX; TK-1; VA 70 C or CA. Preferred modified starches are derived from waxy maize or from tapioca.

Although any emulsifier can be applied, we found that suitable emulsifiers are mono- and diglycerides; acetic, lactic, citric, tartaric and diacetyl tartaric acid (DATA) esters of mono- and diglycerides; polyglycerol esters; propylene glycol esters; stearyl-2-lactylic esters; sorbitan esters and others. We found that a very beneficial effect on product performance is obtained, when the emulsifier comprises

- a DATA-ester, that provides baking performance to the dough, or

- a lecithin, or

- mono fatty acid esters from sucrose, wherein the fatty acids have a chain length of 12-20 C-atoms, or

- mixtures thereof.

The DATA-ester and the mixture with the lecithin provide in particular improved appearance to the baked products. Very suitable DATA-esters are those, that have a low saponification value (sap. value < 450).

The lecithin can be any known sort of lecithin, however, it is preferred to use lecithins that have a high phospholipid-content.

Other dough-improving ingredients, such as sugar, fat, enzymes, in particular xylanase and/or glucoamylase, and/or

transglutaminase and/or amylase, ascorbic acid and reducing agents, such as cysteine can also be incorporated in the dough. The amounts are effective amounts, which can be derived from the prior art. Ascorbic acid is used in slightly higher amounts of more than 100 ppm (on flour).

Very suitable laminated doughs, with very good product-performance are obtained, when we apply a specific ratio between fat-content (in % on flour) and number of fat-layers. In fact we found that ratio's of 0.66 - 1.5 lead to very good results.

The natural flour component of our doughs can be any flour, applicable according to the prior art in laminated dough systems. Preferred flours are strong flours, in particular the flours with at least 15 wt% protein on dry matter are preferred.

Our new laminated dough systems can also be filled with fillings, such as custards, marmalades, fruit, ham, cheese or chocolate. However, in order to avoid problems with the readiness of the baked products, it is suitable to apply fillings with a reduced water-content and/or to add a food-grade waterbinder to the filling. Very convenient fillings comprise custard-fillings with a water-content of 50-65 wt%, marmalade-fillings with a water-content of 45-70 wt%, while these fillings also can contain 2-15 wt% of a waterbinder, selected from the group, consisting of gelatin, egg-white powder, starches, modified starches, flour, carrageenan, guar gum. Custard-fillings will contain preferably 9-15 wt% of these waterbinders, while the marmalades preferably will contain 2-8 wt% thereof. The filling-material can be applied as a pourable filling or as a frozen filling, in particular in the form of a frozen stick.

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5 The ready-to-bake, frozen laminated doughs, according to our invention, produce upon baking for 30 minutes at 210°C a product with a specific volume (s.v.) of at least 3.5 ml/g, preferably at least 5 ml/g; in particular at least 6 ml/g. Ovensprings, achieved during above baking of the frozen products, are at least 2.2 and most preferably at least 4.5 ml/gram.

Examples and comparative examples

Experiments were carried out, wherein we have compared the following procedures and recipes:

	<u>Exmpl.</u>	<u>recipe</u>	<u>proce- dure</u>	<u>results</u>		
				<u>s.v.</u>	<u>Appearance</u>	<u>Oven- spring</u>
10	1	EP 561,702 ¹	EP 561,702 ¹	4.7	-	3.6
	2	EP 561,702 ²	EP 561,702 ²	3.2	-	2.1
	3	WO 92/18010	WO 92/18010	2.8	-	1.7
	4	Acc Invention	Acc Invention	5.8	+	4.7
	5	WO 92/18010	Acc Invention	3.6	- -	2.6
15	6	Acc Invention	WO 92/18010	5.1	+	4.1

1 = without a thickener

2 = in presence of C.M.C

- = bad

+ = good

The recipes that were applied were as follows:

A: According to EP 561,702¹:

25	Flour:	Columbus	100	wt%
	Water:		58	wt%
	Salt		2	wt%
	Konings-yeast		7.5	wt%
	Sugar		8	wt%
	Total		175.5	wt%
30	Laminate-margarine		52.5	wt%

ratio: dough: margarine = 3.3:1

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B: According to EP 561.702²

Premix (puff pastry dough)

	Flour:	Columbus	100	%
5	Water		60	%
	Salt		1	%
	CMC-blanose		0.5	%
	Sugar		<u>7</u>	%
	Total		168.5	%

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Yeast-dough:

	Flour:	Columbus	100	%
	Water		60	%
	Salt		2	%
15	Konings-yeast		7.5	%
	CMC-blanose		0.5	%
	Improver (Volufrost ^R)		<u>1.5</u>	%
	Total		171.5	%
	lamine-margarine		68	

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ratio: dough: margarine = 2.5:1

C: According to WO 92/18010

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Predough:

	Flour:	TT-550	12.5	%
	Water		12.75	%
	Sugar		0.25	%
	Konings-yeast		<u>0.25</u>	%
30	Total		25.75	%

Base-dough:

	Flour:	TT-550	87.5	%
	Water		46	%
35	Salt		0.6	%
	Sugar		4.5	%

Konings-yeast 4.5 %
Water/Lecithin 4 %
Total 143.2 %
Total-dough $143.2 + 25.75 = 169.95$
5 Laminate-margarine: 40

Ratio: dough: margarine = 4.2:1

10 D: According to invention

Flour: Columbus: 100 %
Water 63 %
Salt 2 %
Konings-yeast 5 %
15 sugar 3 %
gelatin 3 %
Instant Clearjel^R 5 %
Ascorbic acid 0.02 %
Enzymes 0.04 %
20 Emulsifier 0.6 %
Total 181.66 %
Laminate-margarine: 40

ratio: dough: margarine = 4.5:1

25 Procedures

A. According to EP 561,702¹

30 A premix was made from flour and sugar; water and yeast were added to the premix and salt was mixed in. The mixture was kneaded during 6 min. at 15°C.

35 300 grams of margarine was applied as laminate fat for every 1000 g dough.

The following lamination-procedure was applied:

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1 turn in 3
rolling until 7 mm
3 turns in 3
1 turn in 2
5 rolling until 3-3.5 mm
cutting of a sample of 16x12 cm
(dough-weight: 50 grams)
moulding of croissants
freezing until -30°C in 1 hour
10 storage at -20°C

Baking: conventional oven at 210°C for 28 min. steam was introduced during 5 sec.

15 B: According to EP 561,702²

1. The puff-pastry dough:

20 A premix was made from the dry-ingredients; water was added to the premix and the mixture was kneaded during 3 min. at 15°C. The dough was rested for 30 min. at 4°C.

2. The yeast-dough

25 A yeast dough was prepared by mixing of dry ingredients (without yeast and salt). Water and yeast were added to the premix; salt was mixed in and the dough was kneaded for 6 min. at 15°C.

30 3. Preparation of puff-pastry

35 1 kg of both doughs were rolled out. The resulting sheets of dough were piled up and 800 grams of margarine were applied on the puff pastry dough.

The following lamination-procedure was applied:

- 1 turn in 2
- 3 turns in 3
- rolling until 3-3.5 mm
- cutting of a sample of 16x12 cm (dough weight: 50 grams)
- moulding of croissants
- freezing until -30°C in 1 hour
- storage at -20°C

Baking as above: 210°C; 28 min; 5 sec. steam.

C. Procedure of WO 92/18010

1. Predough

The ingredients were mixed for the preparation of a predough. The predough was held at 30-35°C for 2 hours. The dough was cooled (fast) until 5°C.

2. Base-dough

A water-lecithin mixture (2% lecithin) was made and mixed in into the dough.

The ingredients were mixed during a short time.

3. The predough and the base-dough were kneaded together at 5°C.

4. The following lamination-procedure was performed:

- 1 turn in 4
- 1 turn in 3
- 1 turn in 2
- rolling until 2.75 mm
- cutting of sample of 21x10 cm
- moulding of croissants
- freezing until -30°C in 1 hour
- storage at -20°C

5. Baking was performed using a convection oven. T was increased from 150 to 200°C. Time: 18.5 min.; 1.5l. steam were introduced.

D: According to the invention

5 A premix was made (without yeast, enzymes and flour). The flour was added and the mixture was mixed during 5 min. in a Hobart-mixer. The enzymes were dissolved in water and this solution and the yeast were added to the premix. The dough was kneaded for 5 min. at 15°C.

The lamination procedures was as follows:

- 10 - 1 turn in 4
- 30 min. rest at 15°C
- 1 turn in 4
- 1 turn in 3
- rolling until 2.75 mm
15 - cutting of sample of 21 x 10 cm
- moulding of croissants
- 30 min. rest at 15°C
- freezing until -30°C in 1 hour
- storage at -20°C

20 Baking in conventional oven at 210°C; 28 min, 5 sec. steam.

What is claimed is:

1. A ready to bake, frozen laminated dough, comprising consecutive layers of dough and fat, wherein the dough comprises:
 - a flour component, and calculated as a percentage of flour:
 - 45 - 70 wt% of water,
 - 5 - 10 wt% of yeast,
 - 0.1 - 4.0 wt% of emulsifier,wherein the flour component is composed of:
 - 80 - 99 wt% of natural flour, and
 - 20 - 1 wt% of artificial flour,and wherein the artificial flour consists of:
 - 30 - 70 wt% of a protein, and
 - 70 - 30 wt% of a modified starch,wherein the laminated product contains 8 - 80 fat layers and the total fat content of the product, calculated as a percentage of flour, is 35 - 85 wt%.
2. The ready to bake, frozen laminated dough according to claim 1, wherein the protein is a gelatin-relating compound.
3. The ready to bake, frozen laminated dough according to claim 1 or 2, wherein the laminated product contains 16 - 60 fat layers.
4. The ready to bake, frozen laminated dough according to any one of claims 1 to 3, wherein the total fat content of the product, calculated as a percentage of flour, is 35-50 wt%.
5. The ready to bake, frozen laminated dough according to any one of claims 2 to 4, wherein the gelatin-relating compound is selected from the group consisting of: gelatin with a bloom-rate of 50 - 400, non-gelling gelatin with a bloom-rate of 0 - 50, hydrolyzed gelatin and gelatin-precursors.
6. The ready to bake, frozen laminated dough according to claim 5, wherein the gelatin-relating compound is collagen.

7. The ready to bake, frozen laminated dough according to any one of claims 1 to 6, wherein the modified starch is a cross-linked starch.
8. The ready to bake, frozen laminated dough according to any one of claims 1 to 6, wherein the modified starch is a cross-linked waxy maize starch.
9. The ready to bake, frozen laminated dough according to any one of claims 1 to 8, wherein the emulsifier comprises:
 - a diacetyl tartaric acid ester which provides baking performance to the dough, or
 - a lecithin, or
 - mono fatty acid esters from sucrose, wherein the fatty acids have a chain length of 12-20 C-atoms, or
 - mixtures thereof.
10. The ready to bake, frozen laminated dough according to any one of claims 1 to 9, wherein the dough further comprises one or more of the following ingredients: sugar, fat, enzymes, ascorbic acid and reducing agents.
11. The ready to bake, frozen laminated dough according to claim 10, wherein the enzymes are selected from the group consisting of: xylanase, glucoamylase, transglutaminase, amylase, and combinations thereof.
12. The ready to bake, frozen laminated dough according to claim 10 or 11, wherein the reducing agents is cysteine.
13. The ready to bake, frozen laminated dough according to any one of claims 1 to 12, wherein the ratio between fat content, calculated as a percentage of flour, and number of fat layers present ranges from 0.66 - 1.5.
14. The ready to bake, frozen laminated dough according to any one of claims 1 to 13, wherein the laminated dough produces upon baking for 30

minutes at 210°C a product with a specific volume of at least 3.5 ml/g.

15. The ready to bake, frozen laminated dough according to claim 14, wherein the product has a specific volume of at least 5 ml/g.

16. The ready to bake, frozen laminated dough according to claim 15, wherein the product has a specific volume of at least 6 ml/g.

17. The ready to bake, frozen laminated dough according to any one of claims 1 to 16, wherein the laminated dough displays upon baking for 30 minutes at 210°C an overspring of at least 2.2 ml/g.

18. The ready to bake, frozen laminated dough according to claim 17, wherein the laminated dough displays an overspring of at least 4.5 ml/g.

19. The ready to bake, frozen laminated dough according to any one of claims 1 to 18, wherein the laminated dough is filled with a filling with a reduced water content and/or with an increased content of a food grade water binding agent.

20. The ready to bake, frozen laminated dough according to claim 19, wherein the filling is a custard, marmelade or fruit-filling.