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**GB A 2010066**  
**GB 1473824**  
**GB 1323279**  
**GB 1306303**  
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(54) **Coated edible products and processes for their preparation**

(57) A sealed, coated edible product, which may be of animal or vegetable origin, is prepared by a process which comprises coating the product with a substantially fat-free batter containing flour, an aqueous liquid and optionally seasonings and between 0.5 and 10% by weight on a dry basis of an egg white substitute, especially one containing greater than 15% by weight of a globular proteinaceous material e.g. egg albumen which is soluble in water and coagulable by heat. Coated products so obtained retain a high proportion of their original moisture content upon subsequent cooking and/or chilling or freezing.

The egg white substitute may egg albumen extended with a proteinaceous or carbohydrate material, or a whey protein isolate.

## SPECIFICATION

**Coated edible products and processes for their preparation**

- 5 This invention relates to a coated edible product which retains a substantial proportion of its original moisture content upon subsequent freezing and cooling, as well as, a process for its preparation. 5
- There is a considerable market for convenience foods nowadays particularly through catering and retail food outlets. Food is frequently supplied to and stored by such food outlets in chilled, frozen and/or pre-cooked state to meet fluctuations in demand.
- 10 It is common for food products, such as fish and meat, to be coated with batter to facilitate deep fat frying and to improve the appearance of the cooked product. However, a problem with these battered products when cooked is that they are often dry and tough in texture due to loss of natural juices during the freezing and cooling processes. 10
- European Patent Publication No. EP-A-0 006 455 discloses a process for preparing fried vegetables wherein pieces of vegetable are coated with a starch-containing product, the coated pieces are then steam blanched and finally deep-fried. Various types of starch materials may be used in the process such as cereal flours, soy flours and potato, as well as modified starch. The coating of the vegetable may be carried out in two steps - first of all the pieces of vegetable are coated with a batter and then with a dry product containing starch. The batters disclosed in the Specification consist of whole egg, skimmed milk powder, salt, pepper and water. 15 20
- Fat-based coatings for preserving cold meat products such as pates are disclosed in Netherlands Patent Publication No. NL-A-80 01969. The coating material comprises fat, albumen, water and/or milk, salt, whole egg, starch and gelatin powder. The fat, albumen, water and/or milk are mixed and then heated to emulsify the fat after which the remaining ingredients are added and the mixture transferred to a mould.
- 25 Austrian Patent No. 193709 discloses a process for preserving deep-chilled edible products such as meat, fruit and vegetables, wherein the chilled product is coated with a material containing flour, egg yolk and egg white and then rolled in fat or a natural or synthetic gelatinising substance. 25
- It is an object of the present invention to provide a coated edible product which retains a substantial proportion of its original moisture content upon freezing and cooking and which has superior organoleptic properties to products, whether coated or uncoated, when prepared by conventional cooking processes. 30
- Accordingly, the invention provides a process for sealing an edible product so that the product retains a high moisture content upon subsequent freezing and cooking, said process comprising coating said product with a substantially fat-free batter containing flour, an aqueous liquid and optionally seasonings and between 0.5 and 10% by weight on a dry basis of an egg white substitute as hereinafter defined, such that the coating gels on freezing or heating of the coated product. 35
- Egg white or egg albumen is known to have unique foaming and heat setting properties, which properties are utilised in the preparation of a number of confectionery products such as meringues and angel food cake. In recent times, the price of dried egg albumen solids has increased substantially and a number of low-cost substitutes have been developed. Among such egg white substitutes are included albumen-based products which comprise dried albumen extended with a proteinaceous or non-proteinaceous material. The latter products are also described as fortified albumen-based products. Other commonly used egg white substitutes are obtained from whey and therefore contain approximately 30% lactalbumen. 40
- Preferably, the egg white substitute used in the process according to the invention contains greater than 15% by weight of a globular proteinaceous material which is soluble in water and coagulable by heat.
- 45 Most preferably the globular proteinaceous material is albumen, especially egg albumen. 45
- Suitably, the egg white substitute is an egg albumen-based product as hereinbefore defined, preferably an egg albumen-based product which comprises dried egg albumen extended with a carbohydrate material such as maize starch. An especially suitable egg albumen-based product is one sold under the Trade Mark MERI-WHITE by CH,Goldrie, Foucard & Son Ltd., of Liverpool and which contains 28% egg albumen as hereinafter discussed. 50
- A preferred batter is one containing approximately 4% by weight on a dry basis of a fortified egg albumen-based egg white substitute such as MERI-WHITE.
- The egg white substitute used in the process of the invention may also be a whey protein isolate, the whey protein being obtained from a cheese whey or a whey of vegetable origin.
- 55 Whey protein isolates generally have a protein content of between 20 and 30% (dry basis). Many processes are described in the literature for preparing such whey protein isolates, for example, as described by Burgess K.J. and Kelly J. - *Journal of Food Technology* 1979 *14*, pages 325-329, as well as, the processes described in British Patent Specification Nos. 1473824 and 1487169. 55
- Suitable egg whites substitutes from whey and which may be used in the process of the invention are the egg white substitutes described and claimed in British Patent Specification Nos. 1473824 and 1487169 referred to above. 60
- Concentrated whey protein fractions having a protein content greater than 30% (dry basis) may also be used in the process of the invention.
- Egg white substitutes for use in the process according to the invention may be in powder or liquid form depending on the source. 65 65

- The edible product may be a product having a major proportion of meat. The meat product to be coated may be white or red meat, fish or shellfish. Chicken and turkey pieces are especially suited for coating by the process of the invention. The process is also very suitable for coating scampi, especially scampi in the frozen state. The process of the invention is also particularly suitable for preparing fish-fingers, fish cakes and rissoles. However, the process of the invention may also be used to seal vegetable products such as onions and mushrooms. 5
- According to a further aspect of the invention there is provided a process for preparing a chilled or frozen edible product which retains a high moisture content upon subsequent cooking, said process comprising coating said product with a batter as hereinabove defined and rapidly chilling or freezing the coated product. 10
- When preparing a frozen product, the rapid freezing is preferably carried out by blast freezing in a spiral freezer such as a GIRO freezer (GIRO is a Trade Mark). Freezing should be completed within approximately 20 minutes. 10
- The coated product may optionally be covered with a layer of breadcrumbs before the freezing or chilling step, respectively.
- In a further aspect of the invention there is provided an edible product coated with a batter as hereinabove defined. 15
- The product to be coated according to the present invention may be a raw product in the fresh or frozen state or a cooked product.
- In the case of a cooked product the cooking techniques which may be employed include steaming, oven-baking, pan-frying, deep-frying and grilling. Also the cooked product may be either hot or cold at the time of coating. 20
- A pre-cooked, chilled or frozen coated product may then be simply reheated prior to consumption, for example by oven-baking, deep-frying or any of the aforementioned cooking techniques. Frozen pre-cooked products may be thawed before heating, however, this is entirely optional and, indeed, is not normally necessary or recommended. For example, frozen fish-fingers prepared according to the process of the invention can be simply oven-baked for a short period before serving. Many battered or breaded products, such as chicken portions, currently on the market cannot be successfully oven baked. 25
- The edible product may be subjected to partial pre-cooking prior to coating with the batter. Pre-cooking may consist of steaming the product for a short period of time. Such a pre-cooking step is carried out for the convenience of the consumer since it shortens the ultimate cooking time involved. 30
- If the product to be coated is pre-cooked then essentially no further moisture loss will occur during subsequent processing of the product such as freezing and heating of the product.
- When the coated product is subjected to rapid freezing, it may be flash fried for approximately 90 seconds to improve the binding of the batter to the product and thereby prevent the batter dripping off the coated pieces of product prior to freezing. The flash frying causes the coating to get on the product. 35
- Whether or not the coated product is flash fried depends also on the size of the pieces of coated product and the state of the product at the time of coating. For example, in the case of frozen products such as scampi, the coating binds readily to the product because it gels when it comes into contact with the frozen product.
- In a typical bulk process for preparing coated edible products according to the invention, for example coated chicken pieces, the product is battered in the raw state by passing pieces of said product to be coated through a vat containing the batter. The coated pieces are then conveyed to a deep-fat fryer for flash frying for approximately 90 seconds. The flash fried pieces are passed over a blower which blows off excess cooking fat and then passed through a cooling tunnel prior to blast freezing. 40
- According to the present invention coated products may be cooked from the frozen state using any of the above mentioned cooking techniques and yet retain a high moisture content. 45
- There are few batter coated and crumb coated products at present on the market which can be successfully cooked from the frozen state without substantial loss of moisture.
- Chilled and frozen coated products prepared according to the present invention are unique in that they can be successfully oven-baked without prior thawing and in that the coating remains crisp after oven-baking. 50
- The process according to the invention ensures minimal loss of moisture from an edible product prepared in accordance with said process. In experimental trials moisture retention has been generally found to be greater than 80% and frequently as high as 90% or greater.
- The edible product can be coated with the batter in accordance with the process of the present invention in either a cooked or frozen state without the need for pre-dusting with flour or other dusting agent conventionally used in the preparation of edible products coated with batter. 55
- As stated above, the batter used in the process of the present invention will readily adhere to any of the edible products hereinabove specified. On account of this good adherence of batter to the product, the coated product is very durable, with consequent cost savings during production and handling stages. With conventional batter coated products, the batter is inclined to drop off the product during production and handling. Up to 10% of the product being manufactured is frequently wasted in this way. 60
- The coated edible products prepared according to the present invention retain their crispness after cooking by any one of the cooking techniques hereinabove mentioned and unlike conventional battered products do not go soggy.
- Egg white substitutes have conventionally been used for their gelation, heat setting and foaming 65

properties. The Applicants are unaware of such egg white substitutes having been used for the sealing in of natural juices in a batter coated product as hereinabove described.

The invention is further illustrated by the following Examples:

5 *Example 1* 5

A batter for chicken portions was prepared from the following ingredients:

	<i>Ingredient</i>	<i>Amount (grams)</i>	
10	Cream/plain flour	394	10
	Egg white substitute		
15	(MERI-WHITE) (Trade Mark)	17	15
	Salt	20	
	Pepper	6	
20	Curry powder	10	20
	Mustard (dry)	7	
25	Total weight of ingredients	454 grams.	25

The dry ingredients were mixed together and then sufficient water was added to give a batter consistency. The chicken portions were dipped in the batter and were immediately subjected to blast freezing at -40°C in a GIRO freezer (GIRO is a Trade Mark) so that complete freezing took place in approximately 20 minutes. The chicken portions were deep fat fried in the frozen state in a deep fat fryer at 180°C and after approximately 12 minutes the cooked chicken portions were removed for organoleptic testing.

The chicken portions were found to have a flavour, appearance and texture superior to fresh roasted or boiled chicken portions or, indeed, chicken portions coated with a conventional batter and deep fat fried. Furthermore, the chicken portions were found to have a high moisture content of up to approximately 90% of the original moisture content.

*Example 2*

The process of Example 1 was repeated except that the water was replaced by beer. 40

*Example 3*

The process of Example 1 was repeated except that the chicken portions were replaced by turkey portions. The cooked turkey portions were found to be extremely tasty and to have a very high moisture content.

45 *Example 4* 45

The process of Example 1 was repeated except that the chicken portions were replaced by onion rings.

50 MERI-WHITE comprises the following ingredients in descending order: 50

	Starch		
	Spray dried albumen		
	Sugar		
55	Modified starch		55
	Calcium lactate		
	Cream of tartar		
	Lactic acid		
	Tartaric acid		
60	Stabiliser		60
	Flavouring		

On analysis MERI-WHITE has been found to have the following composition:

	<i>Component</i>	<i>% (w/w)</i>	
5	Moisture	5.4	5
	Crude Protein (N × 6.25)	22.6	
10	Fat	< 0.1	10
	Ash	3.2	
15	Carbohydrate (by difference)	68.7	15

On further analysis the protein fraction has been shown to comprise 28% dried egg albumen, no other proteins being identified. The egg albumen was positively identified by electrophoresis.

The carbohydrate fraction has been shown to be comprised predominantly of maize starch. Maize starch granules have also been identified in the product on microscopic examination.

#### *Comparison Tests*

A series of experiments were carried out to compare a batter used in the processes according to the invention with a standard batter under controlled conditions. The specific parameters examined were:

- 25 1. Apparent moisture loss from a coated edible product during deep fat frying;
2. Increase in weight of the coated edible product as a percentage of the raw weight;
3. Increase in weight of the coated edible product as a percentage of the weight of added batter

30 All the tests were carried out on chicken legs and breasts. 30

#### *Method*

The pieces of chicken (leg or breast) were weighed and coated using a dilute batter (Batter 1)\* and weighed again to give the weight of added batter (Weight Batter 1). The product was deep fat fried at 35 approximately 220°C for 6 minutes and weighed again (Cooked Weight). When the product had cooled it was again coated in a more concentrated batter (Batter 2)\*\*, weighed to give the weight of added batter 2 (Weight Batter 2), deep fat fried for a further 6 minutes, and weighed again (Cooked Weight).

The weight increase was then calculated as a percentage of both the raw weight and the weight of added batter and the results are detailed in the following tables 1-4.

40 The batters used had the following compositions: 40

	* Batter 1:	224g dry mix from Example 1 in	
45		354 ml water	45
	** Batter 2:	224g dry mix from Example 1 in	
		283 ml water	
50	Control Batter	224g dry mix from Example 1 minus	50
		MERI-WHITE.	

55 Figures for weights are expressed in grams. 55

TABLE 1

5	<i>Control Batter</i>	<i>Chicken Legs</i>					5
		<i>Leg 1</i>	<i>Leg 2</i>	<i>Leg 3</i>	<i>Leg 4</i>	<i>Average</i>	
	Raw Weight	68	71	81	96		
10	Weight Batter	13	14	17	19		10
	Cooked Weight	72	79	90	108		
15	Weight Increase	4	8	9	12		15
	Weight Increase as % of Raw Weight	5.8	11.26	11.11	12.50	7.073	
20	Weight Increase as % of Added Batter	30.76	57.14	52.94	63.15	50.99	20

TABLE 2

25	<i>Control Batter</i>	<i>Chicken Breasts</i>				25
		<i>Breast</i>	<i>Breast</i>	<i>Breast</i>	<i>Breast</i>	
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	
30	Raw Weight	144	145	153	-	30
35	Weight Batter	22	25	33	-	35
	Cooked Weight	164	170	185	-	
40	Weight Increase	20	25	32	-	40
	Weight Increase as % of Raw Weight	13.88	17.24	20.91	-	17.34
45	Weight Increase as % of Added Batter	90.90	100	96.96	-	95.95

TABLE 3

5	<i>Batter of Example 1</i>	<i>- Chicken legs</i>					5
		<i>Leg 1</i>	<i>Leg 2</i>	<i>Leg 3</i>	<i>Leg 4</i>	<i>Average</i>	
	Raw Weight	81	99	86	66		
10	Weight Batter 1*	18	20	18	16	10	
	Cooked Weight	92	110	96	75		
15	Weight Increase	11	11	10	11	15	
	Weight Increase as % of Raw Weight	13.58	11.11	11.62	16.66	13.24	
20	Weight Increase as % of Added Batter	61.11	55.0	55.55	68.75	60.10	

TABLE 4

25	<i>Batter of Example 1</i>	<i>- Chicken Breasts</i>					25
		<i>Breast</i>	<i>Breast</i>	<i>Breast</i>	<i>Breast</i>	<i>Average</i>	
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>		
30	Raw Weight	144	144	164	163	30	
35	Weight Batter 1*	42	36	35	34	35	
	Cooked Weight	185	184	191	193		
40	Weight Batter 2**	49	50	44	45	40	
	Cooked Weight	226	223	225	228		
45	Total Weight of Added Batter	91	86	79	79	45	
	Total Weight Increase	82	79	61	65		
50	Weight Increase as % of Raw Weight	56.94	54.86	37.19	39.87	47.215	
55	Weight Increase as % of Added Batter	90.10	91.86	77.21	82.27	85.36	

## CLAIMS

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1. A process for sealing an edible product so that the product retains a high moisture content upon subsequent freezing and cooking, which process comprises coating said product with a substantially fat-free batter containing flour, an aqueous liquid and optionally seasonings, and between 0.5 and 10% by weight on a dry basis of an egg white substitute as hereinbefore defined, such that the coating gels on freezing or

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heating of the coated product.

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2. A process according to claim 1, wherein the egg white substitute contains greater than 15% by weight of a globular proteinaceous material which is soluble in water and coagulable by heat.
3. A process according to claim 2, wherein the globular proteinaceous material is albumen.
4. A process according to claim 3, wherein the albumen is egg albumen.
- 5 5. A process according to claim 1 or 2, wherein the egg white substitute is an egg albumen-based product as hereinbefore defined. 5
6. A process according to claim 5, wherein the egg albumen-based product comprises dried egg albumen extended with a carbohydrate material.
7. A process according to claim 6, wherein the carbohydrate material is starch.
- 10 8. A process according to any one of claims 5-7, wherein the batter contains between 3 and 5% by weight on a dry basis of a fortified egg albumen-based egg white substitute as hereinbefore defined. 10
9. A process according to claim 1 or 2, wherein the egg white substitute is a whey protein isolate.
10. A process according to claim 9, wherein the whey is a cheese whey.
11. A process according to claim 9, wherein the whey is a whey of vegetable origin.
- 15 12. A process according to any one of claims 1-11, wherein the egg white substitute is in powder form. 15
13. A process according to any one of claims 1-11, wherein the egg white substitute is in liquid form.
14. A process according to any one of claims 1-13, wherein the edible product has a major proportion of meat.
15. A process according to claim 14, wherein the meat is white meat, red meat, fish or shellfish.
- 20 16. A process according to claim 14 or 15, wherein the meat is poultry meat. 20
17. A process according to claim 16, wherein the poultry is chicken or turkey.
18. A process according to any one of claims 1-13, wherein the product to be coated is a vegetable.
19. A process according to claim 18, wherein the product to be coated is onions.
20. A process for preparing a chilled or frozen edible product which retains a high moisture content on subsequent cooking, which comprises coating said product with a batter as defined in any one of claims 1-13 and rapidly chilling or freezing the coated product. 25
21. A process according to claim 20, wherein freezing is carried out by blast freezing in a spiral freezer.
22. A process according to claim 20 or 21, wherein freezing is completed within twenty minutes.
23. A process according to any one of claims 20-22, wherein the coated product is flash-fried for up to two minutes before freezing so as to improve binding of the batter to the product. 30
24. A process according to any one of claims 20-23, wherein the product to be coated is a product as defined in any one of claims 14-19.
25. A process according to any one of claims 20-24, wherein the edible product is partially or completely cooked before coating with the batter.
- 35 26. A process according to any one of claims 20-24, wherein the edible product is frozen before coating with the batter. 35
27. An edible product whenever coated with a batter as defined in any one of claims 1-13.
28. A process according to claim 1 for sealing an edible product so that the product retains a high moisture content upon subsequent freezing and cooking, substantially as hereinbefore described and exemplified. 40
29. An edible product whenever sealed by a process claimed in a preceding claim.
30. A process according to claim 20, for preparing a chilled or frozen edible product which retains a high moisture content upon subsequent cooking, substantially as hereinbefore described and exemplified.
31. A chilled or frozen edible product whenever prepared by a process claimed in a preceding claim.
- 45 32. A chilled or frozen edible product according to claim 31, which can be cooked directly from the chilled or frozen state, respectively, without prior thawing. 45
33. A chilled or frozen edible product according to claim 32, wherein the cooking is carried out by oven-baking.