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Novel meat product comprising yogurt and process for producing the same

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(21) International Application Number: PCT/GB99/01854 (22) International Filing Date: 11 June 1999 (11.06.99) (30) Priority Data: 198 26 978.1 18 June 1998 (18.06.98) DE (71) Applicant (for all designated States except US): BERNARD MATTHEWS PLC [GB/GB]; Great Witchingham Hall, Great Witchingham, Norwich, Norfolk NR9 5QD (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): MATTHEWS, Bernard, Trevor [GB/GB]; Great Witchingham Hall, Norwich, Norfolk NR9 5QD (GB). JOLL, David, John [GB/GB]; Irmingham Hall, Corpusty, Norfolk NR11 6QF (GB). KOPPERS, Werner [DE/DE]; Metjendorfer Landstrasse 236, D-26215 Wiefelstede (DE). BUSE, Friedrich [DE/DE]; Butadinger Strasse 139, D-26215 Oldenburg (DE). (74) Agents: EVANS, David, Charles et al.; 11 Cleveland, 40-43 Chancery Lane, London WC2A 1JQ (GB).	(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>	
(54) Title: NOVEL MEAT PRODUCT COMPRISING YOGURT AND PROCESS FOR PRODUCING THE SAME (57) Abstract A novel meat product is provided which comprises a monolithic piece of meat that is injected with yogurt and processed mechanically to distribute the yogurt substantially uniformly throughout the piece. The product may comprise 5 to 50 % by weight of injected yogurt. Said yogurt may have a pH of less than 5.2, preferably about 3.8 to 3.9 to improve the shelf-life of a raw meat product. Alternatively, the meat product may be cooked, and the yogurt may have a pH of 4.8 to 5.1 to ensure that the overall pH of the meat product does not fall too close to the isoelectric point of the meat, thus preserving the natural moisture and juiciness of the meat during and after cooking.		

Novel Meat Product Comprising Yoghurt and Process for Producing the Same

The present invention relates to a novel meat product comprising yoghurt.

- 5 In particular, the present invention relates to a meat product comprising a monolithic piece of meat that is injected with yoghurt. The present invention also relates to a process for producing a meat product injected with yoghurt.

10 Yoghurt and other fermented milk products are used in many traditional recipes for marinating and/or pickling meat. For example, it is well known to marinate venison in sour buttermilk.

Russian Patent Specification No. 2084184 discloses a fermented meat product obtained by pickling the meat product in the presence of a fermented milk product.

15 According to these recipes, yoghurt is used to impart a sharp, tangy flavour to a marinated, outer zone of the meat product.

20 WO-A-99/21438 discloses a cooked sausage comprising a mixture of meat emulsion and mild yoghurt, wherein the yoghurt is substantially homogeneously dispersed through the meat emulsion, and the mixture has a pH of about 5.5 or more. The water retaining capacity of the meat is thus retained, providing a sausage having desirable organoleptic qualities. Said mild yoghurt may be prepared from milk mixtures by inoculation by slow working yoghurt starter cultures. An advantage of the sausage
25 product of WO-A-99/21438 is that it contains fewer calories per unit weight than conventional meat sausages and is generally easier to digest.

Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is solely for the purpose of providing a
30 context for the present invention. It is not to be taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed before the priority date of each claim of this application.

35 A preferred feature of the present invention is to provide a novel meat product.

In particular, it is a preferred feature of the present invention to provide a novel meat product comprising a monolithic piece of meat, that is a piece of meat that retains its natural structure and consistency. The term "monolithic" thus embraces whole muscle pieces of meat, as well as smaller, but nevertheless recognisable pieces such as slices
 5 and strips of meat and cubed or diced meat, and also referred meat such, for example, as reformed steaks. The term "monolithic" is intended to exclude meat pieces which have been subjected to more severe mechanical processing such as minced or comminuted meat and meat emulsions or doughs of the kind that are formed into sausages, for example.

10

A further preferred feature of the present invention is to provide a novel meat product comprising yoghurt, which is thus lighter in terms of its calorie-content per unit weight as compared with unprocessed meat and is easier to digest.

15 Yet another preferred feature of the present invention is to provide a raw meat product which has a longer shelf life as compared with natural cuts of raw meat.

Yet another preferred feature of the present invention is to provide a meat product having a novel aroma and/or taste.

20

Yet another preferred feature of the present invention is provide an industrial process for producing such a meat product.

Accordingly, in a first aspect of the present invention, there is provided a meat product
 25 comprising a piece of whole muscle meat, characterised in that said piece has been injected with yoghurt and then processed mechanically to distribute said yoghurt substantially uniformly throughout the piece.

In a second aspect of the present invention, there is provided a process for making a
 30 meat product, characterised by injecting a piece of whole muscle meat with yoghurt and thereafter mechanically processing the meat to distribute the yoghurt substantially uniformly through the meat.

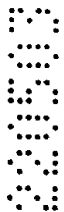
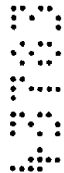
Throughout this specification the word "comprise", or variations such as "comprises" or
 35 "comprising", will be understood to imply the inclusion of a stated element, integer or

step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

The injected yoghurt may be distributed further throughout the piece of meat by
5 mechanically tenderising and/or tumbling. Said product may comprise 5-50% by
weight of injected yoghurt. It has been found that by injecting yoghurt into a monolithic
piece of meat in accordance with the invention, pores and cavities within the piece may
be filled with yoghurt and, where higher proportions of yoghurt are used, the piece may
become saturated with yoghurt. The invention thus provides a meat product having
10 attractive, novel organoleptic properties. By the addition of yoghurt the calorie-content
per unit weight of the product is reduced as compared with natural meat, and the
product as a whole may be generally easier to digest. As a further advantage, the
mechanical processing of the meat after injection assists in disrupting the structure of
the meat, especially proteins, which may thus be opened and free water within the meat
15 may become incorporated properly within the meat structure. As a result, meat
processed in accordance with the invention will typically be tender and juicy after
cooking.

The product of the present invention may be cooked as part of the production process,
20 or alternatively the product may be supplied raw for cooking by a consumer.

Where the product is to be supplied raw, e. g. for cooking at home by a consumer, the
yoghurt may have a pH less than 5.2, preferably less than 4.8. In some embodiments,
the yoghurt may have a pH in the range of 3.6 to 4.0, for example 3.8 or 3.9. By using
25 yoghurt having such a low pH, the acidity of the product as a whole is increased which
tends to suppress the proliferation of



unwanted microorganisms within the meat before cooking. Thus, the product of the present invention may have a longer shelf as compared with natural raw meat.

On the other hand, where the product is to be cooked as part of the production process, e.g. for sale as a cooked cold cut, it is preferable to use yogurt for injection that has a pH which is selected such that, when mixed with the meat, the pH of the product does not fall too close to the isoelectric point of the meat. To this end, the overall pH of the product should be not less than 5.0, and is preferably at least 5.5. The pH of the yogurt which should be used to ensure that the pH of the product falls within these ranges will obviously vary depending on how much yogurt is incorporated into the product. However, the yogurt will typically have a pH in the range of 4.8 to 5.1. By maintaining the pH of the product as a whole above the isoelectric point of the meat, the loss of moisture and water from the product during cooking is minimised. On the other hand, if the pH of the product falls below about pH 5.5 towards the isoelectric point of the meat, then the water-retaining capacity of the meat is reduced, with the result that the juiciness and texture of the final product is impaired.

The product in accordance with the present invention may therefore be injected with a mild yogurt that is prepared in the traditional manner, but is used in the process of the invention before fermentation is fully completed. Thus, after inoculation of a milk mixture, the pH may be monitored until it reaches a desired value. The mild yogurt produced as a result is then made ready for use in the method of the present invention.

Prior to injection, the yogurt may be treated to destroy the yogurt cultures and any other bacteria present in the yogurt. In some embodiments,

fermentation of the yogurt may be quenched by cooling the yogurt to a temperature in the range -2 to 6°C, preferably about -1°C. The yogurt may be cooled rapidly with liquid nitrogen or using a plate-heat exchanger.

Alternatively, the yogurt may be heated to a temperature in the range 65 to 70

5 °C, for instance by using a heat exchanger instead of cooled.

In order to assist in controlling accurately the pH of the yogurt to be injected into the meat piece, slow-working yogurt starter cultures are preferably used. Such slow-working yogurt cultures may comprise L.acidophilus,
10 Bifidobacteria, and S.thermophilus. Further, the yogurt is preferably stirred continuously before use to allow accurate pH control.

In some embodiments, the mild yogurt may comprise an edible alkaline additive to neutralise the acidity of the yogurt. Said alkaline additive may comprise, for example carbonated soda. Phosphates could also be used to stabilise the mixture.

15 In a further aspect of the present invention, the yogurt injected into the meat piece may comprise active yogurt with live yogurt cultures, so that the resultant yogurt cultures in the product act as protective cultures which hinder the reproduction of undesirable microorganisms in the meat. Said live yogurt cultures may be found in yogurt having a low pH for injection into meat
20 intended to be supplied raw, as well as in yogurt having a relatively high pH for injection into meat intended to be cooked as part of the manufacturing process. Prior to injection, the yogurt may be combined with additional condiments and/or flavourings. Said yogurt may comprise 5 to 25% by weight (based on the yogurt) of such additional flavourings and condiments. For example, the yogurt
25 may be mixed with seasonings such as salt and pepper, sodium ascorbate, honey

or other flavourings such as smoke flavour or roast flavour.

In some embodiments, said yogurt may comprise up to 10% by weight of a pre-biotic additive such as a non-digestible carbohydrate. An example of a pre-biotic carbohydrate is inulin. The yogurt may comprise 1-10 %wt inulin,
5 which selectively promotes the activity of some health promoting bacteria in the colon.

Said yogurt may be injected into the meat piece using a single needle injector or a multi-needle injector. A suitable multi-needle injector is the injector that is commercially available from Schröder Maschinenbau GmbH
10 under the trade name "Pökelinjektor N120". The yogurt may be injected at a pressure of about 0.9 to 3.0 bar depending on the type of meat and injection rate. The meat may be injected more than once. In some embodiments, the meat may be injected using tenderising needles.

After injection and mechanical processing, the product may be directly
15 packaged if it is to be sold raw. Alternatively, the product may be coated with spices and/or marinades and optionally cut prior to packaging. As a further alternative, the product may be cooked and optionally smoked and then packaged. As with the raw product, the meat may be further divided into portions or slices prior to packaging as required. In some embodiments, the
20 product may be shaped into any desired shape. For instance, the meat, after injection and tumbling, may be extruded to form an elongate log of generally circular or oval cross section using apparatus of the kind described in EP-A-0024790 or EP-A-0850566.

The meat piece may comprise meat from any kind of slaughtered animal.
25 For instance, the meat may comprise red meat, such, for example, as beef,

venison, lamb or pork; or poultry, such, for example, as turkey or chicken.

Following is a description by way of example only with reference to the accompanying drawings of methods of carrying the present invention into effect.

In the drawings:

5 Figure 1 is a flow diagram of a process in accordance with the present invention.

Figure 2a is a schematic plan view of a meat product in accordance with the present invention.

10 Figure 2b is a schematic isometric view of a slice of the meat product of Figure 2a.

Figure 3a is a schematic side view of a different product in accordance with the present invention.

Figure 3b is a schematic isometric view of a slice of the product of Figure 3a.

15 With reference to Figure 1, yogurt is manufactured substantially according to the traditional manner using milk that is clarified and separated into cream and skimmed milk and then standardised to achieve a desired fat content. The desired proportions of cream and skimmed milk are then blended together, and the mixture is pasteurised and homogenised. The homogenised mixture is
20 heated to a temperature in the range 85 to 90°C for about 30 minutes, and is then cooled to a temperature in the range about 30 to 50°C. After cooling the mixture is inoculated with yogurt starter cultures. The mixture is allowed to ferment for about 4 to 6 hours at 30-50°C, typically about 43°C, such that the mixture coagulates to form yogurt. The pH of the mixture is carefully
25 monitored until a desired pH is reached. For products that are intended to be

supplied raw to a consumer, the yogurt may be fermented until it is fully fermented in the range 3.6 to 5.1, preferably about 3.8 to 3.9. Alternatively, for meat products intended to be cooked as part of the manufacturing process and then supplied to a consumer for reheating, yogurt may be fermented to a
5 relatively higher pH in the range of 4.8 to 5.1 using a slow working starter culture comprising S.thermophilus L.acidophilus and Bifidobacteria.

Once the desired yogurt pH has been reached, the yogurt is subjected to shock freezing to a temperature of -1°C to prevent further fermentation of the yogurt. For such shock freezing, liquid nitrogen or a plate-heat exchanger may
10 be used. As an alternative the yogurt could be heated using a heat exchanger to a temperature in the range 65 to 70 °C. This is especially convenient for yogurt having a low pH for injection into meat that is to be sold raw.

If desired, the fermented yogurt may then be blended with additional spices or other additives.

15 Contemporaneously, raw meat is provided in the form of monolithic pieces. Said pieces may be whole muscle or reformed pieces or alternatively said meat may be mechanically divided to form smaller pieces such as cubes or strips. The meat is weighed into portions of a predetermined weight, and is then combined with the yogurt using a multi needle injector, such as the "
20 Pökelinjektor N120" available from Schröder Maschinenbau GmbH. The yogurt, with optional additives, is injected into the meat at a pressure of about 0.9 to 3.0 bar depending on the type of meat and the size of the needles. After injection of a predetermined amount of yogurt, the product is tumbled to distribute the yogurt substantially uniformly throughout the monolithic meat piece.

25 The product can then be packaged for dispatched. Alternatively, it may

be blended with spices and/or other marinades and packaged. Optionally, the pieces may be further mechanically divided, for example, by being formed into slices.

In yet another alternative, the meat pieces after tumbling may be packaged and/or stuffed and then cooked and/or smoked prior to packaging. Again, the product may be divided further prior to packaging for dispatch.

Example 1

A pork steak with yogurt product is prepared as described above using the following recipe:

Pork Steak with Yogurt

	Boneless Pork Loin	73 kg
	Yogurt Mix for Injection	
15	Yogurt	25 kg
	Salt	1,7 kg
	Pepper	0,18 kg
	Roast flavour	0,12 kg
	Total	100 kg

20

As can be seen, 25 kg yogurt is combined with salt, pepper and a proprietary

roast flavour. The yogurt mixture is then injected into 73 kg of boneless pork loin and tumbled. The resultant product is shown schematically in Figure 2a, and a slice through the product having approximately the weight of an individual portion is shown in Figure 2b.

5

Example 2

A turkey breast with yogurt and honey product is made following the above procedure, with the following recipe:

Turkey Breast with Yogurt and Honey

	Turkey breast	70 kg
5		
	Yogurt Mix for Injection:	
	Yogurt	24 kg
	Curing salt	2 kg
10	Sodium ascorbate	0,3 kg
	Honey	3,5 kg
	Smoke flavour	0,2 kg
15	Total	100 kg

24 kg of yogurt is mixed with curing salt, sodium ascorbate, honey and a proprietary smoke flavour. The yogurt mix is then injected into whole muscle turkey breast portions having a weight of 70 kg. The product is then tumbled and extruded through a stuffing horn into a shirred casing. The resulting product is shown schematically in Figure 3a.

The extruded product is then cooked and smoked as follows:

Cooking and Smoking Procedure

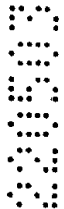
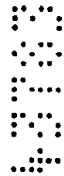
for Turkey Breast with Yogurt and Honey

5	Step	Time	Process	Temp	
	1	30 min	cooking	45°C	
	2	30 min	cooking	55°C	
	3	10 min	cooking	60°C	
	4	10 min	cooking	65°C	
10	6		cooking	75°C	to a core temperature of 72°C
	7	Cold water shower for 60 minutes			
	8	30 min	drying		50°C
	9	30 min	smoking		50°C
15	10	Cooling in chiller for 12 hours			

After cooking and smoking, the casing is stripped from the product which is then sliced and repackaged for dispatch.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A meat product comprising a piece of whole muscle meat, characterised in that said piece has been injected with yoghurt and then processed mechanically to distribute said yoghurt substantially uniformly throughout the piece.
2. A meat product as claimed in claim 1, comprising 5 to 50% by weight of injected yoghurt.
3. A meat product as claimed in claim 1 or claim 2 which is raw.
4. A meat product as claimed in claim 3 wherein the yoghurt has a pH of less than 5.2.
5. A meat product as claimed in claim 4 wherein the yoghurt has a pH of 3.8 to 3.9.
6. A meat product as claimed in claim 1 or claim 2, wherein said product is cooked.
7. A meat product as claimed in claim 6, wherein the product has a pH of not less than 5.0.
8. A meat product as claimed in claim 7, wherein the pH is at least 5.5.
9. A meat product as claimed in claim 7 or claim 8, wherein said yoghurt is a mild yoghurt in which fermentation is quenched prior to completion.
10. A meat product as claimed in claim 7 or claim 8, characterised in that said yoghurt comprises an edible, alkaline additive to neutralise the acidity of the yoghurt.
11. A meat product as claimed in any preceding claim wherein said yoghurt comprises 5 to 25% by weight of additional flavourings and/or condiments.
12. A meat product as claimed in any preceding claim wherein said yoghurt comprises up to 10% by weight of pre-biotic additive.



13. A process for making a meat product, characterised by injecting a piece of whole muscle meat with yoghurt, and thereafter mechanically processing the meat to distribute the yoghurt substantially uniformly throughout the meat.

14. A process as claimed in claim 13 wherein said yoghurt is distributed further throughout the piece of meat by tenderising and/or tumbling.

15. A process as claimed in claim 13 or claim 14 comprising 5 to 50% by weight injected yoghurt.

16. A process as claimed in claim 13, claim 14 or claim 15 wherein said yoghurt has a pH of less than 5.2.

17. A process as claimed in claim 16 wherein the pH is 3.8 to 3.9.

18. A process as claimed in claim 13, 14 or 15, further comprising cooking the meat product.

19. A process as claimed in claim 18 wherein said product has a pH of not less than 5.0.

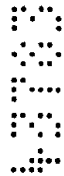
20. A process as claimed in claim 19 wherein the pH is at least 5.5.

21. A process as claimed in claim 19 or claim 20, wherein the piece of whole muscle meat is injected with a mild yoghurt having a pH of 4.8 to 5.1.

22. A process as claimed in claim 19, 20 or 21, wherein the yoghurt is made using slow starter cultures.

23. A process as claimed in claim 19, 20, 21 or 22, characterised in that fermentation of said yoghurt is quenched before it is completed.

24. A process as claimed in claim 19, 20 or 21, wherein the yoghurt comprises an edible, alkaline additive to neutralise the acidity of the yoghurt.



25. A process as claimed in claim 13 to claim 24, wherein prior to injection the yoghurt is treated to destroy yoghurt cultures and any other bacteria present in the yoghurt.

26. A process as claimed in claim 25 wherein the yoghurt is treated by cooling to a temperature in the range -2 to 6 C.

27. A process as claimed in claim 25 wherein the yoghurt is treated by heating to a temperature in the range 65 to 70 C.

28. A process as claimed in any of claims 13 to claim 27 wherein the yoghurt is injected into the meat piece using a single needle injector or a multi-needle injector.

29. A process for making a meat product substantially as hereinbefore described with reference to accompanying Figure 1.

30. A meat product comprising a piece of whole muscle meat substantially as hereinbefore described with reference to the examples 1 and 2.

31. A process for making a meat product substantially as hereinbefore described with reference to the examples 1 and 2.

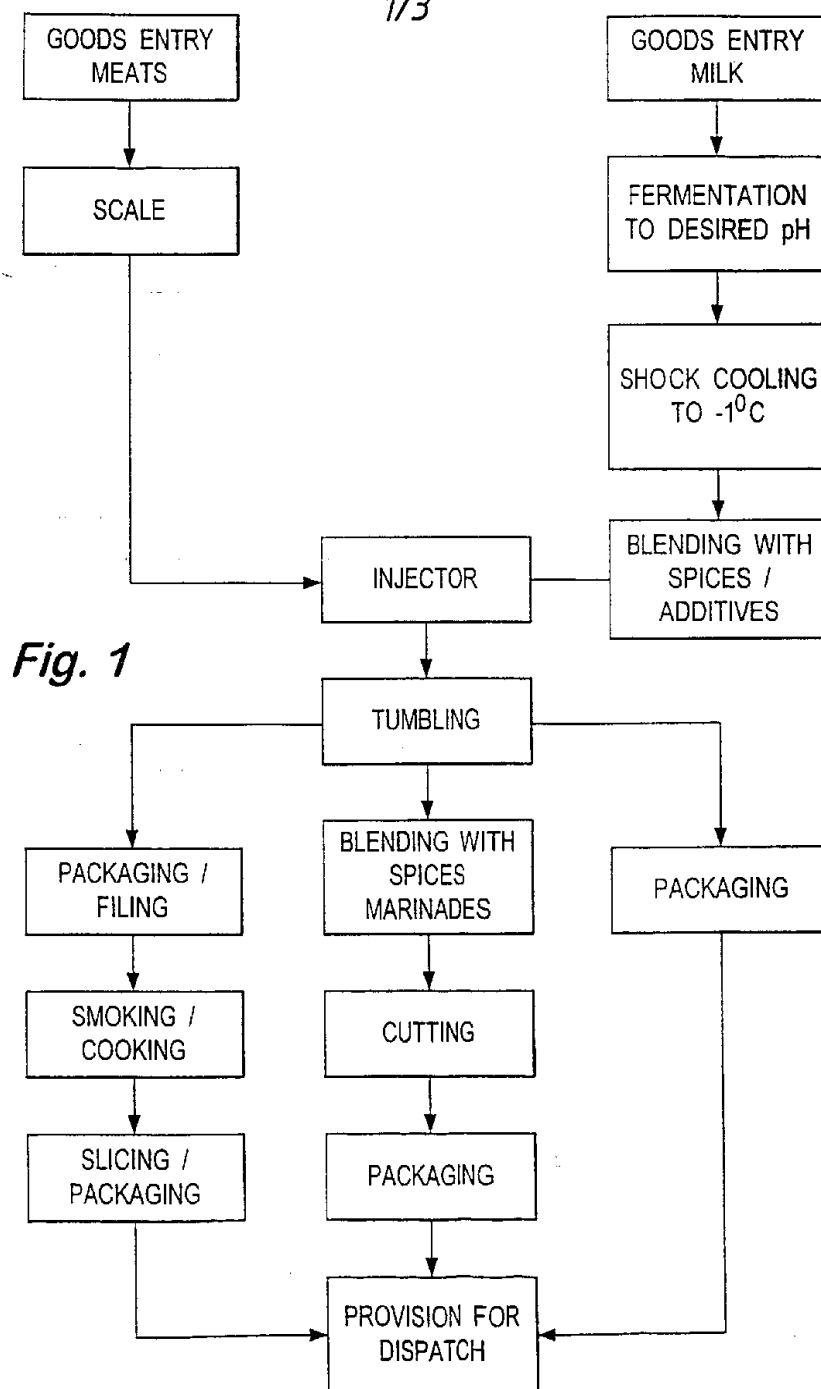
Dated this twentieth day of May 2003

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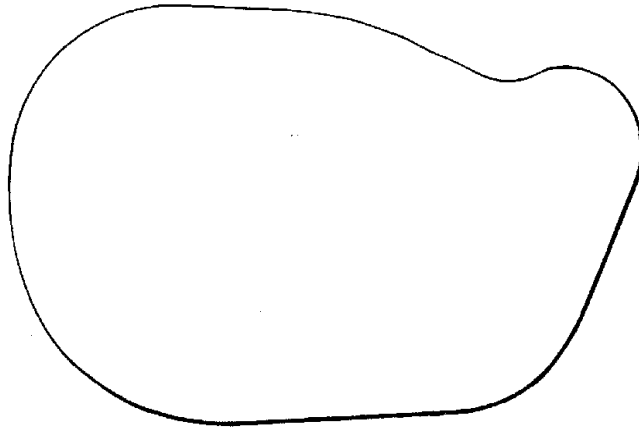


Fig. 2A

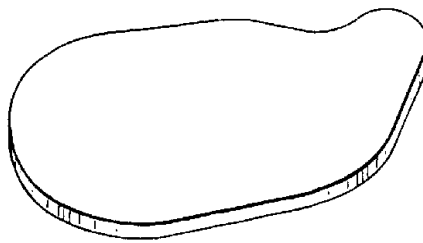


Fig. 2B

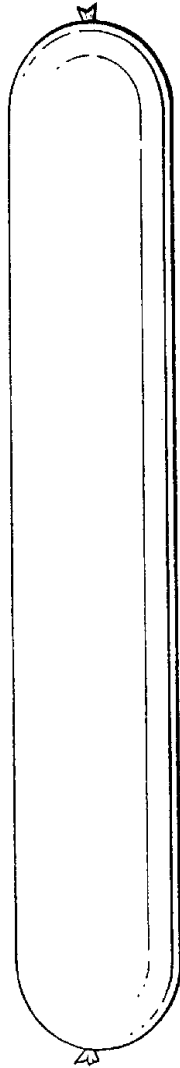


Fig. 3A

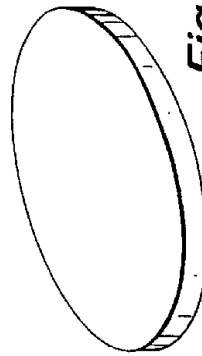


Fig. 3B