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TITLE: MEAT EMULSION PRODUCT

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BACKGROUND OF THE INVENTION

10 The present invention relates generally to food products. More specifically, the present invention relates to the production of a meat emulsion product having a meat-like appearance and texture, and products so produced.

15 It is known to produce meat emulsions in the food industry. Meat emulsions are widely used in the production of products such as bologna, frankfurters, and other sausage products. Additionally, such meat emulsion products are used to produce pet foods.

20 Typically, meat emulsion products are prepared by mixing, chopping, and emulsifying a mixture of raw meat materials such as lean skeletal beef and pork, and meat by-products, with ice, salt, spices, and curing salts in such a manner as to produce an emulsion that contains fine fat particles coated with protein dissolved from meat ingredients. In the case of a sausage product, the resultant meat emulsion is then stuffed into a suitable casing that serves as a processing mold. The casing is then heated at increasing temperatures, for example 55°C to 77°C, for extended periods of time, which may vary between 1 to 8 hours or more, depending on the volume of meat emulsion being processed.

25 The heating of the meat emulsion causes the protein contained therein to coagulate or to set solid. This thereby entraps the fat particles in the protein matrix thereby forming a firm meat emulsion product. The resultant meat emulsion product is a uniform, homogeneous mass that contains no discrete particles of meat and retains the shape of the casing when set.

30 In order to reduce the cost of certain food products to consumers, there has been a demand, in recent years, for meat emulsion products that resemble chunks or pieces of natural meat in appearance, texture and physical structure. Such products are used as a partial or complete replacement for more expensive natural meat chunks in food products such as stews, pot pies, casseroles, canned foods, and pet food products.

35 Chunky meat products are highly desirable in human foods and pet foods, both for aesthetic quality and consumer appeal. These chunky products provide a more

economical product that attempts to simulate natural meat chunks in shape, appearance and texture. It is highly desirable that these products retain their shape, appearance and texture when subjected to commercial canning and retorting procedures.

5 Efforts directed to providing such simulated natural meat chunks have included producing such products from vegetable protein sources, using extrusion-expansion techniques. Such products have met with some acceptance in the food industry, but they have been limited primarily to use as meat extenders. Products produced using vegetable protein sources in an extrusion-expansion procedure lack the appearance and texture of natural meat and therefore are generally not suitable as full substitutes for
10 meat.

 Similarly, meat extrusion products, based on meat protein, produced by conventional procedures have not been entirely satisfactory. These products are in the form of a uniform, homogeneous mass, and lack the structure, texture, and appearance of natural meat chunks. Therefore, these products are not suitable for use in
15 applications in which the use of simulated meat chunks is desired.

 One attempt to improve such meat emulsion products is disclosed in U.S. Patent No. 4,781,939. This patent discloses processing a meat emulsion under conditions that result in the production of a layered, non-expanded product in the form of chunks or pieces which simulate natural meat chunks in texture, appearance and consistency.
20 The meat emulsion product is in the form of distinct chunks or pieces having a plurality of juxtaposed, manually separable meat-like layers resembling a chunk of natural meat in appearance, texture, and consistency. The meat emulsion chunks are suitable for use as a partial or complete replacement for more expensive natural meat chunks in both human foods and animal foods. They retain their integrity and shape when
25 subjected to commercial canning and sterilization procedures such as those required in the production of canned, high moisture food products.

 Although the products produced by the methods set forth in U.S. Patent No. 4,781,939 provide meat emulsion chunks that can be used as a replacement for more expensive natural meat chunks in both human foods and animal foods, such products
30 still do not entirely simulate a meat-like product and may not have as strong a bite/mouth feel as a real meat chunk. In this regard, such products do not entirely simulate muscle meat that includes a plurality of linear fiber bundles or strands.

 Therefore, there is a need for an improved meat emulsion product and method for making same.

SUMMARY OF THE INVENTION

The present invention provides improved methods for producing meat emulsion products as well as products so produced. Pursuant to the present invention, meat emulsion products are produced that have realistic fiber definition in contrast to meat emulsions produced heretofore. This fiber definition provides a very realistic meat-like image similar to that of muscle meat. The resultant product also has a stronger bite/mouth feel and is not pasty, mushy or brittle as compared to other meat emulsion products.

To this end, in an embodiment, the present invention provides a meat emulsion product comprising a body defined, at least in part, by a plurality of fiber-like material and comprising at least 29% protein by weight and not more than 7% fat by weight.

In a preferred embodiment of the invention, the product is a pet food.

In a further preferred embodiment of the invention, at least a portion of the protein is derived from beef, pork, fish or poultry meat.

In another embodiment of the invention, the product comprises approximately 49% to 53% by weight moisture.

In a further embodiment of the invention, the meat emulsion includes at least one proteinaceous material. The proteinaceous material may preferably comprise approximately 25% to about 35% by weight of the product.

In an alternative embodiment, the present invention provides a meat emulsion product comprising a body including protein and fat and having a plurality of generally linear strands of fiber-like material affording the meat emulsion product a realistic meat-like appearance.

In a preferred such embodiment, the protein comprises approximately 29% to about 31% by weight of the meat emulsion product.

The fat preferably comprises approximately 4% to about 6% by weight of the meat emulsion product.

In a further preferred embodiment of the invention, the meat emulsion comprises approximately 49% to about 53% by weight moisture.

In a further aspect of the invention, a method for producing meat emulsion products having a realistic meat-like image is provided. The method comprises the steps of: forming a meat emulsion containing protein and fat; comminuting and heating the emulsion to a temperature of at least 132°C; introducing the emulsion into a

processing zone where it is subjected to a pressure of at least 100psi (689kPa); and discharging the emulsion from the zone.

In a preferred embodiment of the method, the emulsion is subjected to an incomplete shredding. In an embodiment, the incomplete shredding step includes
5 placing the emulsion through compression rolls. The shredding step may take place after discharge from the zone.

In a further preferred embodiment of the method, the meat emulsion includes at least 29% by weight protein and not more than 7% by weight fat.

Accordingly, it is an advantage of the present invention to provide an improved
10 meat emulsion product.

Another advantage of the present invention is to provide an improved method for manufacturing meat emulsion products.

Moreover, an advantage of the present invention is to provide a meat emulsion product that simulates muscle meat.

15 A still further advantage of the present invention is to provide a meat emulsion product that has a very realistic, meat-like image.

A further advantage of the present invention is to provide a meat emulsion product that has a very realistic meat-like image and retains its integrity and shape when subjected to commercial canning and sterilization procedures such as those required in
20 the production of canned high-moisture food products.

An additional advantage of the present invention is to provide a meat emulsion that can be dried and used to product a dried pet food.

Another advantage of the present invention is to provide a meat emulsion product that can be fried and used to produce a dried pet food or treat.

25 Furthermore, an advantage of the present invention is to provide a meat emulsion product that can be used in pet foods.

Another advantage of the present invention is to provide a meat emulsion product that has a stronger bite/mouth feel than typical meat emulsion products produced heretofore.

30 A further advantage of the present invention is to provide a meat emulsion that can simulate poultry, pork, beef, fish or other meat.

These and other advantages of the present invention are disclosed in and will be apparent from the detailed description of the presently preferred embodiments and the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a photograph of a prior art meat emulsion product.

Figure 2 is a photograph of an embodiment of a meat emulsion product of the
5 present invention.

Figure 3 is a schematic of an embodiment of a process of manufacturing meat emulsion products of the present invention.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

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The present invention provides improved meat emulsion products as well as methods for manufacturing same. In certain preferred embodiments, the meat emulsion products are designed for canned pet food. However, it should be noted that the
15 present invention can be applied in the production of meat emulsion products for human consumption. The meat emulsion products can simulate any type of meat products including poultry, beef, pork, and even fish.

As set forth in detail below, generally the meat products of this invention are produced by emulsifying meat, protein, water and various ingredients. The emulsion so
20 produced is then run through a high speed emulsion mill, wherein the emulsion is rapidly heated to cause it to gel thermally. The heated emulsion is then discharged into a hold tube in which it solidifies into a striated meat-like structure.

As is set forth in detail below, pursuant to the present invention, a meat emulsion product is produced that has improved fiber definition (visible small diameter fibers) that
25 afford the product a very realistic meat-like image. In this regard, the resultant meat emulsion product has fiber bundles or strands that afford the meat emulsion a very realistic muscle meat appearance. It is believed that for a resultant poultry meat emulsion product that the product of the present invention has the appearance of tender slow cooked chicken or turkey that has been hand-pulled from the bone and covered in
30 its own broth/juice. Pursuant to the present invention, additionally, a meat emulsion product is produced that has irregular product shape and dimensions, and has a stronger bite/mouth feel than prior art products and is not pasty, mushy or brittle.

Referring to the figures, Figure 1 illustrates a prior art meat emulsion product. As appears in the photograph, the product does not include any fibers, but rather has a
35 homogeneous structure.

Figure 2 illustrates a meat emulsion product of the present invention. As can be seen in the photograph, the product has a plurality of elongate strands of fibers that are generally linearly arranged in bundles. This provides a more realistic meat-like product than the meat emulsion of Figure 1.

5 In preparing the meat emulsion product in accordance with the method of the present invention, a mixture of natural meat materials, including meat from mammals, fish, or fowl and/or meat by-products, having the requisite quality, ingredient cost and palatability, is formulated, ground, and emulsified. The meat and/or meat by-products used may be selected from a wide range of components, with the type and amount of
10 meat material used in the formulation depending on a number of considerations, such as the intended use of the product, the desired flavor of the product, palatability, cost, availability of ingredients, and the like. Both meat (i.e. skeletal tissue and non-skeletal muscle) from a variety of mammals, fowl and fish and/or meat by-products (i.e. the non-rendered clean parts, other than meat, derived from slaughtered mammals, fowl, or fish)
15 may be used as the meat material. Thus, the term meat material as used herein is understood to refer to non-dehydrated meat and/or meat by-products, including frozen materials.

If the product is intended for human consumption, any of the meats and meat by-products used in the production of conventional meat emulsion products may be used in
20 the present invention, including meats such as whole-carcass beef and mutton, lean pork trim, beef shanks, veal, beef and pork cheek meat, and meat by-products such as lips, tripe, hearts, and tongues. If the product is intended for use as a pet food product, the meat mix may contain, in addition to the meat materials described above, any of the meat by-products which are approved for use in animal foods, such as mechanically
25 deboned beef, chicken, or fish, beef and pork liver, lungs, kidney and the like. Typically the meat material is formulated to contain a maximum of about 15%, and preferably below about 10%, by weight of fat.

Additives which are used in conventional meat emulsion products may be mixed with the meat material and included in the meat emulsion of the present invention.
30 These additives include salt, spices, seasoning, sugar and the like in amounts sufficient to provide the product with desired taste characteristics. In addition, minor amounts of other dry ingredients such as, for example, functional ingredients, such as vitamins, antioxidants, prebiotics and minerals, flavors and the like, may also be added to the meat emulsion.

The meat emulsion may also include one or more dry proteinaceous materials, such as, for example, wheat gluten, soy flour, soy protein concentrate, soy protein isolate, egg albumin, and nonfat dry milk to improve emulsion stability and binding, impart flavor and reduce formulation costs. The inclusion of the dry proteinaceous materials in the meat emulsion is particularly advantageous in the production of product intended for use as a pet food. Dry proteinaceous material enables the processor to use meat materials having a protein to fat ratio and myosin to total protein ratio which would otherwise be of marginal acceptability for use in preparing meat emulsion products. If a dry, proteinaceous material is included in the meat emulsion, the amount used may vary from about 5% to about 35% by weight of the emulsion, depending on such factors as the intended use of the product, the quality of meat material used in the emulsion, ingredient cost considerations and the like. In a preferred embodiment, the level of dry proteinaceous material is between approximately 25 to about 35% by weight. Generally, as the fat content and/or moisture content of the meat material used are increased, the level of dry proteinaceous material in the emulsion is increased accordingly.

While the formulation of the meat emulsion may vary widely, the emulsion, including the dry proteinaceous material, should have a protein to fat ratio sufficient to form a firm meat emulsion product upon coagulation of the protein with no sign of emulsion instability. Further, the protein content of the emulsion must be such as will enable the emulsion, upon being heated to a temperature above the boiling point of water, to coagulate and form a firm emulsion product within a short period of time, that is, within about 5 minutes, and preferably within 3 minutes, after being heated to such a temperature. Thus, the meat materials and the additives, including the dry proteinaceous material (if used) are mixed together in proportions such that the meat material is present in an amount of between about 50% to 75% by weight, and preferably from about 60% to about 70% by weight of the meat emulsion. In a preferred embodiment, the starting ingredients for the meat emulsion comprise approximately 29 to about 31% by weight protein and approximately 4 to about 6% by weight fat. The resultant meat emulsion product should have a substantially similar profile to that of the starting ingredients. However, if gravy or broth is added to the product, this profile could change due to the moisture, protein and/or fat content of the gravy/broth.

In addition, the meat emulsion should be formulated to contain between about 45% to 80% by weight moisture, with the moisture content preferably being controlled between about 49% to 53% by weight of the meat emulsion, i.e. the meat materials and

additives. The exact concentration of water in the emulsion will, of course, depend on the amount of protein and fat in the emulsion.

The meat mix selected for use is passed through a grinder to reduce the meat material into pieces of substantially uniform size. Generally it is preferred to pass the meat through a grinder equipped with a 1cm or smaller grinding plate. While satisfactory results may be obtained by grinding the meat to a particle size larger than 1 cm, the use of such larger meat particles is generally not preferred. If the meat materials to be used are in a frozen condition, they must first be pre-broken or cut into pieces in order to reduce the size of the pieces going into the grinder. While the size of the pieces will depend on the size of the meat grinder intake, normally the frozen meat material is cut into pieces about 10cm square.

After grinding, the mix of meat particles is conveyed to a mixing tank in which the meat is mixed until uniform. It preferably is heated to a temperature of between about -1°C to about 7°C, such as by hot water jacketing, steam injection, and the like to facilitate pumping of the meat mix. The uniform mix of ground meat particles is then comminuted under conditions that cause the meat material to emulsify and form a meat emulsion, in which the protein and water of the meat mixture form a matrix that encapsulates the fat globules. The meat material may be emulsified by any conventional procedure and equipment commonly used in meat emulsification, such as by using a mixer, blender, grinder, silent cutter chopper, emulsion mill and the like, which is capable of breaking up and dispersing the fat as globules in the protein slurry to form an emulsion.

Typically the temperature of the meat emulsion increases during the emulsification process. This heating of the meat emulsion is not objectionable as long as the temperature does not increase to the point that protein denaturation begins to occur at an undesirable rate at this stage of the process. The temperature of the meat mixture during emulsification should be maintained below about 49°C in order to minimize protein denaturing at this stage of the process. According to a preferred embodiment of the invention, the meat material is passed through an emulsion mill to emulsify the meat material with the emulsion being heated to a temperature between about 10°C to about 49°C, preferably between about 21°C to about 38°C.

The additives to be incorporated in the meat emulsion, including dry proteinaceous material (if used), may be added to the meat mix prior to emulsification. Alternatively, it is frequently preferable to incorporate the additives, particularly the dry proteinaceous material, in the meat mix after emulsification of the meat. Since the

addition of the dry proteinaceous material increases the viscosity of the emulsion, better emulsification is obtained when the meat mix is emulsified before the addition of the dry proteinaceous material, which results in the formation of a viscous meat "dough".

5 This meat emulsion dough is comminuted in turn, so as to increase the fineness of the emulsion and is rapidly heated to a temperature above the boiling point of water. At this temperature, the coagulation of protein in the emulsion proceeds so rapidly that the emulsion is set and a firm emulsion product formed within a very short period of time, e.g. 20 seconds or less.

10 It has been found that rapidly heating the viscous meat emulsion to a temperature above the boiling point of water - generally between about 120°C to about 163°C, and preferably between about 140°C to about 154°C - will result in the protein in the emulsion coagulating to set the emulsion and form a firm emulsion product within about 5 minutes and typically from a few seconds to about 3 minutes after heating. At this stage in the process, the emulsion is under a pressure of approximately 100psi
15 (689kPa) to about 500psi (3448kPa) and preferably 200psi (1379kPa) to 350psi (2413kPa). The high temperature, along with increased pressures will provide fiber definition to the product. It has been surprisingly found that the higher the product temperature and pressure the better the fiber development. By this is meant linear alignment with smaller, finer, long fibers.

20 Preferably the emulsion is processed in equipment wherein the emulsion is heated to such elevated temperatures while it is being comminuted such as by mechanical heating and/or steam injection. According to a preferred embodiment, the viscous meat emulsion, which is at a temperature of between about 30°C to about 40°C, is pumped through an emulsion mill in which the meat emulsion is subjected to shearing
25 to increase the fineness of the emulsion and almost simultaneously heat the emulsion to between about 120°C to about 163°C, preferably 140 °C to about 154°C, through rapid mechanical heating and/or steam injection. Thus, the emulsion preferably is heated to such elevated temperatures in a period of less than about 60 seconds. When the emulsion has been heated to such an elevated temperature in this manner, further
30 significant shearing and cutting of the emulsion should be avoided. Control of the emulsion temperature within the desired range can be effected by adjusting such factors as the feed rate into the emulsion mill, the rotational speed of the emulsion mill and the like, and can readily be determined by those skilled in the art. The hot meat emulsion, which is at a temperature above the boiling point of water and preferably in the range of
35 between about 120°C to about 163°C, preferably about 140°C to about 154°C, is

transferred with a positive displacement pump, e.g., a gear or lobe pump, to a holding tube that defines a confined processing zone. The product is pumped at high pressures of 80psi (552kPa) to about 500psi (3448kPa), preferably about 150psi (1034kPa) to about 450psi (3103kPa), and most preferably 200psi (1379kPa) to about 350psi (2413kPa) into the processing zone. At such high pressures, the process operates at or close to the emulsifier upper design limit pressure. For this reason, preferably a positive displacement pump (pressure limit of 500psi (3448kPa) to beyond 2500psi (17238kPa)) is close-coupled directly after the emulsifier. This allows the use of the emulsifier to develop the high temperature without the high pressure. The pressure will be developed after the gear pump. This thereby reduces the pressures in the emulsifier housing to 60psi (414kPa) to 100psi (689kPa).

The confined processing zone preferably is in the form of an elongated tube. The emulsion is retained in the confined processing zone at a pressure above the vapor pressure of the emulsion until the protein in the meat emulsion has coagulated sufficiently to set the emulsion and form a firm emulsion product, which retains its shape and structure when discharged from the confined processing zone. At such elevated temperature, protein coagulation proceeds at a very rapid rate.

While the period of time required for the hot emulsion to set sufficiently to form a firm product will depend on a number of factors, such as the temperature to which the emulsion is heated and the amount and type of protein in the emulsion, a residence time of between a few seconds to about 3 minutes, and usually between about 1 to about 1.5 minutes, in the elongated tube is generally sufficient for the protein to coagulate sufficiently and form a firm emulsion product which will retain its shape, integrity, and physical characteristics. The residence time in the elongated tube can be controlled by adjusting the flow rate of the emulsion to the elongated tube and/or by adjusting the length of the elongated tube.

The structure of the elongated tube helps to create the fiber structure of the product. The elongated tube should have a reduced cross-sectional diameter along its length such that the circumference of the tube becomes smaller as the product proceeds further into the tube. In practice, tubes having a length of between about 2.5 m and about 6m and preferably 3m to 5m and an internal diameter of between about 12mm and about 75mm are believed to function satisfactorily to form a firm emulsion product. Because the tube has a cross-sectional diameter that decreases along its length, or a portion thereof, the product, as it enters the tube, is squeezed as it flows through the tube. The flow rate and differing pressures on the product help

create the fiber structure. By way of example, a tube material is used having a diameter of approximately 62mm at the opening where the product enters the tube and narrowing through a conical reducer to a 25mm diameter. Tubes of various cross-sectional shapes may be used, such as circular, square, rectangular, and the like.

Preferably the tube is cooled. This allows the product to be cooled as it is forced through the tube. Typically the tube can be cooled by an external jacket or other means. A rectangular tube or a round triple tube (having a cooling tube within a product tube within a cooling tube) provide preferred designs that facilitate efficient cooling to the center of the product. The cooling increases process stability and, similar to a reduction in cross-sectional area, can enhance fiber definition and alignment by causing variations in the product viscosity and flow rate. The set meat emulsion pieces discharged from the confined processing zone are in the form of long strips of products having a temperature of about 65°C to 100°C, and a moisture content of about 47% to 60%, with the pieces varying in size. Upon discharge from the processing zone, the pieces are rapidly cooled by evaporating cooling to a temperature in the range of 60°C to 93°C. If desired, suitable cutting means, such as a rotary cut-off knife, a water jet knife, a knife grid, or the like may be mounted at the discharge end of the elongated tube to cut the product into pieces of a desired size, e.g. from about 150mm to about 350mm. If desired, the product may be cut down the center to allow the product to cool more rapidly. The meat emulsion chunks thus formed have excellent integrity and strength and will retain their shape and fiber characteristics when subjected to commercial canning and retorting procedures such as those required in the production of canned foods having a high moisture content.

To enhance the fibrous image of the product, a set of compression rolls, which consists of two long lightly-textured cylinders (rolls) that spin at similar speeds, can be used prior to final product resizing or dicing. Product that is discharged from the confined processing zone is dropped into a narrow adjustable opening between the spinning cylinders, which open up, or partially separate or tear the fibers. It has been found that this incomplete form of shredding functions to emphasize the linear fibers.

The meat emulsion pieces discharged from the confined processing zone may be diced and conveyed to a dryer to remove a large portion of the moisture therefrom, and the dried product collected and stored. Moisture reduction may also be accomplished by exposing the pieces to dry heat, so that the resultant product pieces, although displaying fibers, have a generally kibble-like appearance. The dry heat may

be provided by roasting, baking, grilling or frying the body. Preferably the body is flash-fried. The duration would typically be less than one minute and preferably in the range from 15 to 35 seconds when the oil is in the temperature range from 150° to 200°C.

5 Alternatively, in producing a "wet" product, the meat emulsion pieces may be conveyed from the elongated tube directly to a canning operation in which chunks are filled into cans together with other ingredients, such as sauce, gravy, and the like, and the cans retorted. In either situation, the product can be resized if desired.

10 By way of example, in the production of a canned pet food product, a suitable gravy may be prepared by heating a mixture of water, starch, and condiments. The meat emulsion chunks and gravy are filled into cans in the desired proportions, the cans are vacuum sealed and are then retorted under time-temperature conditions sufficient to effect commercial sterilization. Conventional retorting procedures may be used. Typically, a retorting temperature of about 118°C to 121°C for approximately 40 to 90 minutes is satisfactory in producing a commercially sterile product.

15 Figure 3 sets forth a flow chart illustrating generally the process steps of the present invention.

20 It should be understood that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modifications may be made without departing from the spirit and scope of the present invention and without diminishing its attendant advantages. It is, therefore, intended that such changes and modifications be covered by the appended claims.

CLAIMS:

1. A meat emulsion product comprising a body defined, at least in part, by a plurality of fiber-like structures integrally formed therewith and comprising at least 29% protein by weight and not more than 7% fat by weight.
2. A meat emulsion product according to claim 1 wherein the protein is derived from poultry meat.
3. A meat emulsion product according to claim 1 or claim 2 wherein the product comprises 49% to 53% by weight moisture.
4. A meat emulsion product according to any one of the preceding claims including at least one dry proteinaceous material.
5. A meat emulsion product according to claim 4 wherein the proteinaceous material comprises 25% to 35% by weight of the product.
6. A meat emulsion product according to any one of the preceding claims wherein the product is a pet food.
7. A meat emulsion product comprising a body including protein and fat and having a plurality of generally linear strands of fiber-like material integrally formed therewith, affording the meat emulsion product a realistic meat-like appearance.
8. A meat emulsion product according to claim 7 wherein the protein comprises 29% to 31% by weight of the meat emulsion product.
9. A meat emulsion product according to claim 7 or claim 8 wherein the fat comprises 4% to 7% by weight of the meat emulsion product.
10. A meat emulsion product according to any one of claims 7 to 9 wherein the meat emulsion product comprises 49% to 53% by weight moisture.

11. A meat emulsion product according to any one of claims 7 to 10 wherein the product is a pet food.
- 5 12. A meat emulsion product according to any one of claims 7 to 11 wherein the protein is derived, at least in part, from poultry meat.
- 10 13. A method for producing a meat emulsion product having a realistic meat-like image comprising the steps of:
forming a meat emulsion containing protein and fat;
comminuting and heating the meat emulsion to a temperature of at least 132°C;
introducing the emulsion into a processing zone and subjecting the meat emulsion to a pressure of at least 100psi. (689kPa); and
discharging the meat emulsion from the zone.
- 15 14. A method according to claim 13 wherein the meat emulsion is subjected to an *incomplete shredding.*
- 20 15. A method according to claim 14 wherein the incomplete shredding includes the step of placing the emulsion through compression rolls.
- 25 16. A method according to claim 14 or 15 wherein the shredding takes place after the emulsion is discharged.
17. A method according to any one of claims 13 to 16 wherein the meat emulsion includes at least 29% by weight protein and no more than 7% by weight fat.
18. A method according to any one of claims 13 to 17 wherein the processing zone includes an elongated tube.
- 30 19. A method according to claim 18 including the step of cooling the tube.
20. A method according to claim 18 or claim 19 wherein the tube has a cross-sectional diameter that varies along at least a portion of its length.

- 21. A method according to any one of claims 13 to 20 including the step of canning a resultant meat emulsion product.
- 5 22. A method according to any one of claims 13 to 20 including the step of drying the meat emulsion and forming a kibble-like piece therefrom.
- 23. A method according to claim 22 wherein the drying includes frying.