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S1468 S1505 S1607 S1750 S1755**

(56) Documents cited
**GB 0541815 A US 3669898 A
Patent Abstracts of Japan, Vol.11, No.24 (C-399)
[2471], page 118 C399**

(58) Field of search
**UK CL (Edition K) A5A, C3H HHX2 HK2
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(54) **Stabilised foamable protein hydrolysate**

(57) Proteinaceous material is hydrolysed with either sodium hydroxide or ammonium hydroxide, the hydrolysate neutralised with hydrochloric acid, concentrated by heating and stabilised by the addition of ferrous sulphate, thereby to produce a foamable protein hydrolysate. Colouring agents and accelerators may be added. The foam produced may have a pore size of from 5 to 20 microns. The foaming agent may be used to produce foamed cement (particularly for use in the construction of marine buildings), in the construction of culverts and ducts, to produce foamed calcium silicate (especially for water storage, filter media and water desalinisation), as a binder for coal particles, as a transport system for heavy loads, and as a muffling agent in the exhausts of internal combustion engines.

SPECIFICATION

Title of Invention	Foam Compounds and Apparatus for Producing Foam Compounds
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This invention relates to obtaining a Foam Compound from Ox-Blood, Horn and Hoof, Soya Bean, Chicken Feathers, Fish Oil, and the like where sources of Protein are found. The Foam Compound is designed to be used in certain percentages with water and compressed air, passed through an atomising gun to produce independent microscopic air cells ranging from 5 to 20 microns to Aerate a particular cementitious material and to determine different densities dependent on the degree of aeration.

Unlike fire fighting foams which have larger air cell size to cover a maximum area of fire and designed to collapse with the resultant drainage damping the fire, this invention relates to the opposite where the air cells are required to be of the order of 5 to 20 microns to provide the smallest nuclei making the span between the cementitious material so minute to reduce the stress factor contributing to a high strength to weight ratio of the aerated material. In addition the microscopic cells must be stable at all times without collapsing until the cementitious material has set, and must have surface tension and shear strength whilst being subject to mixing, pumping and handling of the aerated material, thus requiring the addition of stabilizers, accelerators and colour pigments if necessary without slumping the produced material.

According to one aspect of this invention is the provision of Ox-blood having been treated with an Anti-coagulant EDTA (Ethylene Diamine Tetra Acetic Acid) and in particular the di-sodium salts thereof, to prevent the blood from congealing. This may be done in a pressure vessel capable of holding two to three thousand litres of blood or more, Hydrolysing the contents or other Protein based material by heating to approximately 100° C adding Sodium Hydroxide or Ammonium Hydroxide using 2½% NaOH or 4% NH₄OH and heating over a period of three hours.

It is an object of this invention to Neutralize the contents by adding Hydrochloric acid to the equivalent of NaOH or NH₄OH, and having neutralized the contents a process of evaporation is provided to afford different

concentrations of the remaining liquid, which in turn determines to a large extent the cells size required, and retaining the colloidal residue containing up to 90-95% protein.

After Hydrolysis and evaporation the remaining liquid is stabilized by the addition of Ferrous Sulphate $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ crystals in the ratio of $2\frac{1}{2}$ - 3% by volume.

The stabilized compound is then used as a foaming agent diluted with water to provide a 4% solution, compressed air introduced with both solution and compressed air passing through a labyrinth which atomizes the molecular structure of the solution encapsulating the compressed air to provide a very stable foam composed of millions of microscopic air cells, the ultimate size of the cells resulting from the physical work done by the length and volume of the labyrinth.

By this means, an expansion of between ten to fifteen times can be produced from one litre of a 4% solution, making a most economical method of creating bulk out of dense material through aeration.

Apart from the introduction of foam into cementitious material, food stuffs can be so treated, together with several alternative uses of the foam produced.

Where necessary Calcium Chloride can be introduced into the solution as an accelerator, together with colour pigments in the manner of synthetic oxides be added to provide a whole spectrum of colour to the cementitious material.

CLAIMS

Claim 1 The production of a Foaming Agent added to water in varying percentages, adding compressed air and both solution and air passed through a labyrinth to produce microscopic independent air cells. The Foaming agent being a liquid concentrate with Protein content obtained from Ox-blood, Horn and Hoof, Chicken Feathers, Soya Bean, Fish oil and any other material containing Protein, the material containing the protein being liquidized, adding where necessary and Anti-coagulant, hydrolized, with specified percentages of Sodium Hydroxide or Ammonium Hydroxide and heating over a period of three hours when Hydrochloric acid is added to Neutralize and when Neutralized further heating is applied to cause evaporation to form higher concentrations of Foaming Agent, which in turn determine to a large extent combined with the physical work done by bigger labyrinths the desired air cell size.

The Foaming Agent stabilized with the addition of Ferrous Sulphate and coloured by the introduction by synthetic oxides adding where necessary Calcium Chloride accelerators. The final concentrate diluted with water to four parts concentrate to one hundred parts water and delivered through a dosing pump to a flow water meter to afford quality control of aeration.

Claim 2 As claimed in Claim 1, A non-toxic foaming agent for use when aerating cementitious material for water applications.

Claim 3 As claimed in Claim 1, a protein foaming agent providing impermeability when used to aerate cementitious material.

Claim 4 As claimed in Claim 1, a Protein foaming agent when used to aerate reinforced cementitious material provides a very good bond stress between steel and aerated cementitious material which enhances the structural performance of said material.

- Claim 5 As claimed in Claim 1, a Protein Foaming agent with stabilizers added to provide surface tension and shear strength to the independent air cells allowing the cells to collesce without collapsing to combat coefficients of expansion and contraction, shook loads and eccentric loadings of aerated cementitious material.
- Claim 6 As claimed in Claim 1, a Protein foaming agent stabilized in various degrees to allow the air cells to remain viable for indefinite periods and until the initial setting of aerated cementitious material.
- Claim 7 As claimed in Claim 1, a Protein foaming agent having accelerator aerators added for use in aerating cementitious material of Calcium Silicate Hydrates for the rapid setting thereof.
- Claim 8 As claimed in Claim 1, a Protein foaming agent with various colouring material added a colour aerated cementitious uses.
- Claim 9 As claimed in Claim 1, a Protein foaming agent when added to other material provides through it's high Surfactant properties a good entraining agent, reducing friction allowing the aerated material to be pumped great distances through small bore pipes.
- Claim 10 As claimed in Claim 1, a Protein foaming agent when used in higher percentages being very stable, can be used as formwork in the construction of culverts, ducting and the like.
- Claim 11 As claimed in Claim 1, a Protein foaming agent with no stabilizers, accelerators or colouring pigments and used in lower degrees of concentration when used with Calcium Silicate Hydrate where the air cells are encouraged to merge providing a solid sponge like material for the storage of water, filter media, and desalinization of salt water.
- Claim 12 As claimed in Claim 1, a Protein foaming agent stabilized to such extent and used with Calcium

Silicate Hydrates allows the composite material to be poured directly into water, without disintegrating, for the construction of Pontoons, Lightbuoys, Jetties and Harbour works the densities of which are determined by the degree of aeration.

- Claim 13 As claimed in Claim 1, a Protein foaming agent used to aerate Ultra fine coal or fines to such a degree with the use of a binder material, nuggets can be formed to provide a smokeless fuel when greater combustibility is created thus consuming vast amounts of carbon and a very small residue of ash.
- Claim 14 As claimed in Claim 1, a Protein foaming agent of such stability can be used as in a Hovercraft principle and sprayed under heavy loads for the easy movement of said loads and alternatively, produced in channel sections or tubes for the conveying of articles, the foam being recycled for continuous use.
- Claim 15 As claimed in Claim 1, a Protein foaming agent capable of being introduced into exhaust chambers of internal combustion engines and the like, whereby the exhaust noises are muffled thus reducing the number of decibels, the heat of said engines breaking down the foam and the solution recycled for reuse. Noise or reverberations are thereby reduced without impairing the efficiency of the power sources.

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

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Relevant Technical fields

(i) UK CI (Edition K) C3H (HHX2, HK2); A5A

(ii) Int CI (Edition 5) C08L 89/00

Search Examiner

C SHERRINGTON

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASES: WPI

Date of Search

10.2.92

Documents considered relevant following a search in respect of claims

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 0541815 (DAWSON ET AL) especially Examples 1 to 3	1 at least
X	US 3669898 (LAURENTIAN CONCENTRATES LIMITED) especially column 1, lines 56-70 column 2, lines 5-12, lines 22-24; Examples 1-6; Claims 1-3, 5, 6, 16, 17	1
X	PATENT ABSTRACTS OF JAPAN, VOLUME 11, NO 24(C-399) [2471], page 118 C399 equivalent to JP 610197659 A and DERWENT WPI ACCESSION NO 86-269608/41	1



Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).