

(12) UK Patent Application (19) GB (11) 2513323 (13) A

(43) Date of A Publication

29.10.2014

(21) Application No: 1307258.2

(22) Date of Filing: 22.04.2013

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(51) INT CL:
A23L 1/22 (2006.01)

(56) Documents Cited:
EP 1477073 A1 **US 5227182 A**
US 3920849 A **US 20110223297 A**
US 20100282267 A1

(58) Field of Search:
INT CL **A23L**
Other: **WPI, EPODOC**

(54) Title of the Invention: **Method and apparatus for manufacturing dry powders**
Abstract Title: **A method of flavouring a dry powder for food consumption**

(57) The present invention comprises a method of and apparatus for manufacturing a dry powder containing an aromatic essence for flavouring edible products comprising mixing the liquid aromatic essence with an amount of a food-safe hygroscopic powder material sufficient to leave the resultant mixture in the form of a substantially dry powder. Preferably the hygroscopic powder material is silicon dioxide and the liquid aromatic essence is propylene glycol. The liquid aromatic essence and the hygroscopic material may also be mixed with a food-safe carrier material in powder form such as milk whey powder or modified starch. In another embodiment sodium bicarbonate, sodium acidic pyrophosphate and milk whey or starch may be mixed prior to mixing of the liquid essence

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METHOD AND APPARATUS FOR MANUFACTURING DRY POWDERS

The present invention concerns a process and apparatus for converting a liquid containing a solute or suspension into a dry powder. Such dry powders are used in substantial quantities in the food industry and also for flavouring animal feed. The liquids to be converted contain, for flavouring purposes, aromatic essences. These flavoured essences can be prepared from essential oils, such as almond and lemon; from vanilla; from fresh fruits by expression; from ginger by extraction; and from mixtures of essential oils and synthetic organic chemicals. Alternatively they can be manufactured from synthetic chemicals, with for example alcohol, glycerol, propylene glycol, alone or in combination, as solvents. Water is added and sometimes certified food colour as well.

Extracts, essences, and flavours employing only natural flavouring agents are called pure; those employing synthetics (in part or entirely) are called imitation, or artificial, flavourings.

Essential oils, which are complex substances derived from plants, consist of a number of organic chemical components such as alcohols, aldehydes, ethers, esters, hydrocarbons (terpenes, sesquiterpenes, etc.), ketones, lactones, phenols, and phenol ethers. Nearly all of these organic chemicals have been synthesized, and it is these synthetics that are most frequently used in the manufacture of imitation flavourings.

At the present time the main process for converting liquids into dry powder is known as spray drying. This well known process has a number of problems which are particularly prevalent when spray drying essences for flavouring food products such as ice cream, yoghurt, drinks and animal feed. Such essences are especially susceptible to deterioration under the typical temperatures of the spray drying process which can be as high as 250° C. Thus spray drying aromatic and edible food essences can cause losses of between 50 and 60 percent of the active essence being treated. In addition the equipment used to carry out the process on an industrial scale is expensive both to install and run.

The present invention has for an aim to provide a process and apparatus for converting liquids into dry powders in which the equipment required to carry out the process has a lower capital requirement and running costs than conventional spray drying processes and additionally causes less loss of any active ingredient in the final
5 dry powder.

In one aspect the present invention comprises a method of manufacturing a dry powder containing an aromatic essence for flavouring edible products comprising mixing the liquid aromatic essence with an amount of a food-safe hygroscopic powder material sufficient to leave the resultant mixture in the form of a
10 substantially dry powder.

In accordance with a preferred feature of the present invention the liquid aromatic essence and the hygroscopic material are also mixed with a food-safe carrier material in powder form.

15 In order that the present invention may be more readily understood embodiments thereof will now be described by way of example.

In a first embodiment of treatment apparatus in accordance with the present invention the liquid to be treated is stored in a vat from which it can be delivered in metered quantities via a suitable valve and pipe arrangement to a mixing container.
20 The mixing chamber houses a suitable known mixing apparatus for intimately intermixing its contents and may comprise one or more motor-driven blades. The embodiment now being described further includes two hoppers for holding powdered materials for use in manufacturing a final dry powder containing the essence initially stored in the vat in a liquid carrier. Each of these two hoppers is
25 arranged so that it can deliver accurately measured quantities to the mixing chamber.

In the following example of a process according to the present invention the liquid material to be turned into a dry powder and contained in the vat is a liquid food essence of the type which once provided in dry powder form is used to flavour
30 substances such as ice cream, yoghurt and other confectionary. One example of such a liquid essence is sold by the Greek company Vioryl as STRAWBERRY OS 12004/21. However as already described hereinbefore there are many other aromatic essences

used in the food industry which are stored and transported in liquid form and are subsequently spray-dried to manufacture a powder which can be used as flavouring.

The first of the two hoppers is for holding a hygroscopic material and one particular example of such a material is silicon dioxide (an anti-caking agent also known as silica or E551). As with the vat, this hopper and the second hopper are each arranged so that they can deliver a fixed amount of their contents to the mixing chamber. The second hopper is for holding a powdered edible carrier such as milk whey powder or modified starch. As an alternative to the hoppers each being fitted with metering mechanisms they can simply be filled by the correct amounts and their contents dumped or otherwise fed to the mixing chamber. It has been discovered that provided that the hygroscopic material is in sufficient quantity in relation to the weight of the essence that the resulting mixture will be sufficiently dry for commercial use.

A preferred ratio by weight of the constituents to be mixed is 30% aromatic essence, 20% hygroscopic material and 50% carrier. However these ratios can be varied quite considerably and as the carrier basically acts passively to bulk up the final powder. It is of course possible to obtain a dry powder solely by adding the hygroscopic material to the essence. A ratio of 30% liquid essence to 70% silica for example will produce a dry powder with a concentration of essence typical for the food industry, whereas a ratio of 70% liquid essence to 30% of silica will still produce a dry powder but will contain a very high concentration of the aroma of the essence. It will accordingly be understood that the preferred ratio can be varied in accordance with the specific chemical properties of differing liquid essences and of the hygroscopic material.

In another variant of the above described embodiment, the measured doses from the hoppers can also pass through a separate mixing chamber where they are intimately mixed before being deposited in the mixing chamber. The chamber may also be provided with a mill through which the final treated contents of the mixing chamber have to pass before they are either stored for subsequent packaging or even used in immediate production.

The output of the mixing chamber either with or without the mill is accordingly transferred to a packaging or storage station shown by any suitable known system such as an Archimedes screw or a conveyor belt.

Another embodiment of the present invention has a vat for containing liquid essence and three hoppers each for containing and delivering a chemical material to a mixing chamber where the contents of the vat and the three hoppers are intermixed. In operation one hopper contains a base chemical in the form of sodium bicarbonate, the second hopper contains sodium acidic pyrophosphate (SAPP) and the third hopper contains powdered milk or modified starch which, as in the previous embodiment, act as a carrier in the final dry powder. As will be appreciated each of these substances is edible. In addition the order in which the contents of the hoppers are stored is immaterial to the operation of the system as all that is necessary is that the three components will be well mixed before the process proceeds to the next step.

Accordingly metered quantities of the contents of the three hoppers are deposited in the mixing chamber and are then intimately mixed by the mixing means. As the contents of the three hoppers are all dry powders there will be minimal chemical reaction between them when they are intermixed.

As before the liquid essence to be dried and contained in the vat is a liquid food essence frequently used in edible human and animal substances. A calculated amount of the liquid essence in the vat is added to the already mixed dry powders from the three hoppers and the four components are then mixed together. The addition of this liquid starts a reaction between the basic sodium bicarbonate and the acidic SAPP so as to balance their respective Ph's with the accompanying generation of salts and carbon dioxide. The latter gas is evacuated through a vent.

Once the final components of the chemical reaction within the mixing chamber have been mixed they may be milled so as to provide a maximum size limit to the particles so formed by the previously described chemical reaction. Finally, transfer means carry the milled particles to a storage or packing station.

Another embodiment will now be described. In this embodiment the steps of processing the various components are carried out in exactly the same manner and sequence as in the process just described and therefore will not be described further. However the contents of the mixing chamber once the three dry powders and the liquid from vat have been added, mixed and perhaps milled into a final product pass onto a conveyor under the force of gravity via a rotary valve and are carried to the packaging or storage station.

However it will be appreciated that there is a potentially wide range of substances which can be processed. Accordingly in this next explanatory process the three hoppers respectively contain sodium bicarbonate, citric acid and powdered starch whilst vat can contain other liquid essences.

- 5 With some substances it may be necessary to provide a drying station because the chemical process in the mixing chamber may also produce excessive moisture. Thus in an additional step the mixed particles may be carried through a drying chamber before reaching the packaging or storage station. This drying chamber may include heaters such as radiant heaters which are well known in, for example, the paper
- 10 making industry. In order to reduce the temperature in the drying chamber so as not to damage the essence-carrying particles, the drying process may also have means for generating a partial vacuum in the drying chamber. It will be appreciated that it is not anticipated that a drying chamber will always be needed.

- 15 In the several processes described by way of example it will be understood that there are many chemical substances which can be used in the production of a dry powder product in accordance with the present invention. It will be appreciated that there are many structurally different mechanical arrangements which can be used to supply the various components, to carry their mixing, to mill or grind the final product of the chemical reactions within the mixing chamber and finally to transfer
- 20 the final product for storage, packaging and use.

CLAIMS

- 1) A method of manufacturing a dry powder containing an aromatic essence for flavouring edible products comprising mixing the liquid aromatic essence with an amount of a food-safe hygroscopic powder material sufficient to leave the resultant mixture in the form of a substantially dry powder.
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- 2) A method according to claim 1 wherein the liquid aromatic essence, the hygroscopic material are also mixed with a food-safe carrier material in powder form.
- 3) A method according to claim 1 or claim 2 wherein the hygroscopic material is silicon dioxide.
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- 4) A method according to claim 2 or claim 3 wherein the carrier material is milk whey powder.
- 5) A method according to claim 2 or claim 3 wherein the carrier material is modified starch.
- 15 6) A method according to any one of claims 2 to 4 wherein the liquid essence contains propylene glycol.
- 7) A method according to any one of claims 2 to 6 wherein the ratios by weight of the liquid aromatic essence, the hygroscopic material and the carrier material are respectively between 25%-35%, 20%-30% and 45%-55%.
- 20 8) A method of manufacturing a flavoured food material comprising mixing the food material with a dried powder according to any one of the preceding claims.
- 9) An apparatus for manufacturing a dried powder containing an aromatic essence comprising a mixing chamber.



Application No: GB1307258.2

Examiner: Sally Vaughan

Claims searched: 1 - 9

Date of search: 24 March 2014

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1 - 8 at least	US2011/0223297 A (CORKERY et al) see whole document
X	1 - 3 at least	US3920849 A (MARMO et al) see whole document
X	1 - 3 at least	US5227182 A (SONG et al) see whole document
X	1 - 3 at least	US2010/0282267 A1 (ATCHLEY) see whole document
X	1 - 3 at least	EP1477073 A1 (AJINOMOTO Co) see whole document

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC

A23L

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
A23L	0001/22	01/01/2006