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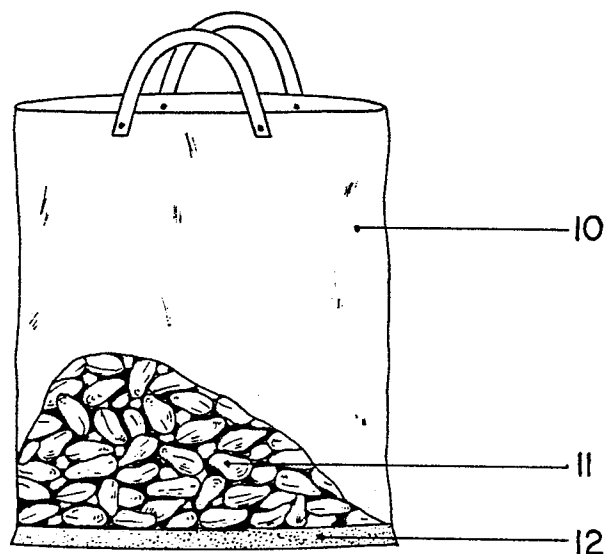
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54 **Package for foodstuffs, such as shell fish, which while in the packaged state will exude liquid, and a packaging method.**

57 The invention relates to a package for foodstuffs (11) which while in the packaged state will exude a considerable amount of liquid. The invention is particularly directed to a package for fresh mussels. The package contains some amount of superabsorbing material (12) of the type which, even under pressure, is capable of absorbing and retaining many times its own weight in liquid. The invention also relates to a method of packaging foodstuffs.



Package for foodstuffs, such as shell fish, which while in the packaged state will exude liquid, and a packaging method

The invention relates to a package for foodstuffs, such as shell fish, more particularly mussels, oysters, periwinkles and the like, which
5 while packaged may exude liquid, the exuded liquid substantially being kept isolated from the foodstuffs.

When foodstuffs of the type mentioned above are packaged in the conventional way there may be problems with regard to the exuded liquid, especially if the foodstuff is likely to exude liquid in an amount of
10 10-40 per cent by weight, based on the original total weight of the foodstuff. With conventionally packaged fresh mussels there may particularly be problems in that after some hours fresh mussels all of a sudden exude a fairly large amount of aqueous liquid in a relatively short time. Actually, about 1 kg of fresh mussels may exude some 250 ml of liquid.
15 Consequently, if the mussels should be put in a simple, watertight plastic bag without any special provision, the bag would after some time contain 250 ml of liquid per kg of fresh mussels. The problem is that in that liquid there will after some time take place particular reactions which are of a nature such that the inevitable contact between said
20 liquid and the inside of the mussels leads to a deterioration of the quality of the mussels. Such deterioration may even be of a degree that consumption of mussels that have too long been in contact with the liquid exuded by them may give rise to symptoms of poisoning. To solve that problem fresh mussels have up to now often been packaged and sold
25 in nets, from which the liquid exuded from the mussels can run out. Such a leaking package, however, constitutes rather a nuisance if it is to be carried along with other purchases or in the case of transport by motor-car. The liquid released also may constitute a nuisance in the increasing practice nowadays of self-service shops selling mussels in, say, 2-3
30 kg packs. Belgian Patent Specification 885 583 discloses a form of packaging mussels with a view to solving the problem of exuding liquid, the mussels being contained in a plastic bowl which is provided with a hole at its lowest point. The bowl is in its turn contained in a bigger,

approximately rectangular plastic box. The water exuded by the mussels passes via the hole in the bowl into the empty space between the bowl and the box. In its filled state the box is closed with a lid. Further, this package contains such provisions as prevent the exuded liquid from
5 returning from the space between the bowl and the box into the bowl.

A disadvantage to the package described in said Belgian patent specification 885 583 is that the rectangular box must have relatively large dimensions to permit accommodating the bowl and to provide sufficient empty space between the bowl and the box. This requirement has a detri-
10 mental effect on the cost price of the package and on the cost of transport. Another disadvantage to this form of packaging is that the bowl and the box are still in, be it limited, communication with each other. Particularly in the case of injudicious use, during transport, during stay in a self-service shop, there remains the chance of some amount of
15 liquid flowing back from the hollow space into the bowl and getting into renewed contact with the inside of the mussels. This is the more objectionable in that the consumer counts on the quality of the mussels being safeguarded by the special form of packaging.

As after one or more days a fairly large amount of liquid may have col-
20 lected in the space provided for it in the box of said Belgian patent specification, for, say, 2-3 kg of fresh mussels, the box must be handled with particular care in order to avoid leakage in the event of damage, which would be very unpleasant. A further drawback to this known package is that the box must be closed with a lid, as a result which the packaged
25 mussels are no longer in contact with the ambient air. Moreover, the water will remain in the package, so that when leaving the shop with it the consumer must carry a box with water splashing about in it.

The present invention has for its object to provide a package of the type indicated in the introduction which no longer displays the afore-
30 mentioned drawbacks. The package according to the invention is characterized in that it contains a superabsorbing material for absorbing and retaining the liquid. The invention is therefore based on the knowledge that said problems to packaged foodstuffs which exude a relatively large amount of liquid may be solved when steps are taken such that the liquid

is rapidly and effectively absorbed. The package for the foodstuffs according to the invention is particularly characterized in that the superabsorbing material is of the type which has a total liquid absorption capacity of at least 10 millilitres of test liquid per gramme at a pressure of 3000 N/m², measured in the manner indicated in the description.

According to the invention said total liquid absorption capacity of the superabsorbing material is advantageously in the range of from 15 to 30 ml/g, preferably about 20 ml/g, and not higher than 50 to 100 ml/g, at a pressure of 3000 N/m².

10 According to the invention first of all the use is considered of such a superabsorbing material that it can be filled to 60-80% of its total liquid absorption capacity within a period of 1 minute.

A favourable embodiment of the package is characterized according to the invention in that use is made of such a superabsorbing material that
15 said total liquid absorption capacity of 10 ml/g at a pressure of 3000 N/m² can be reached within a period of 2 minutes.

The package is preferably characterized according to the invention in that the superabsorbing material is formed from cross-linked cellulose and/or cellulose ethers, such as carboxymethyl cellulose (CMC), hydroxyethyl cellulose, hydroxypropyl cellulose and methyl hydroxyethyl cellulose. Said products based on CMC are commercially available under the trade name AKUCCELL-S. Another embodiment is characterized according to the invention in that the superabsorbing material is formed from salts of cross-linked polyacrylic acid, polyacrylates cross-linked with polyamide epichlorohydrin, cross-linked polystyrene sulphonate and cross-linked polyacrylamide. According to the invention, however, the superabsorbing material may alternatively be formed from starch derivatives such as starch-acrylonitrile graft copolymers and cross-linked starch derivatives. In principle also use may be made of combinations of said
20
25
30 superabsorbing substances.

A simple embodiment of the package is characterized according to the invention in that the superabsorbing material present in the package is contained in a separate sachet having a wall of liquid-permeable material.

In the case where the package is in the form of a container, such as a bag, a carrier bag or a box, a favourable embodiment according to the invention is characterized in that the superabsorbing material is present in a compartment which forms part of the container and is positioned
5 at the bottom thereof.

According to the invention the fresh mussels may be packaged in a liquid tight, plastic bag at the bottom of which there is present a small amount of the superabsorbing powder. The presence of as little as 15 grammes of the superabsorbing powder available under the trade name AKUCCELL-S, a
10 product based on carboxymethyl cellulose, in a bag of 1 kg of fresh mussels is amply sufficient for the "leakage water" to be absorbed from the mussels even under the pressure exerted by the weight of the mussels. The use of 15 g of superabsorbing AKUCCELL-S powder having a total liquid absorption capacity of about 20 ml/g results in $15 \times 20 = 300$ ml of
15 liquid being absorbed, which amply satisfies the requirement of absorbing and retaining the total amount of about 250 ml of "leakage water" from 1 kg of mussels. The invention even permits packaging fresh mussels in a sealed liquid tight bag without any resulting change in quality of the mussels.

20 The superabsorbing substances to be used according to the invention are generally employed in the form of a powder. The particle size of such powdered substances is generally in the range of 0,01 to 2 mm. These particles may be in the form of randomly shaped granules or small fibres. According to the invention the package contains an amount of said super-
25 absorbing material such that the total amount of liquid to be absorbed by it approximately corresponds to the maximum amount of liquid to be exuded by the packaged product.

The invention also comprises packaging means, such as containers in the form of a bag, a carrier bag or a box, which are destined for packaging
30 liquid exuding foodstuffs and contain some amount of said superabsorbing material. According to the invention the superabsorbing material present in the package may with advantage be contained in a separate bag or sachet having a liquid-permeable wall. For the convenience of the packaging shopkeeper or consumer the sachet may be provided with directions,

for instance in the form of a printed text, indicating the object and the liquid absorption capacity of the sachet. Depending on the kind or the amount of liquid-exuding foodstuff to be packaged the package may contain one or more of such sachets of superabsorbing powder. Alternatively, the package may be provided according to the invention with a separate superabsorbing material-containing compartment having a liquid-permeable wall. These last-mentioned packaging forms may in principle be ready made on a large scale and be printed with the liquid absorption capacity. The invention also comprises a method of packaging foodstuffs such as shellfish, more particularly mussels, oysters, periwinkles and the like in a container, such as a plastic bag, a carrier bag or a box, which products exude moisture during their stay in the package, characterized in that in the container there is some amount of said superabsorbing material as well as the packaged product.

A special form of packaging mussels is characterized according to the invention by a first, essentially closed, container which is provided at its upper side with a number of openings, and a second container provided with a great many openings for admitting the mussels, and a layer of superabsorbing material which lies on the bottom of the first container and between the first and the second container. The first container is advantageously in the form of a plastic bag which is sealed along its upper side and provided with a number of air holes near the sealing seam, and the second container is also a plastic bag, there being provided a layer of supporting material containing the superabsorbing material. The mussel package according to the invention on the one hand permits the admission of air to the packaged mussels and on the other prevents the release of liquid from the package.

The invention comprises more particularly a mussel package for 2-5 kg of mussels, which package contains 10-70 grammes of said superabsorbing material. The invention also relates to specially packaged foodstuffs of which the package is in the form according to the invention.

An important advantage to the packaged product according to the invention is that the additional weight resulting from the use of superabsorbing material can be kept very low because of the high liquid

absorption capacity of the powder.

Consequently, also the space taken up by the superabsorbing powder is very small, so that the presence in the package of a small sachet or compartment containing superabsorbing powder will not give any difficulty at all. Owing to the generally negligible additional weight and the small dimensions of the package containing some amount of superabsorbing powder the package according to the invention does not present any handling or transport problems and has a favourable appearance. The package according to the invention can in principle also be used on current packaging machines. The use of the package according to the invention generally does not require the purchase of new packaging machines, although in some cases the machines to be used may have to be slightly adapted.

The high liquid absorption capacity makes the package according to the invention very suitable even for containing products that exude relatively large amounts of liquid.

The invention will be further explained with reference to the accompanying schematic drawing.

Figure 1 shows a measuring device for determining the liquid absorption capacity of superabsorbing powder.

Figure 2 shows a carrier bag with contents according to the invention.

Figure 3 shows a variant embodiment of the packaged product according to the invention.

Of the superabsorbing material the liquid absorption capacity mentioned and envisaged in the description and the claim is determined by means of the device illustrated in Figure 1, which corresponds in essence to the commercially available ENSLIN apparatus. Basically, the ENSLIN apparatus consists of a plate 1 of fritted glass which serves as a filter that communicates with a horizontally positioned, graduated microburet 2. It is essential that the position of the microburet 2 should be so chosen that the microburet and the upper side of the glass plate 1 are in one and the same horizontal plane. The exchangeable filter unit 3 is connected up with the glass tube 4 for feeding the test liquid to the filter 1. On the horizontal upper surface of the filter 1 there is to be placed the sample 5 of superabsorbing material whose liquid absorption

capacity is to be measured by means of a test liquid. A piston 16 serves to apply an external pressure of 3000 N/m^2 to the superabsorbing powder 5. At its end away from the filter 1 the tube 4 is connected to a three-way cock 6. On its other side the three-way cock 6 is connected to a funnel 7 for supplying the required, sufficiently large amount of test liquid. The threeway cock 6 is through a piece of tube 8 connected to the two-way cock 9, which is connected to the microburet 2. The porous glass filter 1 is of the G-3 type having a porosity of 16-40 microns, the upper side of the filter having a surface area of $12,25 \text{ cm}^2$. The microburet 2 has an inner diameter of 3,5 mm.

The procedure for carrying out a test with the apparatus shown in Figure 1 is as follows :

- fill the apparatus with test liquid consisting of a solution in water of 1% NaCl by setting the threeway cock 6 into such a position that both the microburet 2 and the glass filter will be filled with liquid;
- so set the apparatus that the glass filter 1 will be saturated with test liquid;
- close the twoway cock 9;
- set the threeway cock 6 into such a position that the supply of test liquid from the funnel 7 is stopped;
- dry the surface of the glass filter;
- spread 150 milligrammes of dry superabsorbing powder evenly over the surface of the filter plate 1 and allow the piston 16 to come down onto the powder, exerting a pressure of 3000 N/m^2 ;
- simultaneously open the twoway cock and start time recording;
- read the millilitres of absorbed test liquid from the graduated microburet 2 at time intervals of 15, 30, 60, 90 etc. seconds;
- continue reading the absorbed amounts of test liquids until the liquid level in the buret 2 does not change more than 0,2 ml/gramme within two time intervals of 100 seconds; the measurement is completed then;
- each measurement on a particular type of absorbing powder is repeated five times and the values obtained are averaged;
- the average amount of liquid in millilitres per gramme, absorbed at

a pressure of 3000 N/m^2 , and found at the end of the measurement is the "total liquid absorption capacity" referred to in the description and the claims.

Figure 2 shows an embodiment of the package according to the invention.
5 It represents a watertight plastic carrier bag 10 containing about 3 kg of fresh mussels 11. At the bottom of the bag there is provided a separate compartment 12 filled with about 45 grammes of superabsorbing powder of the type commercially available under the trade name AKUCCELL-S and consisting essentially of powder of cross-linked carboxymethyl
10 cellulose. The compartment is partitioned off from the contents of the bag by means of a liquid-permeable wall.

The large amount of water usually exuded by the mussels will collect at the bottom of the bag 10 and will practically immediately be taken up by the superabsorbing material in the compartment 12. An amount of 3 kg of
15 mussels may produce as much as about 0,5-0,8 litres of water in a relatively short time. All the "leakage water" will readily and rapidly be taken up by the superabsorbing material AKUCCELL-S, as a result of which no water is left at the bottom of the bag 10 and the quality of the mussels will not deteriorate under the influence of harmful substances
20 that would inevitably form in the "leakage water". This way of packaging mussels provided by the present invention not only preserves the quality of the mussels, but also permits safe and easy transport by car along with other purchases because of the absence of awkward leakage moisture.

25 Of the superabsorbing material AKUCCELL-S, which is used for the mussel package according to Figure 2 and consists essentially of powder of cross-linked carboxymethyl cellulose, the total liquid absorption capacity can be determined with the aid of the apparatus given in Figure 1. The test liquid taken up by the superabsorbing AKUCCELL-S powder can be
30 measured in millilitres per gramme after 15, 30, 45, 60, 90 600, 900 seconds from the start of the measuring procedure and at a pressure of 3000 N/m^2 . Of every five successive measurements the results are averaged. The measuring results will lie within a 10% spread. The AKUCCELL-S to be used for the mussel package of Figure 2 will have a total

liquid absorption capacity of about 20 ml/gramme.

Figure 3 shows a somewhat varied embodiment of a package according to the invention. A closed and heat-sealed plastic bag 13 contains a product 14 which while in said bag 13 exudes a large amount of liquid. At the bottom of the bag 13 is a sachet 15 filled with superabsorbing powder of the AKUCCELL-S type. The walls of the sachet 15 are of a liquid-permeable material. The liquid to be exuded by the product 14 is completely and rapidly absorbed by the superabsorbing powder in the sachet 15.

Optionally, the superabsorbing material may be provided with a moisture spreading agent serving to prevent the superabsorbing material from being blocked.

Belgian Patent Specification 809 023 describes a method of vacuum-packaging meat in the presence of a sachet or envelope containing moisture absorbing material in the form of silica gel, chalk or some claylike material. The wall of the sachet or envelope is of a material permeable to liquid. The envelope may also contain other substances that serve a different purpose, such as a preserving agent for meat. Although for particular uses some benefit will probably be derived from this known packaging form, it has the disadvantage that the moisture absorbing materials proposed for it, viz. silica gel, chalk or a claylike material are capable of absorbing only a relatively small amount of moisture. Because of the low moisture absorption capacity the amount of moisture absorbing material to be used in said known form of packaging is fairly large and bulky in relation to the product to be packaged. Consequently, BE 809 023 describes an embodiment where the envelope containing the moisture absorbing powder has relatively large dimensions, viz. 15 x 20 cm. As for various reasons, for instance of transport, weight and appearance, the dimensions almost invariably play an important role in the packaged endproduct, said known packaging form will not be acceptable for various uses. More particularly, the package according to BE 809 023 will not be suitable for products which while in the packaged state, will exude relatively large amounts of liquid. Another disadvantage to the known package is that the above-mentioned absorbing materials contained therein, viz. silica gel, chalk and a claylike product are

actually not suitable in the first place for absorbing water vapour and are only to a limited extent capable of absorbing liquid, such as sea water, or fresh water, lymph, blood or electrolyte solutions.

5 US 3 026 209 describes a fresh meat package which comprises some kind of tray, on the bottom of which there is placed a fairly thick layer of absorptive material which is covered with a perforated supporting plate on which the meat is placed. The tray with the meat is entirely enclosed in a transparent wrapping film. In the absorptive material there is present a bacteriostatic agent to retard or prevent the undesirable
10 growth of microorganisms. A disadvantage to this known package is that the absorptive materials proposed for it, such as paper, sponge, silica gel and the like, have only a relatively limited capacity of absorbing liquid. For absorbing an even fairly small amount of liquid use need be made then of a rather thick and large layer of absorptive material.

15 Swedish Patent Specification 7804793-3 describes a package for food-stuffs in which on the ridged bottom of a box there is placed a plate of absorptive material supporting a perforated plate. In that case, too, the absorptive material is of paper or the like, which has only a relatively low absorptive capacity with all the resulting afore-mentioned
20 disadvantages to it.

US Patent Specification 4 124 116 describes a moisture absorbing pack consisting of an upper filter layer and a lower dissolving layer between which there is provided a liquid absorbent granular material. The absorbent material is of the superabsorbent type described in US Patent
25 Specification 3 661 815. In US 4 124 116 it is proposed to use the moisture absorbing pack in optical lens cases, burial caskets, storage rooms, railroad cars and other types of enclosures. The patent specification does not mention the use of a moisture absorbing pack in a package for foodstuffs. Considering that the superabsorbing material according
30 to US 3 661 815 had been developed particularly with a view to its use in the hygienic goods sector, it was not obvious for a man skilled in the art also to use superabsorbing material in the packaging of foodstuffs, particularly with regard to the stringent toxicological requirements to be satisfied by the packaging of foodstuffs.

Within the scope of the invention variations may be made. For instance, to the superabsorbing material there may be added a bacteriostatic agent known in itself.

CLAIMS

1. A package for foodstuffs, such as shell fish, more particularly mussels, oysters, periwinkles and the like, which while packaged may exude liquid, the exuded liquid substantially being kept isolated
5 from the foodstuffs, characterized in that the package contains a superabsorbing material for absorbing and retaining the liquid.
2. A package according to claim 1, characterized in that the superabsorbing material is of the type which has a total liquid absorption capacity of at least 10 millilitres of test liquid per gramme
10 at a pressure of 3000 N/m^2 , measured in the manner indicated in the description.
3. A package according to claim 2, characterized in that said total liquid absorption capacity of the superabsorbing material is in the range of from 15 to 30 ml/g, preferably about 20 ml/g, at a pressure
15 of 3000 N/m^2 .
4. A package according to one or more of the preceding claims, characterized in that said total liquid absorption capacity of the superabsorbing material is not higher than 50 to 100 ml/g at a pressure of 3000 N/m^2 .
- 20 5. A package according to one or more of the preceding claims, characterized in that use is made of such a superabsorbing material that it can be filled to 60-80% of its total liquid absorption capacity within a period of 1 minute.
6. A package according to claim 2, characterized in that use is made of
25 such a superabsorbing material that said total liquid absorption capacity of 10 ml/g at a pressure of 3000 N/m^2 can be reached within a period of 2 minutes.
7. A package according to one or more of the preceding claims, characterized in that the superabsorbing material is formed from cross--
30 linked cellulose and/or cellulose ethers, such as carboxymethyl

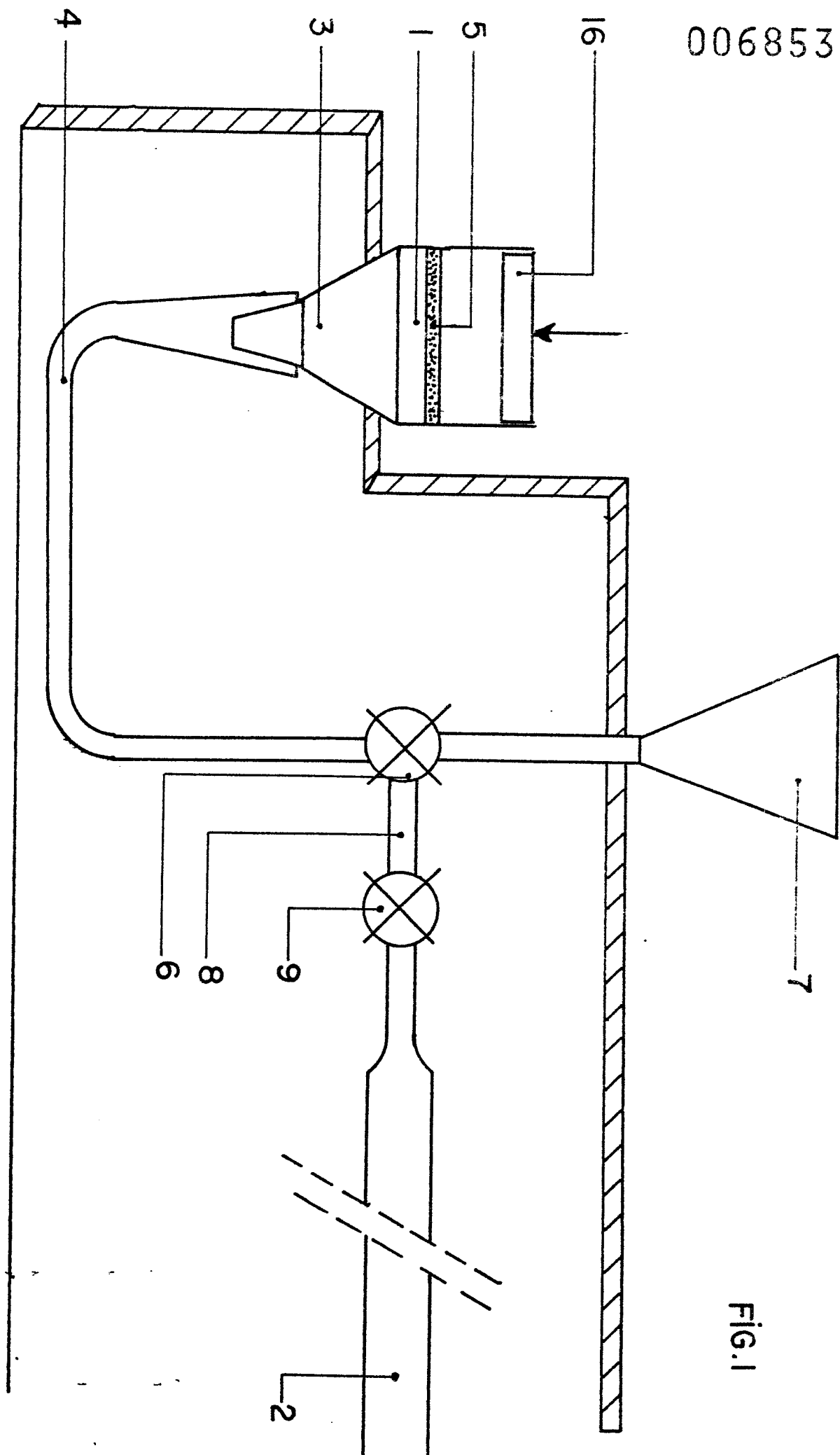
cellulose, hydroxymethyl cellulose, hydroxypropyl cellulose and methyl hydroxyethyl cellulose.

- 5 8. A package according to one or more of the claims 1-6, characterized in that the superabsorbing material is formed from salts of cross-linked polyacrylic acid, polyacrylates cross-linked with polyamide epichlorohydrin, cross-linked polystyrene sulphonate and cross-linked polyacrylamide.
- 10 9. A package according to one or more of the claims 1-6, characterized in that the superabsorbing material is formed from starch derivatives, such as starch-acrylonitrile graft copolymers and cross-linked starch derivatives.
- 15 10. A package according to one or more of the preceding claims, characterized in that the superabsorbing material present in the package is contained in a separate sachet having a wall of liquid-permeable material.
11. A package according to one or more of the claims 1-9, the package being in the form of a container, such as a bag, a carrier bag or a box, characterized in that the superabsorbing material is present in a compartment which forms part of the container.
- 20 12. A package according to claim 11, characterized in that the compartment containing the superabsorbing material is at the bottom of the container.
- 25 13. A package according to one or more of the preceding claims, characterized in that the superabsorbing material is present in an amount such that the total amount of liquid to be absorbed by it approximately corresponds to the maximum amount of liquid to be exuded by the packaged product.
- 30 14. A package according to one or more of the preceding claims, characterized in that the package is in a form such that the packaged product is accessible to the ambient air.

15. A mussel package according to one or more of the preceding claims, characterized by a first, essentially closed, container which is provided at its upper side with a number of openings, and a second
5 container provided with a great many openings for admitting the mussels, and a layer of superabsorbing material which lies on the bottom of the first container and between the first and the second container.
16. A mussel package according to claim 15, characterized in that the
10 first container is in the form of a plastic bag which is sealed along its upper side and provided with a number of air holes near the sealing seam, and the second container is also a plastic bag, there being provided a layer of supporting material containing the superabsorbing material.
- 15 17. A mussel package for 2-5 kg of mussels, according to one or more of the preceding claims, characterized in that the package contains 10-70 grammes of said superabsorbing material.
18. A packaged foodstuff, characterized in that the package is in the form according to one or more of the preceding claims.
- 20 19. A method of packaging foodstuffs, such as shell fish, more particularly mussels, oysters, periwinkles and the like, which while packaged may exude moisture, said foodstuffs being packaged in a container, such as a bag, a box or a carrier bag, characterized in that
25 in the container there is present some amount of said superabsorbing material as well as the packaged product.
20. Foodstuffs packaged by the method of claim 19.

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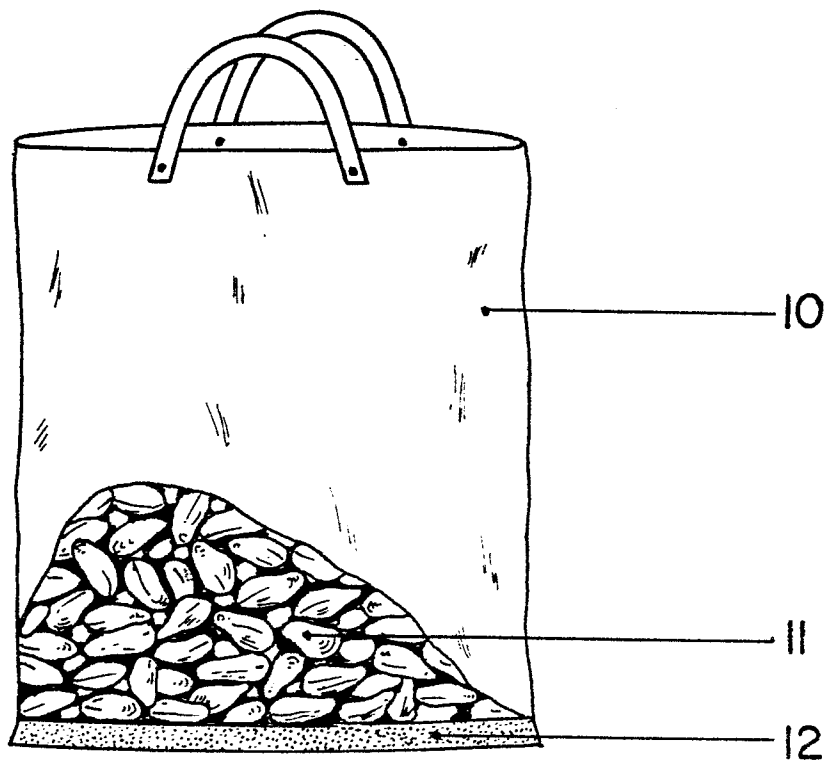


FIG. 2

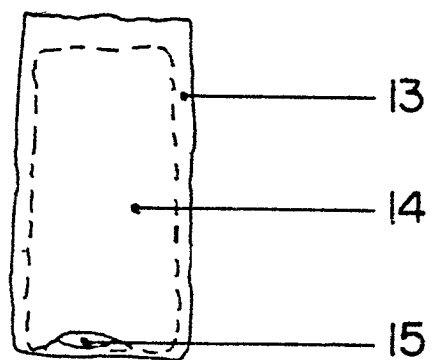


FIG. 3



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 8)
P,X	US-A-4 275 811 (MILLER) * column 1, lines 9-25; column 2, line 63 - column 4, line 16; column 4, lines 31-58; figures 1-9 *	1,9,10 ,18,19 ,20	B 65 D 81/26
Y	---	11,12, 14	
Y	GB-A-2 003 836 (R. MARX) * page 1, lines 3-18; page 2, line 60 - page 3, line 2; figures 1-3 *	11,12	
Y	---	14	
A	US-A-2 674 509 (BARNET) * column 3, lines 28-63; figures 1,2 *		TECHNICAL FIELDS SEARCHED (Int. Cl. 8)
A	---	15,16	B 65 D C 08 B
D,A	US-A-3 661 815 (SMITH) * column 1, lines 19-21; column 1, lines 45-53; column 4, line 60 - column 7, line 45 *	1,2,3, 4,9	
A	---	1,2,9, 13	
A	US-A-4 224 366 (McCABE) * column 2, lines 20-56; column 4, line 41 - column 6, line 55; figures 1-4 *		

	-/-		
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		16-09-1982	MARTENS L.C.R.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone		T : theory or principle underlying the invention	
Y : particularly relevant if combined with another document of the same category		E : earlier patent document, but published on, or after the filing date	
A : technological background		D : document cited in the application	
O : non-written disclosure		L : document cited for other reasons	
P : intermediate document		& : member of the same patent family, corresponding document	



DOCUMENTS CONSIDERED TO BE RELEVANT			Page 2
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
A	NL-A-7 604 730 (HOECHST) * page 4, lines 30-34 * & GB - A - 1 552 861	7	
D,A	US-A-4 124 116 (E. McCABE) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16-09-1982	Examiner MARTENS L.G.R.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	