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(54) **BEVERAGE INFUSION PACKAGES AND MATERIALS THEREFOR**

AUFGUSSBEUTEL UND ENTSPRECHENDE HERSTELLUNGSMATERIALIEN

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Description

[0001] The present invention relates to a beverage infusion packages (e.g. tea bags, coffee bags and the like) as well as to porous, fibrous web materials for use in producing such packages.

[0002] Beverage infusion packages such as tea bags comprise a particulate beverage precursor material, e.g. tea leaves or coffee granules, in a bag, sachet, pouch or the like (all conveniently referred to herein as a bag) of a porous, fibrous cellulosic material. This material typically has a basis weight of 10 to 30 g m^{-2} and is often referred to as "tissue" or "tissue paper". The tissue may be of the "heat seal" or "non-heat seal" type and the invention is primarily concerned with the production of beverage infusion packages by techniques which do not involve heat sealing although a description of "heat seal" tissue is given below for the sake of completeness.

[0003] "Heat seal" tissue comprises two or more layers wet-laid in succession one on top of the other. One layer contains only cellulosic fibres and the other incorporates thermoplastic fibres. A beverage infusion package is produced from such tissue by forming the bag such that layers of the tissue incorporating thermoplastic fibres are juxtaposed and then heat sealed.

[0004] "Non-heat seal" tissue generally (but not necessarily) comprises a single wet-laid layer of cellulosic fibres produced from mixtures of well known paper-making fibres which may include both woody and non-woody materials, e.g. Manila hemp, sisal, jute, bleached and unbleached soft wood and hard wood species and in some instances approved synthetic fibres such as viscose rayon. The material is typically manufactured by the wet laid process on an inclined wire paper-making machine. The material is generally treated with classic wet and dry strength chemical enhancing products, such as CMC (carboxymethyl cellulose) and Kymene (epichlorohydrin).

[0005] Beverage infusion packages (e.g. tea bags) produced from such "non-heat seal" material incorporate a seam formed by a mechanical compression action (e.g. involving crimping). Examples of such packages are those of the "double-chamber" type having attached string and tag as produced by both Constanta and Perfecta machines the world over.

[0006] Briefly, such double chamber packages are produced by longitudinally folding a strip of the non-heat seal tissue so that the free longitudinal edges are adjacent to each other. These two edges are then folded over together several times and the fold then reinforced by means of a pressure controlled toothed wheel known to those skilled in the art as a Crimp Wheel. The thus formed tube is then formed into the final double-chamber beverage infusion package (incorporating beverage precursor material). Such a package comprises, in effect, a short length of the tube folded transversely so that the widthwise ends are adjacent to each other and with the crimped seal extending lengthwise along the inner sides of the package which is closed at its transverse ends by a staple to which may be attached a string and tag.

[0007] To produce a beverage, the package is infused with hot water. This may be done, for example, by immersing the package in hot water, pouring hot water onto the package, or heating water and the bag in a microwave oven. This action, of infusing the package with hot water, causes the bag to inflate and float due to water bridging the pore structure of the tissue and creating a gas barrier film entrapping the atmosphere and volatiles generated during the brewing process. The inflation of the package increases stress on the mechanically formed seam to a degree dependent, at least in part, on the type and dosage of the beverage precursor material in the package, e.g. black tea or herbal tea. The stress on the mechanical seam may be such as to result in failure thereof causing tea leaves, coffee grounds or the like to be released into the beverage and this is obviously undesirable. The problem of seam failure occurs when the wet crimp strength of the seam is not sufficiently high and is exaserpated in the microwave method of infusing the beverage where the extended period of energy input (e.g. for two minutes) increases the stress placed on the mechanical seam both in a cold and hot environment and has a detrimental effect on most classical wet and dry chemical systems employed.

[0008] DE-A-1 800 032 discloses a beverage infusion (e.g. a tea bag) formed of porous fibrous cellulosic material and having a closure seam produced by a mechanical compression action without heat sealing. The fibrous cellulosic material may incorporate 20% of viscose synthetic fibre.

[0009] It is an object of the present invention to obviate or mitigate the above mentioned disadvantages.

[0010] According to a first aspect of the present invention there is provided a beverage infusion package formed of porous, fibrous cellulsoic material and having a closure seam produced by a mechanical compression action without heat sealing, porous material containsing thermoplastic fibres which are amorphous or only partially crystalline characterised in that the thermoplastic fibres are present as a fused or thermally bonded network.

[0011] Thus in accordance with the first aspect of the invention the beverage infusion package is formed from a material incorporating fibres of a thermoplastic which is amorphous or (more preferably) partially crystalline-, the thermoplastic fibres being present as a fused or thermally bonded network. —We have found that such fibres produce a significant enhancement of mechanical seam integrity. The dry strength of the seam is sufficient to prevent the package bursting open and spilling the beverage precursor material during manufacture, packaging, delivery and or consumer use. Moreover, the wet crimp strength is such that there is no significant seam failure when infusion packages in accordance with the invention either when boiling water is poured onto the package to brew the beverage or when the infusion package is heated with water in a microwave oven.

[0012] We do not wish to be bound by theory but we believe that the success of the present invention is attributable to several reasons. Firstly, the thermoplastic fibres in the paper at the opposite sides of the seam are bent and form an inter-locked synthetic matrix which is impervious to boiling water and microwave energy. Secondly, the fact that the thermoplastic fibres are amorphous or only partially crystalline ensures that fibre recovery is limited which enables the crimped seam to be maintained under high stress in a hot aqueous environment.

[0013] The invention is particularly effective in the case where the mechanically formed seam is formed by folding over together adjacent edges of the porous material and applying a mechanical compressive force to the folded over edges. The compressive force may be applied by crimping, e.g. using a pressure controlled toothed wheel (a so-called Crimp Wheel). In such a case the fibres are crimped together providing an additional degree of interlocking and therefore enhancement of seam integrity.

[0014] The beverage infusion package of the invention may for example be a tea bag, e.g. of the double-chamber type, but is also applicable to other beverages, e.g. coffee.

[0015] The porous fibrous material will generally have a basic weight of 10 to 30gm^{-2}, more typically 10 to 20 $gm^{2,}$ e.g. 10-13 gm^2. For preference, the material will comprise 5 to 30%, more preferably 10% to 30%, and ideally 15% to 25% by weight of the thermoplastic fibres.

[0016] The material may be formed by conventional paper-making techniques by laying a suspension comprised of cellulosic and thermoplastic fibres onto a paper-forming fabric of a paper-making machine (e.g. an inclined wire paper-making machine) and withdrawing water from the laid suspension through the fabric.

[0017] Cellulsoic fibres forming the suspension may be those conventionally used for producing non-heat paper for beverage infusion bags and may include both ''woody'' and "non-woody" materials such as manila hemp, sisal, jute, and bleached and unbleached soft wood and hard wood species.

[0018] Generally the relative amounts of non-woody material to woody material will be 40 to 80 parts of non-woody material to 20 to 60 parts woody material.

[0019] The material may be produced by laying successive layers of suspension (possibly of differing composition) one on top of the other, e.g. as described in WO-A- 704956. It is however more preferred that the material comprises only a single layer of the cellulosic and thermoplastic fibres. This is an important aspect of the invention in its own right and therefore according to the second aspect of invention there is provided a porous fibrous web material having a basis weight of 10 to 30 gm^{-2} and being comprised of a single, wet-laid layer of an admixture of cellulosic and thermoplastic fibres which are amorphous or are only partially crystalline, characterised in that the thermoplastic fibres are present as a fused or thermally bonded network.

[0020] Material in accordance with the second aspect of the invention is suitable, and primarily intended for, producing beverage infusion packages in accordance with the first aspect of the invention. However, the material is also suitable for any use where a porous, high wet strength, mechanically crimped seam is required.

[0021] Preferably the crystallinity of the thermoplastic fibres is less than 40% to reduce fibre recovery to 10% which enables the mechanical seam to be retained under high stress in a hot aqueous environment. More preferably the crystallinity is 10-20%.

[0022] Examples of thermoplastics which may be used are polypropylene, polyester, polyamide 6, 66, 11, 12 and high density polyethylene. Blocked or random copolymers or terpolymers of propylene and ethylene may also be used.

[0023] The thermoplastic fibres will preferably have a thickness of 0.55 to 6.7 decitex (0.5 to 6.0 denier) although best results will generally be achieved with fibres in the 2.2 to 4.4 decitex (2 to 4 denier) range.

[0024] The length of the thermoplastic fibres may be 0.5mm to 12mm, preferably 3mm to 6mm and more typically 5mm.

[0025] The thermoplastic fibres in the web have been "fused" or thermally bonded together, at a temperature greater than the crystalline melt temperature of the thermoplastic fibres.

[0026] Such "fusing" can provide two effects. Firstly, the crystallinity of the thermoplastic fibres from which the web is manufactured may be reduced to a desired value. Thus for example the fibres may initially have significant crystallinity (e.g. greater then 50% and possibly greater than 80%) and this crystallinity may be reduced by the heat treatment to the preferred value of, say, 10-20%. Secondly the fibres become fused together at their junctions (or points of contact) to provide a cohesive reinforced crystalline matrix. The affect of fusing the thermoplastic web further improves the dry and wet crimp functionality by increasing web elasticity specifically in the cross machine direction orientation.

[0027] The thermoplastic fibres from which the web is produced may be of isotatic polypropylene drawn into fibres having a degree of crystallinity of at least 75%, the crystallinity subsequently being reduced during the above described "fusing" step.

[0028] The crystallinity of the fibres may be assessed colorimetrically. Thus, when polypropylene (a preferred thermoplastic for use in the invention) is crystallised from the melt and drawn under stress the arrays of crystallites, known as spherilites, become highly orientated in the longitudinal direction of the filament. Due to the highly orientated spherilites the fibres when viewed under polarised light show a distinctive bright yellow colouration demonstrating a degree of crystallinity.

[0029] When polypropylene is used in the current invention and is thermally bonded at a temperature greater than the

crystalline melt temperature of the polypropylene the spherilites become more randomly orientated and under polarised light show only slight evidence of yellow colouration.

[0030] It is recognised for current beverage infusion bags formed having a seal produced by mechanical compression that if the initially formed dry seal is below a predefined value then the strength of the crimp in the wet state (wet crimp) will be insufficient. However the current invention can produce a more than adequate wet crimp seal for microwave use for only a small increase in wet crimp strength.

[0031] The material of the second aspect of the invention or any other material from which a beverage infusion package in accordance with the first aspect of the invention is to be produced may be treated (by either addition to the wet pulp stock suspension or at a size press unit) with agents known *per se* for imparting wet and dry strength, e.g. carboxymethyl cellulose (CMC) and epichlorohydrin (e.g. available under the name KYMENE (Trade Mark). These agents may be used such as to provide at least 1% by weight thereof on the material.

[0032] Particularly in the case where the web is treated with epichlorohydrin, it is preferred that it is also treated with poly(vinyl alcohol) which acts to increase dry strength and (in conjunction with epichlorohydrin) improves wet crimp strength. The poly(vinyl alcohol) is preferably one having a degree of hydrolysis of at least 60%, more preferably at least 80%, and most preferably 95% to 99.9%.

[0033] The poly(vinyl alcohol) may for example of the type known as the "super-hydrolysed" variety, e.g. as available under the AIRVOL (Trade Mark) as available from Air Products.

[0034] Levels at which the poly(vinyl alcohol) will be applied to the web will generally be in the range 0.5 to 4% by weight typically 1.0 to 2% by weight.

[0035] It is possible for the porous fibrous material (from which the infusion package is produced) to be relatively hydrophilic such that, during brewing of the beverage, the bag rapidly wets out and sinks in the brew liquor providing a satisfactory infusion rate. The hydrophilicity of the porous fibrous material may be measured by a water climb test in which the lower end of a vertically disposed strip (1"x 5" (2.54 x 12.70cm)) of the material is dipped into water and then time taken for the water to rise 1" (2.54cm) up the material is measured. In accordance with the invention it is preferred that the porous, fibrous material has a water climb value of less than 70 seconds, e.g. 20 to 40 seconds, ideally about 30 seconds.

[0036] A further means of measuring, hydrophilicity is by the Water Drop Test in which a micro syringe is used to drop a small bead of water at ambient temperature on to a single layer of the infuser web, which is supported around its perimeter by a small diameter ring, typically 2" (5.08cms). The time taken for the droplet of water to spread out and collapse into the infuser web, i.e. zero contact angle, is timed by means of a stopwatch. It is preferred that the porous, fibrous material has a value in the Water Drop Test of less than 10 seconds, more preferably less than 5 seconds, and even more preferably less than 1 second.

[0037] The hydrophilicity of the web may be achieved by treatment with epichlorohydrin and poly(vinyl alcohol).

[0038] The invention will be illustrated by the following non-limiting Examples in which porous fibrous material (in accordance with the second aspect of the invention) were produced as illustrated in Examples 4 and 5. Examples 1-3 represent comparative materials.

Example 1 - (Comparative)

[0039] A standard NHSTB 12.3-13.0 gsm infuser web was produced on an inclined pilot paper machine from 70% Manila and 30% soft wood and bonded with 1% Kymene and 2% CMC. This material was then slit to 94.3 mm coils and conditioned in a humidified laboratory to the typical industry standard of 7-8% moisture content, as low moisture is known to significantly affect conversion parameters adversely.

Example 2 - (Comparative)

[0040] A USA style latex NHSTB prototype at 12.3-13.0 gsm infuser web was produced in the inclined pilot paper machine from 70% Manila and 30% softwood and bonded with 1% Kymene and 13.5% of a co-polymer of Ethyl and Butyl acrylate latex. This material was then slit to 94.3mm coils and conditioned in a humidified laboratory to the typical industry standard of 7-8% moisture content.

Example 3 - (Comparative)

[0041] A European style latex NHSTB prototype at 12.3-13.0 gsm infuser web was produced on the inclined pilot paper machine from 60% Manila, 30% softwood, 10% hardwood and bonded with 1% Kymene and 13.5% of a co-polymer of methacrylate Styrene Butadiene latex. This material was then slit to 94.3 mm coils and conditioned in a humidified laboratory to the typical industry standard of 7-8% moisture content.

Example 4 - (Invention)

[0042] A standard NHSTB 12.3-13.0 gsm infuser web was produced on the inclined pilot paper machine from 55% Manila and 30% softwood, 15% Polypropylene (3 denier, 5mm) and bonded with 1% Kymene. During the production of this material the polypropylene was "fused"/"thermally bonded" to an amorphous state by taking the polymer past its crystalline melt temperature. This material was then slit to 94.3mm coils and conditioned in a humidified laboratory to the typical industry standard of 7-8% moisture content.

Example 5 - (Invention)

[0043] A standard NHSTB 12.3-13.0 gsm infuser web was produced on the inclined pilot paper machine from 55% Manila and 30% softwood, 15% polypropylene (3 denier, 5mm) and bonded with 1% Kymene and 2% PVOH (Airvol 165). During the production of this material the polypropylene was "fused"/"thermally bonded" to an amorphous state by taking the polymer past its crystalline melt temperature. This material was then slit to 94.3mm coils and conditioned in a humidified laboratory to the typical industry standard of 7-8% moisture content.

[0044] The materials produced in Examples 1 to 5 were subjected to a number of Tests as detailed below. Unless otherwise stated, tea bags for use in the Tests were produced on a Constanta NHSTB Machine at a speed of 140 bags/min. The bags were dosed with 1.8 grams of black tea equally between the two chambers and the enclosure made as standard using a steel staple.

Test 1 - Microwave Crimp Failure

[0045] The energy out put of microwaves has increased dramatically over the recent couple of years and is now typically 850-1200 watts for domestic appliances. It has also been observed that the energy inputted to the fusion packet during the typical brew cycle can also vary for a given microwave wattage depending on make, model and whether the microwave is "cold" i.e. the first use or is "hot" i.e. the second and subsequent uses during a sustained period.

[0046] The test regime that has been adopted to evaluate the above observation and to provide a broad indication of infusion material acceptability over a range of conditions is outlined as follows:

- Microwave used in a 1200 watt variable power domestic unit made by Philips Industries.
- Water used is drawn from a domestic cold water supply common to the region.
- 5 replicates are performed with out any cool down times between tests.
- The bags are placed into 175ml of water at ambient temperature, contained by a grade B 250 ml laboratory beaker.
- The beaker is observed, through the glass door, during both microwaving and then in removal from the microwave and following recorded:
    - Does the crimp fin seal fail during the brewing process as indicated by tea leaf present in the beaker.
    - When the tea bag is removed and the top stapled seal opened does the crimped fin seal show signs of deforming such that the bag is on the verge of opening.
- The test is then repeated immediately for the next replicate until the 5 samples have been tested.
- The microwave is then allowed to cool down to ambient temperature and the test is then repeated at the next power setting (90%) until the full range of setting (60-100%) have been evaluated for a given sample type.

[0047] The results are shown in Table 1.

Microwave Crimp Failure Vs Energy Input Table 1

[0048]

	Ex 1	Ex 2	Ex 3	Ex 4	Ex 5
% Energy Input	JRC NHSTB	Latex Product USA	Latex Product EU	Microwave NHSTB	Microwave NHSTB
100	Total failure	Total failure	Total failure	No failure	No failure
90	Total failure	Total failure	Total failure	No failure	No failure

Table continued

	Ex 1	Ex 2	Ex 3	Ex 4	Ex 5
% Energy Input	JRC NHSTB	Latex Product USA	Latex Product EU	Microwave NHSTB	Microwave NHSTB
80	Total failure	Total failure	Total failure	No failure	No failure
70	Total failure	Open on inspection	No failure	No failure	No failure
60	Open on inspection	No failure	No failure	No Failure	No failure

Test 2 - Tea Sift

[0049] The amount of tea that is allowed to pass through the infuser web is of critical importance as it limits how the tea bag producer can blend/mill the tea used. This impacts on both the final infusion rate of the tea bag and how much tea is lost into the package during transport (Tea sift).

[0050] To assess comparatively the differences between infuser tissues the following test regime has been adopted and is outlined as follows:

- 3 discrete size ranges of sand are used (75-106, 106-150, 150-221 microns)
- The sand used is of the type produced by shot blasting and is fractionated in-house using graduated sieves.
- The test is performed by weighing out 10.0g $\pm$0.05g of the sand and placing it in a catchpot for each of the sand fraction.
- The catchpot is then covered by a square of the test tissue across the opening
- The catchpots are then stacked one on top of each other to form a column.
- The stack is then carefully inverted.
- The stack is then placed in an Endecote vertical shaker and vibrated for 10 minutes.
- When the time is finished the catchpot stack is removed and carefully inverted so the tissue sample are again on top of each catchpot.
- The residual sand in each catchpot is measured and the percentage "sift" of the paper determined by the product of the original and final sand weights.
- The results are recorded under the appropriate sand range and the average "sift" ranking is established by taking the mean value of the 3 sand range results.

[0051] The results are shown in Table 2.

% Tea Sift Data Table 2

[0052]

	EX 1	Ex 2	Ex 3	Ex 4	Ex 5
Particle Size Microns	JRC NHSTB	Latex Product USA	Latex Product EU	Microwave NHSTB	Microwave NHSTB
75-106	93.4	64.8	67.2	829	29.2
106-150	21.9	31.7	30.1	60.5	37.5
150-212	4.6	8.3	6.2	17.2	10.9
AVET	40.0	34.9	34.5	56.9	42.53

Test 3 - Tea Infusion

[0053] The speed at which a specific tea blend infuses (Brews) is reliant on the impact of infusion packets and is

obviously of key importance to the consumer.

[0054] To assess comparatively the impact in infusion rate of different infuser tissues the infusion rate is evaluated by measuring the colour change of the brew liquor of a period of time, typically 5-6 minutes, by colourimetry. The following test regime has been adopted and is outlined as follows:

- The tea bag is contained in a holding cage, to maintain submergence in the water, is placed into a 1000 ml beaker containing a photometer probe and a magnetic stirrer. 700 ml of boiling de-ionised water is poured into the beaker at which point the test begins.
- The initial (Time=zero seconds) photometer reading is taken and then at intervals until the end of the test at 270 seconds.
- The brew liquor in the beaker is maintained at 85°C during the test by means of a heating plate.

[0055] The results are shown in Table 3.

Infusion Data Table No. 3

[0056]

Light Transmission					
	Ex1	Ex 2	Ex 3	Ex 4	Ex 5
Infusion Time Sec	NHSTB	Latex Product	Latex Product	Microwave NHSTB	Microwave NHSTB
30	0.129	0.015	0.13	0.125	0.132
90	0.523	0.321	0.299	0.481	0.300
120	0.639	0.541	0.442	0.588	0.642
150	0.721	0.690	0.569	0.669	0.729
240	0.895	0.807	0.797	0.835	0.918
270	0.935	0.859	0.853	0.968	0.958

Test 4 - Hydrophilicity

[0057] Water Climb and Water Drop Tests were conducted as described above.

[0058] The results are shown in Table 4.

Water Climb & Water Drop Test Data Table 4

[0059]

		Ex 1	Ex 2	Ex 3	Ex 4	Ex 5
Water Climb to 1" (Secs)	Water Drop Test (Secs)	JRC NHSTB	Latex Product USA	Latex Product EU	Microwave HSTB	Microwave HSTB
30	<1	3				3
50	<60				3	
300	>250		3			
400+	>450			3		

Test 5 — Wet Crimp

[0060] The dry strength of the crimp fin seal is of critical importance to both dry functionality in manufacture, packaging and end use, while the wet integrity of the crimped fin seal is obviously the key factor in brewing functionality.

[0061] To assess comparatively the differences between dry and wet crimp strengths of different infuser tissues, the following test regime has been adopted:

- Tea bags are manufactured without tea being dosed to the individual bags.
- The top seal is cut off 5 bags which are opened flat.
- A 50mm section is cut from ostensibly each chamber side of the bag. Each section is then cut to give the side of the chamber section containing the crimped fin seal alone.
- The sample is then loaded into the jaws of a tensile testing machine, such that the crimped fin seal is situated between the jaws.
- A standard tensile assessment of the seal is then under taken and the results reported as grams/50mm.
- The wet crimp test is identical to the above except that once loaded into the jaws of the tensile tester the sample is sprayed lightly with a mist of water at ambient temperature.

[0062] The results are shown in Table 5.

Wet Crimp Data Table No. 5

[0063]

Typical Crimp Tensile Range (g/50mm)				
	Ex 1	Ex 2	Ex 3	Ex 4
Crimp Type	NHSTB	Latex Product	Latex Product	Microwave
Dry	125-200	160-242	110-165	123-300
Wet	9-13	20-36	16-21	17-25

Test 6 - Hot Water On Cup Brew

[0064] Herbal teas are of high bulk for a given grammage. The amount of tea dosed to herbal tea is still typically 1.5g-2.0g however the tea expands significantly during brewing and contains significant volumes of both ambient atmosphere and gases produced during the brewing process. The effect of this is to put an increased strain on the crimped fin seal, which with standard paper grades causing a rupturing of this seam.

[0065] To assess comparatively the differences between infuser tissues the following test regime has been adopted and is outlined as follows:

- Tea bags are manufactured without tea being dosed to the individual bags.
- 2 grams of peppermint tea is dosed between the two chambers and the top enclosed as standard with a steel staple.
- The bags are placed in a 500ml b grade laboratory beaker
- 200 ml of boiling domestic fresh water is poured on to the bag to determine if the bag:
    - Inflates (Balloons)
    - The crimped fin seal ruptures, as defined by tea leaves in the brew liquor.
- The test is normally the result of 5 replicates and is reported as a percentage of the total tested.

[0066] The results are shown in Table 6

Hot Water On Cup Brew Test Table 6

[0067]

	Ex 1	Ex 2	Ex 3	Ex 4	Ex 5
Pour on Test	Typical NHSTB	Latex Product US	Latex Product EU	Microwave HSTB	Microwave HSTB
Ballooning	100%	20%	30%	100%	100%
Open on Inspection	0%	20%	20%	5%	5%
Burst	90%	10%	15%	5%	0%

Claims

1. A beverage infusion package formed of porous, fibrous cellulsoic material and having a closure seam produced by a mechanical compression action without heat sealing, said porous material containsing thermoplastic fibres which are amorphous or are only partially crystalline **characterised in that** the thermoplastic fibres are present as a fused or thermally bonded network.

2. A package as claimed in claim 1 wherein the thermoplastic has a crystallinity of less then 40%, preferably 10% to 20%.

3. A package as claimed in claim 1 or 2 wherein the thermoplastic is selected from polypropylene, polyester, polyamide and high density polyethylene.

4. A package as claimed in claim 3 wherein the thermoplastic is polypropylene.

5. A package as claimed any one of claims 1 to 4 wherein the fibrous material comprises 5 to 30% by weight of the thermoplastic fibres.

6. A package as claimed in claim 5 wherein the porous fibrous material comprises 10 to 30% by weight of thermoplastic fibres.

7. A package as claimed in claim 6 wherein the porous fibrous material comprises 15% to 25% by weight of the thermoplastic fibres.

8. A package as claimed in any one of claims 1 to 7 wherein the thermoplastic fibres have a thickness in the range 0.55 to 6.7 decitex (0.5 to 6.0 denier).

9. A package as claimed in claim 8 wherein the thermoplastic fibres have a thickness in the range 2.2 to 4.4 decitex (2 to 4 denier).

10. A package as claimed in any one of claims 1 to 8 wherein the porous fibrous material is hydrophilic.

11. A package as claimed in claim 9 wherein the porous fibrous material has a water climb value of less than 70 seconds as measured by the time taken for water to rise 2.54 cm (1 inch) up that material.

12. A package as claimed in claim 11 wherein the porous fibrous material has a water climb value of 20 to 40 seconds.

13. A package as claimed in any one of claims 1 to 12 wherein the porous fibrous material has been treated with poly (vinyl alcohol) having a degree of hydrolysis of at least 60%.

14. A package as claimed in claim 13 wherein the poly(vinyl alcohol) has a degree of hydrolysis of at least 80%.

15. A package as claimed in claim 14 wherein the poly(vinyl alcohol) has a degree of hydrolysis of 95% to 99%.

16. A package as claimed in any one of claims 1 to 15 wherein the porous fibrous material has a basis weight of 10 to 30 g m^{-2}.

17. A package as claimed in any one of claims 1 to 16 wherein the mechanically formed seam has been formed by folding over together adjacent edges of the porous material and applying a mechanical compressive force to the folded over edges.

18. A package as claimed in any one of claims 1 to 17 wherein the seam is a crimped seam.

19. A package as claimed in any one of claims 1 to 18 which is of the double-chamber type.

20. A package as claimed in any one of claims 1 to 19 which is a tea bag.

21. A porous fibrous material having a basis weight of 10 to 30 g m^{-2} and being comprised of a single, wet-laid layer of an admixture of cellulosic and thermoplastic fibres which are amorphous or only partially crystalline in that the thermoplastic fibres are present as a fused or thermally bonded network.

22. A material as claimed in claim 21 wherein the thermoplastic has a crystallinity of less then 40%.

23. A material as claimed in claim 21 or 22 wherein the thermoplastic is selected from polypropylene, polyester, polyamide and high density polyethylene.

24. A material as claimed in claim 23 wherein the thermoplastic is polypropylene.

25. A material as claimed any one of claims 21 to 24 wherein the fibrous material comprises 5 to 30% by weight of the thermoplastic fibres.

26. A material as claimed in claim 25 wherein the porous fibrous material comprises 10 to 30% by weight of thermoplastic fibres.

27. A material as claimed in claim 26 wherein the porous fibrous material comprises 15% to 25% by weight of the thermoplastic fibres.

28. A material as claimed in any one of claims 21 to 27 wherein the thermoplastic fibres have a thickness in the range 0.55 to 6.7 decitex (0.5 to 6.0 denier).

29. A material as claimed in claim 28 wherein the thermoplastic fibres have a thickness in the range 2.2 to 4.4 decitex (2 to 4 denier).

30. A material as claimed in any one of claims 21 to 29 wherein the porous fibrous material is hydrophilic.

31. A material as claimed in claim 30 wherein the porous fibrous material has a water climb value of less than 70 seconds as measured by the time taken for water to rise 2.54 cm (1 inch) up that material.

32. A material as claimed in claim 31 wherein the porous fibrous material has a water climb value of 20 to 40 seconds.

33. A material as claimed in any one of claims 21 to 32 wherein the porous fibrous material has been treated with poly (vinyl alcohol) having a degree of hydrolysis of at least 60%.

34. A material as claimed in claim 33 wherein the poly(vinyl alcohol) has a degree of hydrolysis of at least 80%.

35. A material as claimed in claim 34 wherein the poly(vinyl alcohol) has a degree of hydrolysis of 95% to 99%.

Patentansprüche

1. Getränkeaufgussbeutel, welcher von einem porösen, faserstoffartigen, zellulosischen Material gebildet wird und welcher einen durch eine mechanische Kompressionseinwirkung ohne Wärmeversiegelung erzeugten Schließfalz

aufweist, wobei das besagte poröse Material thermoplastische Fasern enthält, welche amorph sind oder welche nur teilweise kristallin sind, **dadurch gekennzeichnet, dass** die thermoplastischen Fasern als ein gesohmolzenes oder als ein thermisch gebundenes Netzwerk vorliegen.

2. Beutel gemäß Anspruch 1, bei welchem das thermoplastische Material eine Kristallinität von weniger als 40%, vorzugsweise von 10% bis 20 % aufweist.

3. Beutel gemäß Anspruch 1 oder 2, bei welchem das thermoplastische Material ausgewählt wird unter Polypropylen, Polyester, Polyamid und Polyethylen mit hoher Dichte.

4. Beutel gemäß Anspruch 3, bei welchem das thermoplastische Material aus Polypropylen besteht.

5. Beutel gemäß irgendeinem der Ansprüche 1 bis 4, bei welchem das faserstoffartige Material von 5 bis 30 Gewichtsprozent der thermoplastischen Fasern umfasst.

6. Beutel gemäß Anspruch 5, bei welchem das poröse, faserstoffartige Material von 10 bis 30 Gewichtsprozent der thermoplastischen Fasern umfasst.

7. Beutel gemäß Anspruch 6, bei welchem das poröse, faserstoffartige Material von 15 bis 25 Gewichtsprozent der thermoplastischen Fasern umfasst.

8. Beutel gemäß irgendeinem der Ansprüche 1 bis 7, bei welchem die thermoplastischen Fasern eine Dicke in dem Bereich von 0,55 bis 6,7 decitex (0,5 bis 6,0 Denier) aufweisen.

9. Beutel gemäß Anspruch 8, bei welchem die thermoplastischen Fasern eine Dicke in dem Bereich von 2,2 bis 4,4 decitex (2 bis 4 Denier) aufweisen.

10. Beutel gemäß irgendeinem der Ansprüche 1 bis 8, bei welchem das poröse, faserstoffartige Material hydrophil ist.

11. Beutel gemäß Anspruch 9, bei welchem das poröse, faserstoffartige Material einen Wassersteigwert von weniger als 70 Sekunden aufweist, gemessen durch die von dem Wasser benötigte Zeit um 2,54 cm (1 Zoll) bis zu dem Material hoch zu steigen.

12. Beutel gemäß Anspruch 11, bei welchem das poröse, faserstoffartige Material einen Wassersteigwert von 20 bis 40 Sekunden aufweist.

13. Beutel gemäß irgendeinen der Ansprüche 1 bis 12, bei welchem das poröse, faserstoffartige Material mit Poly(vinyl) alkohol behandelt worden ist, welcher einen Hydrolysegrad von mindestens 60 % aufweist.

14. Beutel gemäß Anspruch 13, bei welchem der Poly(vinyl)alkohol einen Hydrolysegrad von mindestens 80 % aufweist.

15. Beutel gemäß Anspruch 14, bei welchem der Poly(vinyl)alkohol einen Hydrolysegrad von 95 bis 99 % aufweist.

16. Beutel gemäß irgendeinem der Ansprüche 1 bis 15, bei welchem des poröse, faserstoffartige Material ein Basisgewicht von 10 bis 30 g m^{-2} aufweist.

17. Beutel gemäß irgendeinem der Ansprüche 1 bis 16, bei welchem der mechanisch erzeugte Falz gebildet worden ist durch ein gemeinsames Umklappen von aneinander grenzenden Kanten des porösen Materials und durch Anlegen einer mechanischen komprimierenden Kraft auf die umgeklappten Kanten.

18. Beutel gemäB irgendeinem der Ansprüche 1 bis 17, bei welchem der Falz ein gekränselter Falz ist.

19. Beutel gemäß irgendeinem der Ansprüche 1 bis 18, welcher von dem Doppelkammertypus ist.

20. Beutel gemäß irgendeinem der Ansprüche 1 bis 19, welcher ein Teesäckehen ist.

21. Poröses, faserstoffartiges Material, welches ein Basisgewicht von 10 bis 30 g m^{-2} aufweist und welches aus einer einzigen, nassveriegten Schicht einer Mischung aus zellulosischen und thermoplastischen Fasern besteht, welche

amorph oder nur teilweise kristallin sind, **dadurch gekennzeichnet, dass** die thermoplastischen Fasern in einem geschmolzenen oder in einem thermisch gebundenen Netzwerk vorliegen.

22. Material gemäß Anspruch 21, bei welchem das thermoplastische Material eine Kristallinität von weniger als 40 % aufweist.

23. Material gemäß Anspruch 21 oder 22, bei welchem das thermoplastische Material ausgewählt wird unter Polypropylen, Polyester, Polyamid und Polyethylen mit hoher Dichte.

24. Material gemäß Anspruch 23, bei welchem das thermoplastische Material aus Polypropylen besteht.

25. Material gemäß irgendeinem der Ansprüche 21 bis 24, bei welchem das faserstoffartige Material von 5 bis 30 Gewichtsprozent der thermoplastischen Fasern umfasst.

26. Material gemäß Anspruch 25, bei welchem das poröse, faserstoffartige Material von 10 bis 30 Gewichtsprozent der thermoplastischen Fasern umfasst.

27. Material gemäß Anspruch 26, bei welchem das poröse, faserstoffartige Material von 15 bis 25 Gewichtsprozent der thermoplastischen Fasern umfasst.

28. Material gemäß irgendeinem der Ansprüche 21 bis 27, bei welchem die thermoplastischen Fasern eine Dicke in dem Bereich von 0,55 bis 6,7 decitex (0,5 bis 6,0 Denier) aufweisen.

29. Material gemäß Anspruch 28, bei welchem die thermoplastichen Fasern eine Dicke in dem Bereich von 2,2 bis 4,4 decitex (2 bis 4 Denier) aufweisen.

30. Material gemäß irgendeinem der Ansprüche 21 bis 29, bei welchem das poröse, faserstoffartige Material hydrophil ist.

31. Material gemäß Anspruch 30, bei welchem das poröse, faserstoffartige Material einen Wassersteigwert von weniger als 70 Sekunden aufweist, gemessen durch die von dem Wasser benötigte Zeit um 2,54 cm (1 Zoll) bis zu dem Material hoch zu steigen.

32. Material gemäß Anspruch 31, bei welchem das poröse, faserstoffartige Material einen Wassersteigwert von 20 bis 40 Sekunden aufweist.

33. Material gemäß irgendeinen der Ansprüche 21 bis 32, bei welchem das poröse, faserstoffartige Material mit Poly (vinyl)alkohol behandelt worden ist, welcher einem Hydrolysegrad von mindestens 60 % aufweist.

34. Material gemäß Anspruch 33, bei welchem der Poly(vinyl)alkohol einen Hydrolysegrad von mindestens 80 % aufweist.

35. Material gemäß Anspruch 34, bei welchem der Poly(vinyl)alkohol einem Hydrolysegrad von 95 bis 99 % aufweist.

Revendications

1. Conditionnement d'infusion formé d'un matériau cellulosique fibreux, poreux et possédant un joint de fermeture produit par une action de compression mécanique sans thermoscellage, ledit matériau poreux contenant des fibres thermoplastiques qui sont amorphes ou qui ne sont que partiellement cristallines **caractérisé en ce que** les :fibres thermoplastiques sont présentes sous forme d'un réseau fondu ou thermiquement lié.

2. Conditionnement suivant la revendication 1, dans lequel le thermoplastique présente une cristallinité de moins de 40%, de préférence de 10% à 20%.

3. Conditionnement suivant la revendication 1 ou 2, dans lequel le thermoplastique est choisi parmi un polypropylène, un polyester, un polyamide et un polyéthylène haute densité.

4. Conditionnement suivant la revendication 3, dans lequel la thermoplastique est ua polypropylène.

5. Conditionnement suivant l'une quelconque des revendications 1 à 4, dans lequel le matériau fibreux comprend de 5 à 30% en poids des fibres thermoplastiques.

6. Conditionnement suivant la revendication 5, dans lequel le matériau fibreux poreux comprend de 10 à 30% en poids des fibres thermoplastiques.

7. Conditionnement suivant la revendication 6, dans lequel le matériau fibreux poreux comprend de 15% à 25% en poids des fibres thermoplastiques.

8. Conditionnement suivant l'une quelconque des revendications 1 à 7, dans lequel les fibres thermoplastiques possèdent une épaisseur dans l'intervalle de 0,55 à 6,7 décitex (de 0,5 à 6,0 deniers).

9. Conditionnement suivant la revendication 8, dans lequel les fibres thermoplastiques possèdent une épaisseur dans l'intervalle de 2,2 à 4,4 décitex (de 2 à 4 deniers).

10. Conditionnement suivant l'une quelconque des revendications 1 à 8, dans lequel le matériau fibreux poreux est hydrophile.

11. Conditionnement suivant la revendication 9, dans lequel le matériau fibreux poreux possède une valeur de montée d'eau de moins de 70 secondes, telle que mesurée par le temps pris pour que de l'eau s'élève à 2,54 cm (1 pouce) dans ce matériau.

12. Conditionnement suivant la revendication 11, dans lequel le matériau fibreux poreux possède une voleur de montée d'eau de 20 à 40 secondes.

13. Conditionnement suivant l'une quelconque des revendications 1 à 12, dans lequel le matériau fibreux poreux a été traité avec un poly(vinylalcool) présentant un degré d'hydrolyse d'au moins 60%.

14. Conditionnement suivant la revendication 13, dans lequel le poly(vinylalcool) présente un degré d'hydrolyse d'an moins 80%.

15. Conditionnement suivant la revendication 14, dans lequel le poly(vinylalcool) présente un degré d'hydrolyse de 95% à 99%.

16. Conditionnement suivant l'une quelconque des revendicaaons 1 à 15, dans lequel le matériau fibreux poreux possède une masse surfacique de 10 à 30 gm^{-2}.

17. Conditionnement suivant l'une quelconque des revendications 1 à 16, dans lequel le joint formé mécaniquement a été formé en repliant ensemble des bords adjacents du matériau poreux et en appliquant une force de compression mécanique sur les bords repliés.

18. Conditionnement suivant l'une quelconque des revendications 1 à 17, dans lequel le joint est un joint serti.

19. Conditionnement suivant l'une quelconque des revendications 1 à 18, qui est du type double chambre.

20. Conditionnement suivant l'une quelconque des revendications 1 à 19, qui est un sac de thé.

21. Matériau fibreux poreux possédant une masse surfacique de 10 à 30 g m^{-2} et qui est composé d'une seule couche, déposée par voie humide d'un mélange de matériau cellulosique et de fibres thermoplastiques qui sont amorphes ou qui ne sont que partiellement cristallines **caractérisé en ce que** les fibres thermoplastiques sont présentes sous forme d'un réseau fondu on thermiquement lié.

22. Matériau suivant la revendication 21, dans lequel le thermoplastique présente une cristallinité de moins de 40%.

23. Matériau. suivant la revendication 21 ou 22, dans lequel le thermoplastique est choisi parmi un polypropylène, un polyester, un polyamide et un polyéthylène haute densité.

24. Matériau suivant la revendication 23, dans lequel le thermoplastique est un polypropylène des revendications 21 à

24, dans, lequel le

25. Matériau suivant l'une quelconque des revendications 21 à 24, dans lequel le matériau fibreux comprend de 5 à 30% en poids des fibres thermoplastiques.

26. Matériau suivant la revendication 25, dans lequel le matériau fibreux poreux comprend de 10 à 30% en poids des fibres thermoplastiques.

27. Matériau suivant la revendication 26, dans lequel le matériau fibreux poreux comprend de 15% à 25% en poids des fibres thermoplastiques.

28. Matériau suivant l'une quelconque des revendications 21 à 27, dans lequel les fibres thermoplastiques possèdent une épaisseur dans l'intervalle de 0,55 à 6,7 décitex (de 0,5 à 6,0 deniers).

29. Matériau suivant la revendication 28, dans lequel les fibres thermoplastiques possèdent une épaisseur dans l'intervalle de 2,2 à 4,4 décitex (de 2 à 4 deniers).

30. Matériau suivant l'une quelconque des revendications 21 à 29, dans lequel le matériau fibreux poreux est hydrophile.

31. Matériau suivant la revendication 30, dans lequel le matériau fibreux poreux possède une valeur de montée d'eau de moins de 70 secondes, telle que mesurée par le temps pris pour que de l'eau s'éléve à 2,54 cm (1 pouce) dans ce matériau.

32. Matériau suivant la revendication 31, dans lequel le matériau fibreux poreux possède une valeur de montée d'eau de 20 à 40 secondes.

33. Matériau suivant l'une quelconque des revendications 21 à 32, dans lequel le matériau fibreux poreux a été traité avec un poly(vinylalcool) présentant un degré d'hydrolyse d'an moins 60%.

34. Matériau suivant la revendication 33, dans lequel le poly(vinylalcool) présente un degré d'hydrolyse d' an moins 80%.

35. Matériau suivant la revendication 34, dans lequel le poly(vinylalcool) présente un degré d'hydrolyse de 95% à 99%.