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(54) **FILLING MATERIAL FOR WASHABLE PILLOWS**

(57) This invention relates to a filling material for improved form-keeping appearance after washing for a washable pillow with a height regaining value of -10% to +30% after 5 washing and drying cycles, characterized by a water retention value WRV of between 6 and 50%, as well as to its use and to a method for its manufacture.

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Description

[0001] This invention relates to a filling material for improved form-keeping appearance after washing for a washable pillow with a height regaining value of -10% to +30% after 5 washing and drying cycles, characterized by a water retention value WRV of between 6 and 50%, as well as to its use and to a method for its manufacture.

Prior Art

[0002] Due to their simplicity, blow-fill technologies are the most common technologies for production of pillow fillings. However, carding technology leads to better organization of fibers / the fiber blend, by creating a batt that is rolled or folded, and, then, stuffed inside of the pillow cover. As a consequence, pillow bulkiness is improved, which means that such a pillow can obtain a pre-defined height with less material than that, made through common blow-fill technique. Additionally, the productivity of carding technology is higher - more pillows can be produced per defined time unit.

[0003] Pillow care remains a big challenge, since pillow fillings rarely keep their form after exposure to mechanical strain, high temperature and water. When a consumer buys a product, it, usually, has a uniform surface that is expected to be kept also after repeated washing and drying. Non-uniform and wavy pillow surface can be an indicator of poor quality. Pillow fillings from 100% polyester fibers are for price and performance - especially resilience - reasons the most common filling materials for pillows in the market. But even these pillows face several challenges, with regard to appearance of their form after washing and drying. Additionally, polyester fiber usage is questioned, due to its lack of biodegradability, since fiber particles can be found even inside of marine animals.

[0004] Rolled or folded carded fillings made mainly from 100% synthetic fibers face challenges related to form-keeping after care (washing and drying). Washability of pillows is required by both, retail and consumer, for hygienic reasons. Additionally, fillings made from 100% synthetic fibers are not biodegradable. Fillings from natural materials, on the other hand, are biodegradable, but are not common, due to their poor performance related to bulk (height loss after washing and drying).

Problem

[0005] In view of this prior art the problem to be solved consisted in providing a pillow filling which overcomes the disadvantages described above, in particular showing improved form-keeping appearance after washing.

Description

[0006] It is an object of the present invention to provide a filling material for improved form-keeping appearance after washing for a washable pillow with a height regaining value of -10% to +30% after 5 washing and drying cycles, characterized by a water retention value WRV of between 6 and 50%. "Washable" in the context of this invention means that it shows negligible changes after washing at 60°C and drying at 85°C under household conditions according to the standard DIN EN ISO 6330. Preferably the water retention value is between 12 and 42 %. In a preferred embodiment of the invention the filling material is a fibrous filling material.

[0007] In a preferred embodiment of the invention the filling material contains man-made cellulosic fibers and remainder fibers.

[0008] Such a filling material may contain between 10 and 70 weight-% of man-made cellulosic fibers, preferably between 20 and 60 weight-% and most preferably between 40 and 55 weight-%, intimately blended with the remainder fibers. In many cases even 10-20% are already sufficient for a satisfying moisture management.

[0009] In a preferred embodiment of the invention the height regaining value is between 0 and 25%, preferably between 4 and 21%, and most preferably between 10 and 21%.

[0010] In a particularly preferred embodiment of the invention the filling material is a carded and thereafter rolled or folded filling material. Carding, rolling and folding in principle are well-known and commercially applied technologies in the industry. In particular rolling and folding are both well-known accumulation methods to achieve a desired thickness of the pillow.

[0011] The man-made cellulosic fibers may be of one or more of the fiber types of the group containing viscose, modal and lyocell fibers, and preferably are lyocell fibers. In a particularly preferred embodiment of the invention the remainder fibers in the intimate blend are synthetic fibers, preferably polyester fibers.

[0012] Another embodiment of the invention is a washable pillow with improved form-keeping appearance after washing, which contains a filling according to the invention.

[0013] Even another embodiment of the invention is the use of the inventive filling material for the manufacture of washable pillows. Pillows with a filling according to the invention show increased sleep comfort, compared to pillows with state of the art fillings. In particular this inventive use consists in a manufacturing process of a washable pillow

containing a filling material, which process contains the steps of

a. Providing man-made cellulosic fibers and synthetic polymer fibers,
b. Fiber opening and blending the fibers of both types (a process step which is also named "intimate blending"),
c. Carding the fibers of both types to obtain a fleece,
d. Optional cross-lapping,
e. Rolling or folding the fleece of step c. or d. to the required weight and dimensions,
f. Cutting,
g. Stuffing into the shell,
h. Closing the shell.

[0014] The inventive manufacturing method can only be described as a method for manufacturing the pillow, not only the filling, because everywhere in the industry the fillings are made in line with the completion of the pillow, i.e. the final steps of stuffing the filling into the shell and closing the shell. The sole manufacture of a filling, i.e. without these two final steps, may be theoretically possible, but would not be relevant. This is to say that all embodiments of the invention described herein are following the same inventive concept and therefore fulfill the requirement of uniformity.

[0015] The carding process may be a horizontal or vertical carding process. Both carding processes are well-known in the industry; suitable basic bedding production equipment is commercially available e.g. from Masias Maquinaria, Spain.

[0016] Cross-lapping is a well-known and established method for the production of filling materials. In the process according to the invention it may be done if required to obtain fillings with specific properties.

[0017] Closing the stuffed shell could be done be sewing, by a zipper or by buttons attached to the shell in a separate step before stuffing.

[0018] In a preferred embodiment of the invention the man-made cellulosic fibers are provided to the card in a share of between 10 and 70 weight-% of man-made cellulosic fibers, preferably between 30 and 60 weight-% and most preferably between 40 and 55 weight-%.

[0019] According to the invention the man-made cellulosic fibers may be of one or more of the fiber types of the group containing viscose, modal and lyocell fibers, and preferably are lyocell fibers.

[0020] The invention will now be illustrated by examples. These examples are not limiting the scope of the invention in any way. The invention includes also any other embodiments which are based on the same inventive concept.

Examples

Materials

[0021] All pillow samples had the same size (50 x 60 cm), the same filling weight (610 g) and used the same commercially available shell fabric (plain weave, 125 g/m^2, 55% lyocell / 45% cotton). Filling contained lyocell and a synthetic component (Polyethylene terephthalate (PET) or Polytrimethylene terephthalate (PTT)). For construction details see Table 1.

[0022] Pillows with carded fillings were produced on a commercial state-of-the-art carded pillow line at equal settings. The production line was composed of a carding machine, a cross-lapping machine, cutting knives, rolling and weighing devices. Filling was manually stuffed into pillow cases. Pillows were rolled before they were wrapped into a packaging.

[0023] A typical pillow with a filling from 60% downs and 40% feathers served as a benchmark. The filling with a mass of 610 g was manually refilled in a pillow case (50 x 60 cm). The same type of shell fabric as for other pillow samples was used.

Table 1: List with produced pillow samples

Pillow number	Filling fibers[a]		Blending ratio (%)		Production technique of the filling
	Lyocell type	Blending partner	Lyocell	Blending partner	
1	CLY 6.24 dtex	PET 11.93 dtex	50	50	Carding
2	CLY 6.24 dtex	PET 11.93 dtex	30	70	Carding
3	CLY 1.71 dtex	PET 11.93 dtex	50	50	Carding
4	CLY 1.71 dtex	PET 11.93 dtex	30	70	Carding
5	/	PET 11.93 dtex	-	100	Carding
6	CLY 6.24 dtex	PTT 7.23 dtex	50	50	Carding
7	CLY 6.24 dtex	PTT 7.23 dtex	30	70	Carding
8	/	60% down/ 40% feather	-	100	Blowing

Methods

[0024] Unless indicated otherwise, all samples were pre-conditioned at 20±2 °C and 65±2% relative air humidity for a minimum of 24 h prior testing.

Method for determination of fiber titer

[0025] Fiber titer was measured according to the "Terminology of man-made fibres", Edition 2009, published by BISFA.

Method for measurement of water retention value

[0026] Water retention value ($WRV_{filling}$) was measured on 4 specimens / filling type according to the standard DIN 53814.

Method for washing and drying of pillow samples

[0027] All pillow samples were exposed to five subsequent washing and drying cycles following method DIN EN ISO 6330. The horizontal drum of the washing machine with front loading was loaded with 3 pillows. Used was the detergent No. 3 (ECE), the washing machine type Electrolux Wascator FOM71 CLS, and following settings: 60°C, 67 min/cycle. The utilized tumble dryer of a rotary tumble type was Electrolux T3190 and it was also loaded with three pillows that were dried for 30 min/cycle at 85°C.

Method for determination of height regaining value

[0028] The pillow heights were measured with a ruler on a tripod as the distance between the lowest and the highest point on the pillow. Height regaining value (Δh_p) was determined as the change in heights of unwashed (h_{p0}) and washed (h_{p5}) pillow according to the following equation:

$$\Delta h_p = \frac{h_{p5} - h_{p0}}{h_{p0}} \times 100$$

Δh_p is a height regaining value (%),
h_{p0} is a height of conditioned pillow before washing and drying (cm), and
h_{p5} is a pillow height of conditioned pillow after five washing and drying cycles (cm).

Assessment of the form-keeping properties of the pillow filling after 5 washing and drying cycles

[0029] Form-keeping properties of the pillow fillings were evaluated after 5 washing and drying cycles. Pillows were

placed in the same room for minimum 48 h prior evaluation and then opened for observation of the filling material by evaluators. Evaluators were three persons with 27, 11 and 6 years of working experience in textile testing laboratory. The score of the form-keeping evaluations was measured in number of points and was calculated according to the criteria in Table 2. Lengths of empty corners (l_{ec}) were measured before the fabric was removed from the filling. An empty corner indicates the shrinkage or deviation of the filling from the original form. It was measured on all 4 corners as the shortest distance from the corner point to the first point on the filling. Then an average corner ($\overline{l_{ec}}$) was calculated for each pillow. Upon removal of shell fabric, uniformity of the filling surface was evaluated according to the criteria in Table 2 and average length of the crack ($\overline{l_{cr}}$) in the filling material calculated (for that three largest cracks in the filling were identified, their lengths measured and their average calculated).

Table 2: Characteristics and criteria for evaluation of form-keeping properties of the filling material

Characteristics	Criteria	Score (points)
Uniformity of filling surface	Negligible changes	4
	Moderate changes: visible some irregularities on the filling surface	2
	Severe changes after washing and drying process: irregular, wavy surface	0
Average length of empty corner, l_{ec} (cm)	≤ 5	2
	5.1-6.9	1
	≥ 7	0
Average length of crack, l_{cr} (cm)	< 25	2
	25-40	1
	> 40	0

Results

[0030] Lyocell is a cellulosic fiber and shows high water retention values, i.e. high water absorption, while both synthetic fibers (PET and PTT) show very low water retention values (Table 3). It is well-known that cellulosic fibers start to swell while absorbing the water (lyocell much more than cotton), therefore it could be expected that the addition of lyocell lowers the form-keeping ability of the pillow filling, but for produced and compared samples surprisingly the opposite occurrence is the case (Table 4 and Figure 1).

[0031] A big concern with regard to pillows filled with natural fibers or fibers from natural origin is the height regaining value. Pillows containing these fibers have been considered as flat pillows, as pillows that lose their bulk after washing and drying. Last column in Table 3 compared the height regaining values of pillows (Δh_{pillow}) after 5 subsequent washing and drying cycles: Surprisingly in contrast to our expectations none of the lyocell containing pillows presented in this table lost its height - in contrary, in majority of the cases even height increase was observed. The down/feather filled pillow showed the poorest performance.

Table 3: Water retention values of filling fibers, pillow filling, and height regaining value of the pillow

Pillow number	Filling fibers[a]		Blending ratio (%)		$WRV_{filling}$[b] (%)	Δh_{pillow}[c] (%)
	Lyocell type	Blending partner	Lyocell	Blending partner		
1	CLY 6.24 dtex	PET 11.93 dtex	50	50	33.15	14.7
2	CLY 6.24 dtex	PET 11.93 dtex	30	70	21.33	10.0
3	CLY 1.71 dtex	PET 11.93 dtex	50	50	30.25	10.4
4	CLY 1.71 dtex	PET 11.93 dtex	30	70	19.59	0
5	/	PET 11.93 dtex	-	100	3.6	14.2
6	CLY 6.24 dtex	PTT 7.23 dtex	50	50	33.6	4.7
7	CLY 6.24 dtex	PTT 7.23 dtex	30	70	21.96	20.8
8	/	60% down/ 40% feather	-	100	37.1	-21.0

[a]Measured according to the BISFA Terminology of man-made fibres (Edition 2009)
[b]Measured according to the standard DIN 53814
[c]Height regaining value of the pillow after 5 washing and drying cycles

[0032] Shell fabric can hide some irregularities on the surface of the filling, but it cannot hide big deformations. Table 4 and Figure 1 show the score of the assessment, where form-keeping properties of pillow fillings were evaluated. Higher share of lyocell (50%) in a blend with the synthetic component leads to better form-keeping properties of the pillow fillings after washing and drying than lower share of lyocell (30%). The worst performance showed the sample 5 from 100% PET.

[0033] Washing and drying of carded filling from 100% PET seems to lead to uncontrolled movement of rolled/folded fleece layers.

Table 4: Score of the assessment - form-keeping properties of the filling

Pillow number	Uniformity of the filling surface (points)	Score $\overline{l_{ec}}$ (points)	Score $\overline{l_{cr}}$ (points)	Score of the form-keeping assessment of the filling (points)
1	4	2	1	7
2	0	1	1	2
3	4	1	1	6
4	0	1	2	3
5	0	1	0	1
6	4	1	1	6
7	2	0	1	3

Claims

1. Filling material for improved form-keeping appearance after washing for a washable pillow with a height regaining value of -10% to +30% after 5 washing and drying cycles, **characterized by** a water retention value WRV of between 6 and 50%.

2. Filling material according to claim 1, wherein the filling material contains man-made cellulosic fibers and remainder fibers.

3. Filling material according to claim 2, wherein the filling material contains between 10 and 70 weight-% of man-made cellulosic fibers, preferably between 20 and 60 weight-% and most preferably between 40 and 55 weight-%, intimately blended with the remainder fibers.

4. Filling material according to claim 1, wherein the height regaining value is between 0 and 25%, preferably between 4 and 21%, and most preferably between 10 and 21%.

5. Filling material according to claim 1, which is a carded and thereafter rolled or folded filling material.

6. Filling material according to claim 2, wherein the man-made cellulosic fibers are of one or more of the fiber types of the group containing viscose, modal and lyocell fibers, and preferably are lyocell fibers.

7. Filling material according to claim 2, wherein the remainder fibers in the intimate blend are synthetic fibers, preferably polyester fibers.

8. Use of a filling material according to claim 1 for the manufacture of washable pillows.

9. Washable pillow with improved form-keeping appearance after washing, **characterized in that** it contains a filling according to claim 1.

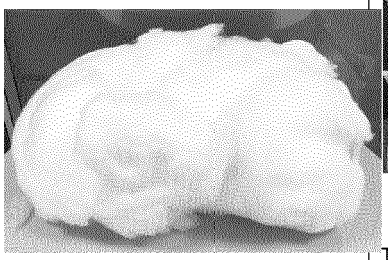
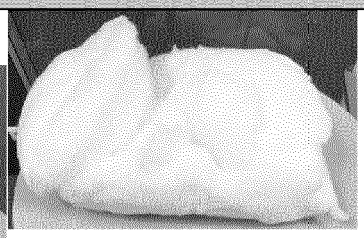
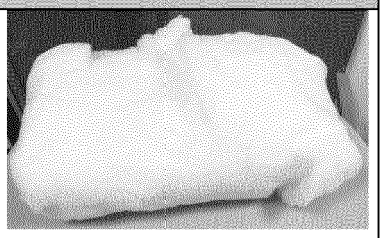
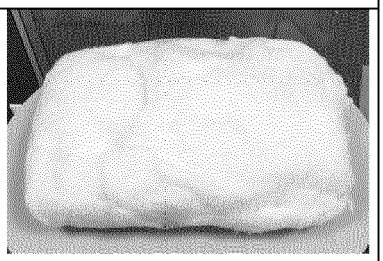
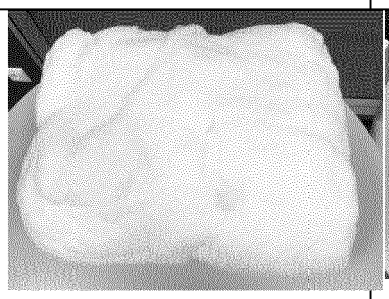
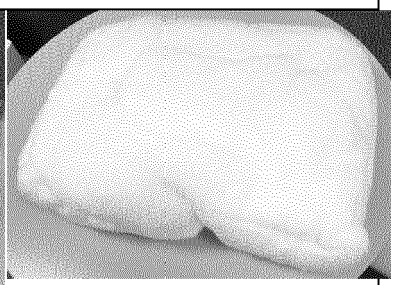
10. Manufacturing process of a washable pillow containing a filling material, **characterized in that** it contains the steps of

    a. Providing man-made cellulosic fibers and synthetic polymer fibers,
    b. Fiber opening and blending the fibers of both types,
    c. Carding the fibers of both types to obtain a fleece,
    d. Optional cross-lapping,
    e. Rolling or folding the fleece of step c. or d. to the required weight and dimensions,
    f. Cutting,
    g. Stuffing into the shell,
    h. Closing the shell.

11. Process according to claim 10, wherein the man-made cellulosic fibers are provided to the card in a share of between 10 and 70 weight-% of man-made cellulosic fibers, preferably between 30 and 60 weight-% and most preferably between 40 and 55 weight-%.

12. Process according to claim 10, wherein the man-made cellulosic fibers are of one or more of the fiber types of the group containing viscose, modal and lyocell fibers, and preferably are lyocell fibers.

Figure 1: Pictures of the filling material after five washing and drying cycles

100% synthetic component	70% synthetic component, 30% CLY	50% synthetic component, 50% CLY
 Pillow No. 5	 Pillow No. 2	 Pillow No. 1
	 Pillow No. 4	 Pillow No. 3
	 Pillow No. 7	 Pillow No. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 18 02 0135

DOCUMENTS CONSIDERED TO BE RELEVANT

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TECHNICAL FIELDS SEARCHED (IPC)

A47G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 October 2018	Beins, Ulrika

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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REFERENCES CITED IN THE DESCRIPTION

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