

Packaging paper with transparent zone, method for manufacturing packaging paper with transparent zone, and packaging comprising such packaging paper

Field of the invention

The invention relates to a packaging paper. The invention further relates to a cellulose packaging
5 comprising the packaging paper and to a method for manufacturing the packaging paper.

Background

Bag-like packagings which are provided with a window and further comprise paper are applied
inter alia for bread, baked goods, vegetables, meat and fruit. The window is generally transparent
10 and has for its object to allow customers and shop staff to see what is packaged in the bag-like
packaging. The window is typically formed by a strip which is adhered on both sides to the paper
and is manufactured from a plastic material such as polypropylene (PP) or polyethylene
terephthalate (PET), or optionally another polyester.

15 A method for making such a packaging and a resulting packaging are known from EP1894714B1
and from EP3095723A1. Such packagings with windows are however difficult to manufacture in
practice. A roll of paper and a roll of plastic window material are thus typically needed for this
purpose. These rolls are unwound and an adhesive material is applied to at least one of the paper
and the window material. The window material is adhered to the paper using the adhesive material.

20 This manufacturing process is difficult to control because the window material has a tendency to
come loose during arranging of the window material. The production workers responsible during
the manufacturing process must be highly skilled in order to obviate this problem. This dependence
on highly skilled personnel is undesirable. The realized mutual connection is moreover of sub-
optimal quality. The window thus has a tendency to tear away from the paper. This is undesirable

25 in use of the packaging. The plastic window is further expensive compared to the paper. The
resulting packaging is therefore also expensive. From an ecological viewpoint with the aim of
sustainability, it is additionally the case that the resulting packaging is difficult or impossible to
recycle.

30 WO2020170226 describes a composite packaging manufactured from different recyclable
materials. The composite packaging described in WO2020170226 is an assembled packaging
constructed from different materials, particularly a recyclable base material and a recyclable
window material which is partially transparent and which is attached to the first recyclable base
material in order to form the window in the composite packaging. The manufacturing process of

the composite packaging of WO2020170226 is difficult to control because the window material has a tendency to come loose during arranging of the window material.

Summary of the invention

- 5 It is therefore an object of the invention to provide a packaging paper which can be manufactured in simple manner and more cheaply. It is a further object of the invention to provide a method for manufacturing such packaging paper and to provide a packaging with the packaging paper.

10 The invention provides for this purpose a packaging paper with a transparent zone, wherein the packaging paper and the transparent zone are made from one cellulose layer and wherein the transparent zone comprises a coating layer material applied to the packaging paper. The coating layer material comprises an oily compound, such as a paraffin or vegetable oil. A packaging paper which is at least partially translucent or transparent is provided in this way. Customers and shop staff can thus see what is packaged in a packaging made with the packaging paper. The use of a
15 plastic material is avoided in this way. Such packaging paper is more sustainable, cheaper and simpler to manufacture.

The transparent zone preferably extends at least partially in a longitudinal direction of the cellulose layer.
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The transparent zone preferably extends at least partially in a width direction of the cellulose layer.

The transparent zone preferably extends over the cellulose layer in the form of a strip. It will however be apparent to the skilled person that the transparent zone can take different forms.
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The transparent zone preferably has an opacity, measured according to ISO 2471, of between 1% and 35%, more preferably between 3% and 25%, most preferably between 3% and 15%.

30 The applied coating layer material preferably has a surface density of at least 1 g/m², more preferably a surface density lying between 2.5 and 6 g/m². It is noted that a predetermined quantity of coating layer material can be selected depending on properties, such as type, of the cellulose layer. In the case of a bleached cellulose layer, also referred to as white paper, about 8 g/m² of coating layer material can thus for instance be applied, or, according to a further example, about 10 g/m² can be applied in the case of brown paper. Further tests have shown that the applied coating
35 layer material has a surface density lying between 2.5 and 15 g/m². Such predetermined quantities

of coating layer material or surface densities of the applied coating layer material are chosen such that the cellulose layer to which the coating layer material is applied is saturated.

5 The cellulose layer preferably has a surface density which is higher than 18 g/m², the cellulose layer preferably having a surface density which is at most 50 g/m², more preferably at most 35 g/m². Such a cellulose layer is relatively light-weight, which has the advantage that the packaging paper is easily transportable and is cheaper. Such a cellulose layer can furthermore be penetrated more uniformly by the coating layer material. The advantageous effect thereof is due to the lower fibre density of the cellulose layer with such a surface density or specific weight.

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It is preferred for a surface on at least a first side of the cellulose layer to have a surface roughness according to ISO 8791/2 (also referred to as Bendtsen Roughness method) of less than 220 ml/min, preferably less than 100 ml/min, more preferably less than 80 ml/min, and most preferably less than 40 ml/min. It is noted that the cellulose layer can have such a surface roughness on both the first and the second side. The surface roughness can differ on the first and the second side. The cellulose layer can further have a substantially uniform surface roughness on the first and second side. Such surface roughness corresponds with the smoothness of the paper. The inventors have surprisingly found that a smoother paper has a tendency to become more transparent with a smaller quantity of coating layer material. It is suspected that this effect is achieved in that the cellulose fibres in a smooth paper are aligned relatively similarly, causing the coating layer material to penetrate and impregnate the cellulose layer more uniformly.

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20 The coating layer material preferably coats the transparent zone substantially wholly. In other words, it is preferred for the whole surface of the transparent zone to comprise coating layer material. It is however also possible for the transparent zone to comprise parts without coating layer material.

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The cellulose layer is preferably a bleached cellulose layer.

30 The cellulose layer preferably comprises a mixture of long fibre and short fibre, with at least 40% long fibres, more preferably at least 50% long fibres, more preferably at least 70% long fibres. Such a cellulose layer has the advantage that it is resistant to tearing. The subsequently realized packaging is therefore stronger, for instance compared to a glassine paper. Such a cellulose layer further has the advantage that it can be produced in usual manner. The price of a cellulose layer with such a fibre composition can be produced considerably more inexpensively compared to glassine paper. The production of such a cellulose layer is moreover simpler, faster and more

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sustainable. According to one example, the cellulose layer can even comprise almost 100% long fibres. Such a cellulose layer is obtained by adding only long fibres during manufacture of the cellulose layer. In other words, no short fibres are added.

- 5 The coating layer material in the transparent zone is preferably applied to the packaging paper at a first temperature within a first temperature range, and hardened gradually at a second temperature within a second temperature range, such that the transparent zone is formed. The first temperature is here higher than the second temperature. An advantage hereof is based on the insight that, in known production processes, a coating layer material is cooled immediately and instantaneously with for instance a cooling roller, typically at a low temperature such as 5°C. The coating layer material on the cellulose layer is thus hardened very quickly. This allows for rapid further processing of the packaging paper. In known processes the coating layer material therefore does not always have time to penetrate further into the cellulose layer, and consequently hardens into a structure with a cloudy or opaque result due to the sudden temperature drop. The inventor has surprisingly found that, owing to the gradual hardening, the zone where the coating layer material has penetrated becomes transparent, also referred to as vitreous, and thus forms said transparent zone. The gradual hardening of the coating layer material allows the oily material to harden and thus form a path through the cellulose layer which is transparent to light. In this way the coating layer material appears to harden into a substantially vitreous structure. The transparency of the transparent zone is considerably improved in this way.

The coating layer material in the transparent zone is preferably exposed to the second temperature for a period of at least 0.1 second, preferably between 0.5 and 7 seconds, preferably at least 7 seconds. The second temperature can here vary within the second temperature range.

- 25 The transparent zone can preferably be obtained by applying at the position of the zone a predetermined quantity of coating layer material at the first temperature which lies within the first temperature range, and gradually hardening the applied predetermined quantity of coating layer material at the second temperature, this lying in the second temperature range, in order to form the transparent zone. An advantage hereof is based on the insight that, in known production processes, a coating layer material is cooled immediately with for instance a cooling roller, typically at a low temperature such as 5°C, in order to rapidly harden the coating layer material on the cellulose layer. This allows for rapid further processing of the packaging paper. In known processes the coating layer material therefore does not always have time to penetrate the cellulose layer, and consequently hardens into a structure with a cloudy or opaque result due to the sudden temperature drop. The inventor has

surprisingly found that, owing to the gradual hardening, the zone where the coating layer material has penetrated becomes transparent and thus forms said transparent zone. The gradual hardening of the coating layer material allows the oily material to harden and thus form a path through the cellulose layer which is transparent to light. It is suspected that the coating layer material hardens into a substantially vitreous structure in this way. The transparency of the transparent zone is improved in this way.

The cellulose layer with the predetermined quantity of coating layer material is preferably exposed to the second temperature range for a period of at least 0.1 second, preferably between 0.5 and 7 seconds, preferably at least 7 seconds.

The second temperature range preferably lies between 30°C and 120°C, preferably between 40°C and 110°C, more preferably between 50°C and 100°C. Such a temperature range enhances the viscosity of the applied coating layer material, whereby the coating layer material penetrates the cellulose layer in improved manner. The second temperature range is optional. It was therefore noted that, when the first temperature range is sufficiently warm, for instance about 150°C, the second temperature range has only a limited effect or no effect.

Application of the predetermined quantity of coating layer material preferably comprises the following steps of:

- providing a moving endless surface;
- taking up the predetermined quantity of coating layer material with the moving endless surface;
- bringing the moving endless surface into contact with the first side of the cellulose layer.

The second temperature range can preferably be provided by residual heat obtained by application of the coating layer material.

The first temperature range preferably lies between 70°C and 180°C, preferably between 80°C and 150°C, more preferably between 100°C and 120°C.

Advantages of the packaging paper apply mutatis mutandis to a cellulose packaging and to a method for manufacture thereof.

According to a second aspect, the invention provides a cellulose packaging comprising a packaging paper as described above. The zone preferably forms a window in the cellulose packaging.

According to a third aspect, the invention provides a method for manufacturing a packaging paper with a transparent zone, the method comprising of:

- providing a cellulose layer with a first side and a second side;
- 5 - applying at the position of a zone a predetermined quantity of coating layer material with a first temperature which lies within a first temperature range;
- gradually hardening the applied predetermined quantity of coating layer material at a second temperature which lies in a second temperature range in order to form the transparent zone.

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The second temperature range preferably lies between 30°C and 120°C, preferably between 40°C and 110°C, more preferably between 50°C and 100°C.

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The second temperature range can preferably be provided by residual heat obtained during application of the predetermined quantity of coating layer material.

The first temperature range preferably lies between 70°C and 180°C, preferably between 80°C and 150°C, more preferably between 100°C and 120°C.

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The transparent zone is preferably arranged extending at least partially over the cellulose layer, as seen in a longitudinal direction thereof.

The transparent zone is preferably arranged extending at least partially over the cellulose layer, as seen in a width direction thereof.

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The transparent zone is preferably applied in the form of a strip.

According to ISO 2471, an opacity of the transparent zone preferably lies between 1% and 35%, more preferably between 3% and 25%, most preferably between 5% and 15%.

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The predetermined quantity of coating layer material is preferably at least 1 g/m², more preferably corresponding to a surface density lying between 2.5 and 6 g/m².

- 5 The cellulose layer with the predetermined quantity of coating layer material is preferably exposed to the second temperature range for a period of at least 0.1 second, preferably between 0.5 and 7 seconds, preferably at least 7 seconds.

10 The cellulose layer preferably has a specific weight which is higher than 18 g/m², the cellulose layer preferably having a specific weight which is at most 50 g/m², more preferably at most 35 g/m².

15 It is preferred for a surface on at least the first side of the cellulose layer to have a surface roughness of less than 220 ml/min, more preferably less than 100 ml/min, still more preferably less than 80 ml/min, and most preferably less than 40 ml/min. The surface roughness is determined here in accordance with ISO 8791-2 and is also known as the Bendtsen Roughness. In this way the coating layer material can penetrate the cellulose layer more uniformly.

20 The coating layer material preferably coats the transparent zone substantially wholly.

The cellulose layer is preferably a bleached cellulose layer.

25 The cellulose layer preferably comprises a mixture of long fibre and short fibre, with at least 40% long fibres, more preferably at least 50% long fibres, preferably at least 70% long fibres.

Brief description of the figures

The above and other advantageous features and objectives of the invention will become more apparent and the invention better understood with reference to the following detailed description when read in combination with the accompanying drawings, in which:

30 figures 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H each show a top view of a packaging paper with a transparent zone according to an exemplary embodiment;
figures 2A, 2B, 2C and 2D show a method for manufacturing a packaging paper with a transparent zone on the basis of cross-sectional drawings of a cellulose layer.

35 Detailed embodiments

The invention will now be further described on the basis of an exemplary embodiment shown in the drawing. The same or similar elements are designated in the drawing with the same reference numeral.

- 5 Figures 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H show exemplary embodiments of a packaging paper 100 with a transparent zone 110. Shown in figures 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H is a coordinate system X, Y, wherein the shown axis X designates a width direction of the packaging paper and wherein the shown axis Y designates a longitudinal direction of the packaging paper.
- 10 In the figures the packaging paper 100 is rectangular. Such a form is typically obtained during manufacture of the packaging paper 100. More specifically, the packaging paper 100 is manufactured from a roll of paper, also referred to as a cellulose layer. It will however be apparent to the skilled person that packaging paper 100 can also take different forms. During manufacture of packaging
- 15 paper 100 the cellulose layer is typically supplied in bulk, more specifically in the form of a roll comprising the cellulose layer in rolled-up form. After unwinding from the roll, the cellulose layer forms a strip. The strip has a width corresponding for instance to the width shown in figures 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H and is guided through a processing device which will be further elucidated, but is configured particularly to treat the strip of cellulose layer and cut it into the packaging paper
- 20 100 shown in figures 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H. It will however be apparent that the packaging paper 100 can take a different form. In contrast to the straight line shown in the figures, an end edge of the packaging paper 100 can thus be formed such that one or more protrusions and/or one or more recesses are formed. End edge is understood to mean the edge lying substantially transversely of the longitudinal direction of the cellulose layer. A transverse edge can also be cut out or can be pre-
- 25 formed with one or more protrusions and/or one or more recesses. The protrusions and/or recesses can serve to attach the packaging paper 100 to a corresponding packaging paper, for instance in order to form a bag-like packaging. The cutting, also referred to as chopping, of the strip of cellulose layer is per se known to the skilled person and will therefore not be elucidated, this in favour of a brief description.
- 30 Packaging paper 100 has a transparent zone 110, more specifically, a packaging paper 100 with a transparent zone 110 is shown. The packaging paper 100 and the transparent zone 110 are manufactured from one cellulose layer. In other words, the packaging paper is manufactured from one piece of cellulose layer. The transparent zone 110, also referred to as window, is thus manufactured from the same cellulose layer as a non-transparent zone of the packaging paper 100.
- 35 This is in stark contrast to known packaging paper which is provided with plastic window material such as polypropylene (PP) or polyethylene terephthalate (PET), or optionally another polyester. The

known packaging paper combines two different material types, i.e. a cellulose layer and a plastic layer, or a first cellulose layer and a second cellulose layer, in order to realize a packaging material which is provided with a window, with the resulting drawbacks stated in the preamble. The known packaging paper thus consists of at least two different, separate materials which are combined,
5 typically by means of glueing.

The transparent zone 110 comprises a coating layer material applied to the packaging paper 100. The coating layer material preferably comprises an oily compound, preferably a paraffin. The oily compound penetrates the cellulose layer, as shown in figure 2C, and allows light to pass through the
10 cellulose layer at the position of the zone where the coating layer material has been applied. The location where the penetrated coating layer material allows the passage of light through the packaging paper is referred to as the transparent zone 110. In the context of the application transparency or translucency is defined as the degree to which it is possible to see through a material, i.e. the cellulose layer. This property depends inter alia on the degree to which the cellulose layer
15 allows light through. The cellulose layer without coating layer material absorbs or reflects light. Transparency falls under the wider term "transmission". In physics, transmission is understood to mean the permeability of a medium to waves, such as light, sound waves or electromagnetic waves, the medium in this case being the cellulose layer. In the context of the application the transmission describes the portion of the incident radiant flux or luminous flux which penetrates the transparent
20 zone. The reciprocal value of the transmission, the opacity, is additionally also used. According to ISO 2471, an opacity of the transparent zone preferably lies between 1% and 35%, more preferably between 3% and 25%, most preferably between 5% and 15%. A packaging paper 100 which is at least partially translucent or transparent is thus provided in this way. Customers and shop staff can thus see what is packaged in a packaging formed from the packaging paper. The use of a plastic
25 material is avoided in this way. Such packaging paper is more sustainable, cheaper and simpler to manufacture. Alternatively or additionally, the coating layer material can comprise a vegetable oil. A packaging paper with a transparent zone 110 comprising only vegetable oil is furthermore recyclable and/or compostable. A further advantage of a transparent zone which is formed by applying the oily compound and saturating the cellulose layer therewith is based on the insight that
30 plastic windows are not strong enough and/or, under the weight of the product in the packaging material, could result in unpredictable stretching and/or tearing of the plastic, with the result that the product may fall out of the packaging material. An additional problem in the use of plastic windows is that the connecting lines between the plastic and the paper are typically weak zones which are susceptible to tearing. The packaging material 100 which is formed from one piece of cellulose layer
35 neutralizes these problems almost completely.

Figures 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H show that the transparent zone 110 extends, preferably, at least partially over the cellulose layer. Although not shown, the transparent zone 110 can also extend over the whole surface of the cellulose layer. In this way the whole packaging paper 100 is transparent. The transparent zone 110 preferably extends in the form of a strip.

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According to the preferred embodiment of figure 1A, the transparent zone 110 extends in a longitudinal direction Y of the cellulose layer. In figure 1A the transparent zone 110 extends from one end edge to the opposite end edge. In this way the transparent zone 110 forms a transparent strip in the cellulose layer, as seen in the longitudinal direction thereof. When this packaging paper is for instance used as bag-like packaging, this makes it possible to see into the bag-like packaging through a whole longitudinal direction of the packaging paper 100. Shown in each of the figures 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H is a representation of an item P packaged in the packaging paper 100. The visibility of the product shows the transparency of the transparent zone 110 and the opacity of the non-transparent zone.

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In figure 1A the transparent zone 110 is arranged centrally on the cellulose layer. In this way two non-transparent zones 120 are situated on either side of the transparent zone 110. The non-transparent zones 120, also referred to as opaque zones 120, can be a part of the cellulose layer where no coating layer material is applied, or where only a small quantity of coating layer material is applied. Such an untreated portion of the cellulose layer is non-transparent. The non-transparent zones have a higher moisture permeability than the transparent zone. Changing an area ratio of the transparent zone and a non-transparent zone furthermore allows the moisture permeability to be controlled. This reduces the risk of products packaged in the packaging paper becoming mouldy, for instance relative to a plastic packaging. The untreated portion of the cellulose layer further allows optimal glueing of the packaging paper to itself or to another material.

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Compared to figure 1A, figure 1B shows that the transparent zone 110 can also be positioned at a peripheral edge of the packaging paper 100, for instance a transverse edge of the packaging paper 100.

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Figure 1C shows that the transparent zone 110 can also extend in a width direction X of the cellulose layer. The transparent zone 110 in figure 1C thus takes a wider form than the transparent zone 110 shown in figures 1A and 1B. The packaged item P is more clearly visible in this way. In this embodiment the non-transparent zone in figure 1C has a smaller surface area than the non-transparent zone in figures 1A and 1B. In this way the packaging paper 100 in figure 1C has a lower moisture permeability than the packaging paper 100 shown in figures 1A and 1B.

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Figure 1D shows a packaging paper 100 with a transparent zone 110 which extends from a first transverse edge to a second transverse edge lying opposite the first transverse edge, as seen in the width direction X of the cellulose layer. The transparent zone 110 in figure 1D is thus smaller than the transparent zone shown in figures 1A, 1B and 1C, as seen in a longitudinal direction Y. In this way the transparent zone forms a transparent strip, as seen in the width direction of the cellulose layer. Similarly to figures 1A, 1B and 1C, two non-transparent zones are situated on either side of the transparent zone. It will be apparent that the formed transverse strip can also be formed to lie adjacently of an end edge of the cellulose layer.

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Figures 1E, 1F and 1G show a packaging material with a plurality of transparent zones 110. Figure 1E thus shows that for instance two or more transparent zones 110 can take the form of a transverse strip. The transparent zones 110 lie at a mutual distance, as seen in a longitudinal direction of the cellulose layer. Figure 1G shows that for instance two or more transparent zones 110 can take the form of a longitudinal strip. These transparent zones 110 also lie at a mutual distance, as seen in a longitudinal direction of the cellulose layer. Figure 1F shows an example wherein the plurality of transparent zones coincide. The example shown in figure 1F comprises a first transparent zone which forms a transverse strip and a second transparent zone which forms a longitudinal strip. It will be apparent on the basis of figure 1F that the transparent zones can overlap and together form one transparent zone. The transparent zone is described above as substantially rectangular with substantially straight edges. The transparent zone can however also have at least partially curved and/or bent edges. The transparent zone can thus for instance also take a round form, such as that of a circle or oval. The transparent zone can further be a combination of a plurality of shapes or have a shape differing from a geometrical form, for instance the silhouette of a person. It will be apparent to the skilled person that the transparent zone can take any form and can for instance be adapted on the basis of logos, shapes of packaged objects or foods, and so on.

Packaging paper 110 can be manufactured by providing a cellulose layer with a first side and a second side. The method for manufacturing the cellulose layer will be explained with reference to figures 2A, 2B, 2C and 2D.

Figures 2A, 2B, 2C and 2D show a cross-section of a cellulose layer 130 as described in relation to 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H. The method comprises of providing a cellulose layer 130 with a first side 131 and a second side 132. As shown in figure 2A, the cellulose layer 130 is initially non-transparent. A product P situated below the cellulose layer 130 is thus not visible or identifiable, or is so only to limited extent. The cellulose layer 130 preferably has a specific weight higher than 18

g/m². The cellulose layer 130 further preferably has a specific weight which is at most 50 g/m², more preferably at most 35 g/m². Such a cellulose layer is relatively light-weight, which has the advantage that the packaging paper is easily transportable and is cheaper. Such a cellulose layer 130 is furthermore more easily penetrable by the coating layer material 140. In other words, such a
5 cellulose layer can be advantageously saturated by the applied coating layer material 140. It is thought that the advantageous effect thereof is due to the lower fibre density of the cellulose layer with such a specific weight.

It is preferred for a surface on at least the first side 131 of the cellulose layer 130 to have a surface
10 roughness of less than 220 ml/min, preferably less than 100 ml/min, more preferably less than 80 ml/min, most preferably less than 40 ml/min. The surface roughness is determined here in accordance with ISO 8791-2 and is also known as the Bendtsen Roughness. In this way the coating layer material applied to this first side can penetrate the cellulose layer 130 more uniformly.

15 It is preferred for the cellulose layer 130 to be a bleached cellulose layer, for instance a white paper. In this way an optimal transparent result is obtained, although it is noted that a white paper is not essential. This is because tests have shown that almost identical transparencies can be realized with a brown paper.

20 The cellulose layer 130 further preferably comprises a mixture of long fibre and short fibre, with at least 40% long fibres, more preferably at least 50%, preferably at least 70%. Such a cellulose layer has the advantage that it is resistant to tearing. The subsequently realized packaging is therefore stronger, for instance compared to a glassine paper. Such a cellulose layer further has the advantage that it can be produced in usual manner. The price of a cellulose layer with such a fibre
25 composition can be produced considerably more inexpensively compared to glassine paper. The production of such a cellulose layer is moreover simpler, faster and more sustainable.

As shown in figure 2B, a predetermined quantity of coating layer material 140 with a first temperature is applied to the first side at the position of a zone. The coating layer material is
30 preferably brought to the first temperature just before application thereof. The first temperature lies within a first temperature range. The first temperature can vary between the limits of the first temperature range. The first temperature range preferably lies between 150°C and 180°C, more preferably between 80°C and 150°C, most preferably between 100°C and 120°C. Such a temperature range enhances the viscosity of the applied coating layer material 140. In this way the
35 coating layer material becomes more viscous, i.e. more runny or liquid, whereby the coating layer material penetrates the cellulose layer 130 in improved manner and is able to saturate the cellulose

layer 130 in efficient manner. A temperature range between 100°C and 120°C realizes the further advantage that the coating layer material cannot burn. The viscosity of the coating layer material 140 preferably lies between 5 mPa/s and 500 mPa/s, measured at a temperature of 100°C. The viscosity of the coating layer material 140 more preferably lies between 5 mPa/s and 250 mPa/s, measured at a temperature of 100°C. It is noted that the cellulose layer can also be heated before the coating layer material is applied. This allows the coating layer material to further penetrate the cellulose layer in improved manner.

The penetration of the coating layer material 140 is illustrated by the circles shown in cellulose layer 130. The coating layer material 140 penetrates between the fibres of the cellulose layer, preferably to (a position close to) the second side 132. In this way a substantially continuous flow of coating layer material through cellulose layer 130 is formed. In order to substantially guarantee a transparency it is preferable to opt for a sufficiently large predetermined quantity of coating layer material. The predetermined quantity of coating layer material is thus preferably at least 1 g/m², more preferably a quantity corresponding to a surface density of between 2.5 to 6 g/m². In this way the coating layer material saturates the cellulose layer and a desired transparency is substantially guaranteed. The predetermined quantity of coating layer material is more preferably a maximum of 12 g/m². It is noted that the predetermined quantity of coating layer material can be selected taking into consideration the type of cellulose layer. In the case of a bleached cellulose layer, also referred to as white paper, 6 to 8 g/m² of coating layer material can for instance be applied, or, according to a further example, 8 to 10 g/m² can be applied in the case of a brown paper. According to a further exemplary embodiment, 1 to 15 g/m² of coating layer material can alternatively be applied. Such a chosen predetermined quantity of coating layer material saturates the cellulose layer. It is further noted that the transparency improves further still when the coating layer material is applied to both the first and the second side. The quantity of coating layer material can differ for the first side and the second side, although it is preferred for the collective surface density of the coating layer material on the first and the second side to correspond to the above stated values. Applying the coating layer material to both sides almost certainly guarantees that coating layer material penetrates through the cellulose layer and the coating layer material saturates the cellulose layer. The inventors have surprisingly found that when coating layer material is applied to both sides of the cellulose layer, the transparency is further improved.

Figure 2C shows that the coating layer material 140 has penetrated through the cellulose layer 130. It will be apparent that a portion of the coating layer material 140 may protrude from the cellulose layer 130. In other words, a quantity of coating layer material 140 may still be present on the surface of cellulose layer 130. It is possible, especially in advantageous circumstances in which the

cellulose layer is wholly saturated by the coating layer material 140, for a residue or excess of coating layer material 140 to remain on the cellulose layer surface. The applied predetermined quantity of coating layer material is then gradually hardened at a second temperature. The second temperature lies in a second temperature range. The second temperature can vary between the

5 limits of the second temperature range. Owing to the gradual hardening, the zone where the coating layer material has penetrated becomes transparent and thus forms the transparent zone 110. The gradual hardening of the coating layer material allows the oily material to harden and thus form a path transparent to light through the cellulose layer 130, as shown in figure 2D. It is noted that the gradual hardening differs significantly from existing production processes where a coating layer

10 material is immediately cooled with a cooling roller, typically at a very low temperature, about 5°C, in order to harden the coating layer material on the cellulose layer. In known processes the coating layer material does not have time to penetrate the cellulose layer, and consequently hardens into a structure with an opaque result due to the sudden temperature drop. The first and second

15 temperature range lie above a melting point of the coating layer material. When the melting point of the coating layer material is for instance 50°C, as is the case for paraffin, the gradual hardening is performed at 50°C or above. The gradual hardening is preferably performed in the second temperature range which lies between 30°C and 120°C, preferably between 40°C and 110°C, more preferably between 50°C and 100°C. It will be apparent to the skilled person that further specific preferred limits of the second temperature range depend on the coating layer material used. The

20 gradual hardening can also comprise heating of the cellulose layer with applied coating layer material. The coating layer material can thus initially already be hardened before the coating layer material and the cellulose layer are exposed to the second temperature range, for instance with a hot air blowing device, as will be further elucidated. The cellulose layer with the predetermined quantity of coating layer material is further preferably exposed to the second temperature range for

25 a period of at least 0.1 second, preferably between 0.5 and 5 seconds, preferably at least 7 seconds. It is suspected that the coating layer material hardens into a substantially vitreous structure in this way. Experiments have shown that the transparency is improved in this manner.

The gradual hardening can be performed in different ways, for instance using a heating device 150

30 which heats the cellulose layer at said second temperature range. Alternatively or additionally, the second temperature range can be provided by residual heat obtained by application of the predetermined quantity of coating layer material. The heating device 150 can be a hot air device which blows air at a temperature lying in the second temperature range onto the cellulose layer with applied coating layer material. The heated air reheats the coating layer material so that the

35 coating layer material can spread further through the cellulose layer in order to saturate the cellulose layer. Such a preferred embodiment can be realized in simple manner. The heating device

150 can be provided at a distance from the application of the coating layer material, for instance about 0.1 to 7 metres. This allows the coating layer material to at least partially harden for a short time and then melt again. Surprisingly, it has been found that the final transparency of the transparent zone is further improved in this way. One or more heating rollers, which heat the cellulose layer with the coating layer material in order to reach the second temperature range, can alternatively or in combination also be provided. It is further possible to further improve the penetration of the coating layer material by exposing the paper to an increased pressure, for instance by making use of heated pressure rollers. As described above, the cellulose layer can optionally be heated both before application of the coating layer material and after application of the coating layer material. Tests have further surprisingly shown that the coating layer material also hardens gradually when a cooling roller is disabled, for instance by preventing coolant from flowing through the cooling roller or by removing the cooling roller. In known devices such a cooling roller is located downstream of a location where the coating layer material is applied, typically in the immediate vicinity thereof so that coating layer material is immediately hardened, resulting in the above stated opaque view. By disabling the cooling roller the gradual hardening is realized in very simple manner. The transparency of the transparent zone is further improved when the coating layer material is applied to both sides of the cellulose layer in such a preferred embodiment.

20 The packaging paper 100 with the transparent zone is highly advantageous as a cellulose packaging material for foods, such as bread, baked goods, vegetables, fruit, cheese or meat, or non-foods. The packaging paper 100 can for instance be processed or formed into a cellulose bag. The packaging paper can also function as a sheet of paper, for instance at a butcher's shop, or can be supplied on a roll. The packaging paper with the transparent zone further allows simple glueing of the packaging paper in order to form for instance a per se closed bag. Yet another advantage is that the packaging paper is considerably cheaper compared to glassine. This advantage is based on the insight that glassine is manufactured using a supercalander. Such a production process requires a lot of energy, which raises the cost of glassine considerably compared to the packaging paper 100. Glassine is moreover fragile because the fibres have been extremely finely ground.

30

Examples

The above stated advantages will be demonstrated in the non-limitative exemplary embodiments stated below.

35 **Example 1**

Example 1 describes a known method and device for drastically increasing the moisture-permeability of bread bags made of paper.

Flexpack Smooth from STARKRAFT is an exemplary embodiment of a cellulose layer 130 with a specific weight of about 35 g/m². According to the first example, the Flexpack Smooth by STARKRAFT is coated on one side, i.e. on the first side 131 or on the second side 132 of the cellulose layer 130, or on two sides, i.e. on both the first side 131 and the second side 132 of cellulose layer 130, with a coating layer material 140 of paraffin with a different weight per unit area in g/m² by means of a HOLWEG-WEBER® RS26 paper bag making machine with a HOLWEG-WEBER® CTH1 waxing unit. The paraffin bath of the HOLWEG-WEBER® RS26 paper bag making machine has a temperature of 120°C. The cellulose layer is driven through the HOLWEG-WEBER® RS26 paper bag making machine at a production speed of about 110 m/min. According to the first exemplary embodiment, the cooling rollers of the HOLWEG-WEBER® RS26 paper bag making machine have a temperature of about 6 to 7°C. A moisture-permeability of paper is typically increased in this way. According to the known method, the paper is then finished further for use as for instance a bread bag by the consumer.

Exemplary embodiments

Continuing on from example 1, a further treatment of the cellulose layer 130, for instance the Flexpack Smooth from STARKRAFT, with coating layer material 140 allows the cellulose layer 130 to be made transparent locally. In other words, it is possible to further create a transparent zone 110 in the cellulose layer 130.

Once cellulose layer 130, also referred to as "the paper" in the further elucidation of the exemplary embodiments, has a coating layer 140, a sample is taken. In the exemplary embodiments a paraffin layer or paraffin coating is applied as coating layer 140. The sample is briefly exposed to a high temperature by holding the paper above a hot plate, for instance of 140°C, for a brief period of time, for instance for about 1 minute. This makes the paper transparent locally, i.e. at the position of the zone which is exposed to the hot plate. It is suspected that, due to the exposure to the very high temperature, the applied paraffin layer melts again and penetrates the pores of the paper in improved manner. The paraffin penetrating the pores of the paper is mainly driven by the capillarity of the paper fibre structure. When a refractive index of paraffin, typically about 1.48, and paper or cellulose, typically about 1.52, are roughly the same, the paper becomes transparent locally.

Transparency or opacity of the treated paper can be measured with a PCE-RM 100 Reflectance Meter. It will be apparent to the skilled person that alternative so-called reflectometers can be used. Reflectometers typically use a measuring scale from 0 to 100%. It is the case here that 0% is fully transparent and 100% fully opaque. The lower the measured value, the better the transparency.

- 5 Such measurement can be used in combination with or as alternative to the above stated ISO 2471 measurement.

In a first exemplary embodiment (exemplary embodiment 1), the paper is coated on one side with 12 g/m² TopScreen®Biowax-based Barrier Coating ED9 from Solenis®. This paraffin is a palm oil
10 type. The measured transparency varies from 16 to 19%.

In a second exemplary embodiment (exemplary embodiment 2) the paper is coated on two sides with 8.5 g/m² on a first side and 4.5 g/m² on a second side with TopScreen®Biowax-based Barrier Coating ED9 from Solenis®. The transparency varies here from 16 to 19%.

15 When the paper is in a third exemplary embodiment (exemplary embodiment 3) coated on two sides with 8.5 g/m² on the first side and 4.5 g/m² on the second side, as in exemplary embodiment 2 but with a hydrogenated and refined petroleum-based paraffin, Proquiwax® 56-58 from Proquinat, the transparency is higher than 20%.

20 When the paper is in a fourth exemplary embodiment (exemplary embodiment 4) coated on two sides with 4.5 g/m² TopScreen®Biowax-based Barrier Coating ED9 from Solenis® on each side, the transparency varies from 13 to 17%.

25 When the paper is in a fifth exemplary embodiment (exemplary embodiment 5) coated on two sides with 4.5 g/m², as in the fourth exemplary embodiment but with a hydrogenated and refined petroleum-based paraffin, such as Proquiwax® 56-58 from Proquinat, the transparency varies between 15 and 19%.

30 A comparison of exemplary embodiments 2 and 4 to exemplary embodiments 3 and 5 shows that the type and quantity of the applied paraffin in combination with the type of paper can determine the degree of transparency.

It is further noted that time also plays a part in creating a transparent zone in advantageous manner.

35 It was for instance found that, one hour after production, the transparency of exemplary embodiments 1, 2 and 4 will deteriorate by an average of 1%. 24 hours after production, the

decrease in transparency is about 2% and after about 100 days the decrease can be 4 to 14%. It is suspected that the paraffin continues to crystallize during the relevant time durations. The crystallization results in more light scattering due to the crystal edges and the transparency decreases as a result.

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In a first comparative experiment (comparative experiment 1) Cristal® Flexible & Transparent Paper from Ahlstrom-Munksjö® is used. A very dense and transparent glassine paper has been obtained by supercalendering, as described in the description introduction of this application. Without additional coating, this glassine paper has a transparency of 17%. When glassine paper is compared to the exemplary embodiments 1-5, it will be apparent that exemplary embodiments 1-5 have at least the same transparency as this expensive and labour-intensive glassine paper, this owing to the above described simple and inexpensive method. The paper according to exemplary embodiments 1-5 is furthermore at least partially moisture and grease-resistant, this in contrast to glassine paper, which is only grease-resistant.

15

When glassine paper is in a second comparative experiment (comparative experiment 2) coated on two sides with 3.5 g/m² TopScreen® Biowax-based Barrier Coating ED9 from Solenis®, the transparency thereof improves to 13 to 15%. When glassine paper is coated on one side with 9 g/m² in a third comparative experiment (comparative experiment 3), the transparency thereof increases to about 15%, which is thus an improved transparency relative to the previous 17%.

25

A comparison of comparative experiment 1 to comparative experiments 2 and 3, and also of exemplary embodiments 2 to exemplary embodiments 1 and 3, shows that a minimal quantity of paraffin is needed to achieve an improved transparency. It is further shown that a greater coating quantity however does not guarantee an improved transparency. As already noted above, very dense and smooth paper, such as Cristal® Flexible & Transparent Paper, requires less paraffin than Flexpack Smooth Paper.

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In a sixth exemplary embodiment (exemplary embodiment 6) the paper according to exemplary embodiment 4 is held at less than 5 cm above a hot plate of about 140°C, removed and slowly cooled. It is noted that the transparency has improved further to 12%. This shows that a gradual cooling, or alternatively a gradual heating, may result in improved transparency.

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The skilled person will appreciate on the basis of the above description that the invention can be embodied in different ways and on the basis of different principles. The invention is not limited here to the above described embodiments. The above described embodiments and the figures are purely

illustrative and serve only to increase understanding of the invention. The invention is not therefore limited to the embodiments described herein, but is defined in the claims.

Claims

1. A packaging paper (100) with a transparent zone (110), wherein the packaging paper (100) and the transparent zone (110) are made from one cellulose layer and wherein the transparent zone (110) comprises a coating layer material applied to the packaging paper (100), wherein the coating layer material comprises an oily compound such as a paraffin or vegetable oil.
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2. The packaging paper (100) according to the foregoing claim, wherein the transparent zone (110) extends at least partially in a longitudinal direction (Y) of the cellulose layer.
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3. The packaging paper (100) according to any one of the foregoing claims, wherein the transparent zone (110) extends at least partially in a width direction (X) of the cellulose layer.
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4. The packaging paper (100) according to any one of the foregoing claims, wherein the transparent zone (110) extends over the cellulose layer in the form of a strip.
5. The packaging paper (100) according to any one of the foregoing claims, wherein the transparent zone (110) has an opacity which, according to ISO 2471, lies between 1% and 35%, more preferably between 3% and 25%, most preferably between 5% and 15%.
20
6. The packaging paper (100) according to any one of the foregoing claims, wherein the applied coating layer material has a surface density of at least 1 g/m², preferably a surface density lying between 2.5 and 6 g/m².
25
7. The packaging paper (100) according to any one of the foregoing claims, wherein the cellulose layer has a surface density which is higher than 18 g/m², the cellulose layer preferably having a surface density which is at most 50 g/m², more preferably at most 35 g/m².
30
8. The packaging paper (100) according to any one of the foregoing claims, wherein a surface on at least a first side of the cellulose layer has a surface roughness of less than 220 ml/min, preferably less than 100 ml/min, more preferably less than 80 ml/min, and most preferably less than 40 ml/min.
35

9. The packaging paper (100) according to any one of the foregoing claims, wherein the coating layer material coats the transparent zone (110) substantially wholly.
10. The packaging paper (100) according to any one of the foregoing claims, wherein the cellulose layer is a bleached cellulose layer.
11. The packaging paper (100) according to any one of the foregoing claims, wherein the cellulose layer comprises a mixture of long fibre and short fibre, with at least 40% long fibres, preferably at least 50%, more preferably at least 70%.
12. The packaging paper (100) according to any one of the foregoing claims, wherein the coating layer material in the transparent zone (110) is applied to the packaging paper (100) at a first temperature within a first temperature range, and hardened gradually at a second temperature within a second temperature range, such that the transparent zone (110) is formed.
13. The packaging paper (100) according to the foregoing claim, wherein the coating layer material in the transparent zone (110) is exposed to the second temperature for a period of at least 0.1 second, preferably between 0.5 and 7 seconds, preferably at least 7 seconds.
14. The packaging paper (100) according to any one of the foregoing claims 12-13, wherein the second temperature range lies between 30°C and 120°C, preferably between 40°C and 110°C, more preferably between 50°C and 100°C.
15. The packaging paper (100) according to any one of the foregoing claims 12-14, wherein the second temperature range can be provided by residual heat obtained by application of the coating layer material.
16. The packaging paper (100) according to any one of the foregoing claims 12-15, wherein the first temperature range lies between 150°C and 180°C, preferably between 80°C and 150°C, more preferably between 100°C and 120°C.
17. A cellulose packaging comprising a packaging paper (100) according to any one of the foregoing claims.

18. The cellulose packaging according to the foregoing claim, wherein the transparent zone forms a window in the cellulose packaging.
19. A method for manufacturing a packaging paper (100) with a transparent zone (110), the method comprising of:
- providing a cellulose layer with a first side and a second side;
 - applying at the position of a zone a predetermined quantity of coating layer material at a first temperature which lies within a first temperature range, wherein the coating layer material comprises an oily compound such as a paraffin or vegetable oil;
 - gradually hardening the applied predetermined quantity of coating layer material at a second temperature which lies in a second temperature range in order to form the transparent zone (110).
20. The method according to the foregoing claim, wherein the second temperature range lies between 30°C and 120°C, preferably between 40°C and 110°C, more preferably between 50°C and 100°C.
21. The method according to any one of the foregoing claims 19-20, wherein application of the predetermined quantity of coating layer material comprises the following steps of:
- providing a moving endless surface;
 - taking up the predetermined quantity of coating layer material with the moving endless surface;
 - bringing the moving endless surface into contact with the first side of the cellulose layer.
22. The method according to any one of the foregoing claims 19-21, wherein the second temperature range can be provided by residual heat obtained by application of the coating layer material.
23. The method according to any one of the foregoing claims 19-22, wherein the first temperature range lies between 70°C and 180°C, preferably between 80°C and 150°C, more preferably between 100°C and 120°C.
24. The method according to any one of the foregoing claims 19-23, wherein the transparent zone (110) is arranged extending at least partially over the cellulose layer, as seen in a

longitudinal direction (Y) thereof.

- 5 25. The method according to any one of the foregoing claims 19-24, wherein the transparent zone (110) is arranged extending at least partially over the cellulose layer, as seen in a width direction (X) thereof.
26. The method according to any one of the foregoing claims 19-25, wherein the transparent zone (110) takes the form of a strip.
- 10 27. The method according to any one of the foregoing claims 19-26, wherein an opacity of the transparent zone (110), according to ISO 2471, lies between 1% and 35%, more preferably between 3% and 25%, most preferably between 5% and 15%.
- 15 28. The method according to any one of the foregoing claims 19-27, wherein the predetermined quantity of coating layer material is at least 1 g/m², preferably corresponding to a surface density lying between 2.5 and 6 g/m².
- 20 29. The method according to any one of the foregoing claims 19-28, wherein the cellulose layer with the predetermined quantity of coating layer material is exposed to the second temperature range for a period of at least 0.1 second, preferably between 0.5 and 7 seconds, preferably at least 7 seconds.
- 25 30. The method according to any one of the foregoing claims 19-29, wherein the cellulose layer has a specific weight which is higher than 18 g/m², the cellulose layer preferably having a specific weight which is at most 50 g/m², more preferably at most 35 g/m².
- 30 31. The method according to any one of the foregoing claims 19-30, wherein a surface on at least the first side of the cellulose layer has a surface roughness of less than 220 ml/min, preferably less than 100 ml/min, more preferably less than 80 ml/min, most preferably less than 40 ml/min.
32. The method according to any one of the foregoing claims 19-31, wherein the coating layer material coats the transparent zone (110) substantially wholly.

33. The method according to any one of the foregoing claims 19-32, wherein the cellulose layer is a bleached cellulose layer.
34. The method according to any one of the foregoing claims 19-33, wherein the cellulose layer comprises a mixture of long fibre and short fibre, with at least 40% long fibres, preferably at least 50%, more preferably at least 70%.