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Gale Pacific Limited

72	FULL NAME(S) OF INVENTOR(S)
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NASARCZYK, Andrew

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Polymeric plastics material and manufacture thereof

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(71) Applicant (for all designated States except US): GALE
PACIFIC LIMITED [AU/AU]; 145 Woodlands Drive,
Braeside, Victoria 3195 (AU).

(72) Inventor; and

(75) Inventor/Applicant (for US only): NASARCZYK, An-
drew [AU/AU]; 145 Woodlands Drive, Braeside, Victoria
3195 (AU).

(74) Agent: PHILLIPS ORMONDE & FITZPATRICK; 367
Collins Street, Melbourne, Victoria 3000 (AU).

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(54) Title: POLYMERIC PLASTICS MATERIAL AND MANUFACTURE THEREOF

(57) Abstract: A polymeric plastics material having a composition which includes a wax, the material having a reduced propensity to absorb moisture. The material is particularly manufactured in filamentary form. A method of manufacturing the polymeric plastics material is also disclosed.

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POLYMERIC PLASTICS MATERIAL AND MANUFACTURE THEREOF

BACKGROUND TO THE INVENTION

Field of the Invention

5 This invention relates to a polymeric plastics material as well as the manufacture thereof. The material is applicable as a filament, fibre and fabric for general commercial and industrial uses, including covers, curtains, blinds, signage and tarpaulins exposed to environmental elements including moisture, and it will be convenient to hereinafter disclose the invention in relation to those
10 exemplary applications. However, it is to be appreciated that the invention is not limited to those applications.

Description of the Prior Art

 The following discussion of the background to the invention is intended to
15 facilitate an understanding of the invention. However, it should be appreciated that the discussion is not an acknowledgement or admission that any of the material referred to was published, known or part of the common general knowledge as at the priority date of the application.

 One previous general purpose covering fabric has a material base woven
20 from polypropylene fibres, with a polypropylene coating applied to each side of the base in order to provide the fabric with various characteristics including a liquid barrier and surfaces for printing. The fibres for the fabric are composed of a multiple of extruded and twisted filaments.

 One problem with this fabric is a propensity for the material base to
25 rapidly absorb moisture, such as water, through capillary action. That action is enhanced by a coating of a polyglycerol fatty ester surfactant applied to the filaments following their extrusion in order to facilitate subsequent processing into fibres. The surfactant has the effect of lowering the surface tension of the filaments and thereby assisting moisture absorption.

30 Moisture absorption typically occurs at cut edges of the fabric, and at any flaws or disruptions in the integrity of the surface coating, and moisture access to even very small portions of the material base can lead to rapid and significant penetration of moisture through the material base. That moisture absorption

sometimes entrains particles of dirt and other impurities, leading to staining of the base as well as initiating bacterial growth within the material base. As a result, the fabric is rendered unsightly and eventually leads to deterioration of the fabric.

5 In addition, the moisture absorption adds considerably to the weight of the fabric. As a consequence, when used in a hung or suspended application, more robust fittings are required to ensure proper support of the fabric. In any event, the wet fabric can be heavier and more difficult to handle.

10 SUMMARY OF THE INVENTION

It is an object of the present invention to provide a polymeric plastics material which has a reduced propensity to absorb moisture such as water.

It is a further object of the present invention to provide a method of manufacturing an improved polymeric plastics material.

15 With those objects in mind, the present invention in one broad aspect provides a polymeric multifilament fibre formed from a multitude of filaments, the fibre having a plurality of capillaries, each fibre comprising:

a polymeric composition comprising a mixture of one or more of a polymer or copolymer of propylene and a wax in an amount between 0.5 and
20 5% by weight of the composition; and

a surface coating of an oil lubricant in an amount between 0.5 and 5% by volume of the material,

wherein the combination of the wax and oil lubricant substantially prevents the fibre from absorbing moisture by capillary action.

25 The above polymeric plastics material is in filamentary form, more specifically fibres manufactured from a multitude of filaments. It has been found that the combination of the wax and oil lubricant according to the present invention significantly prevents a fibre formed from such polypropylene filaments absorbing moisture by capillary action. It is believed that in part, the
30 wax globules distributed over the surface of the filaments act as barrier to the capillary flow of water therealong. In addition, the oil lubricant produces a material surface tension which is higher than exhibited by an unlubricated filament, and thus further reduces the capillary action between the material and water.

In a further broad aspect, the present invention provides a method of manufacturing polymeric multifilament fibre, the fibre having a plurality of capillaries, the method comprising the steps of:

5 preparing a polymeric plastics composition comprising one or more of a polymer or copolymer of propylene and a wax in an amount between 0.5 and 5% by weight of the composition;

forming the composition into two or more filaments;

lubricating a surface of the filaments with an oil lubricant in an amount between 0.5 and 5% by volume of the filaments; and

10 forming the filaments into a multifilament fibre,

wherein the combination of the wax and oil lubricant substantially prevents the fibre from absorbing moisture by capillary action.

In still other aspects, the present invention provides fabric, preferably a woven fabric, made from fibres manufactured according to the above methods.

15 Preferably, the wax is at a surface of the filaments. That is preferably achieved by allowing the wax to migrate to the surface as the composition is formed into the filaments. In at least one preferred form, the wax is intermittently distributed over the surface of each filament.

20 The amount of wax in the fibre is between 0.5 and 5% by weight of the fibre, and more preferably about 1% by weight.

Preferably, the wax is a hydrocarbon compound or mixture. In at least one preferred form, the compound or mixture is selected from one or more of the Fischer-Tropsch range of hydrocarbons.

25 Preferably, the lubricant is applied to each filament's surface following formation of the filaments.

Preferably, the lubricant is present in an amount of between 0.5 and 5% by volume of the filaments, and more preferably about 2% by volume.

The lubricant is preferably oil present as a film on the surface of the filaments.

30 Preparing the composition preferably comprises preparing a polypropylene base batch and adding a hydrocarbon compound such as a wax or a mixture that includes a wax (such as a master batch) to the base batch. The prepared composition is preferably extruded to form the filaments. That extrusion preferably forms filamentary material, and more preferably a fabric.

According to yet another form of the present invention, there is provided a polymeric multifilament fibre formed from a multitude of filaments, the fibre having a plurality of capillaries, each fibre comprising:

5 a polymeric composition comprising a polymer, copolymer or combination thereof of propylene mixed with a wax selected from one or more of the Fischer-Tropsch range of hydrocarbons in an amount between 0.5 and 5% by weight of the composition; and

10 a surface coating of an oil lubricant between 0.5 and 5% by volume of the filaments, the oil lubricant being a hydrocarbon white oil,

wherein the wax is distributed in globules over a surface of each filament and the oil lubricant is present as a film on the surface of each filament, this combination of the wax and oil lubricant substantially preventing the fibre from absorbing moisture by capillary action.

15

According to another form of the present invention, there is provided a method of manufacturing polymeric multifilament fibre, the fibre having a plurality of capillaries, the method comprising the steps of:

20 preparing a polymeric plastics composition comprising a mixture of a polymer, copolymer or combination thereof of propylene and a wax selected from one or more of the Fischer-Tropsch range of hydrocarbons in an amount between 0.5 and 5% by weight of the composition;

forming the composition into two or more filaments;

25 lubricating a surface of the filaments with an oil lubricant in an amount between 0.5 and 5% by volume of the filaments, the oil lubricant being a hydrocarbon white oil; and

forming the filaments into a multifilament fibre,

30 wherein the wax is distributed in globules over a surface of each filament and the oil lubricant is present as a film on the surface of each filament, this combination of the wax and oil lubricant substantially preventing the fibre from absorbing moisture by capillary action.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

The present invention will now be described with reference to one or more particular preferred embodiments of the present invention, wherein the polymeric plastic material is in the form of a polymeric fabric formed from woven multifilament fibres.

5 The polymeric fabric is formed from a plurality of multifilament fibres, each fibre in turn including a multitude of filaments. Each fibre and the filaments thereof have a composition which includes a polymer or co-polymer of propylene. However, it should be appreciated that, depending on the intended application of the material other polymers and co-polymers may be suitable, for example polyamides comprising nylon, and polyesters. Those hydrocarbons particularly suitable for use with polypropylene in the manufacture of the material and filament are sold by Sasol under the product name of AdSpense. One preferred product is known as AdSpense 868. This product was specifically developed for use as a dispersing aid in the manufacture of polyolefin master
10 batches and colour concentrates.

The polymeric plastics material mixture (base batch plus master batch) is formed into filaments by extrusion. That extrusion occurs in any manner well known to those skilled in the relevant art. Typically, the composition is extruded through a multifilament die to simultaneously produce between about 60 and
20 160 filaments for subsequent formation into fibres. Formation of the polymeric plastics composition into the filaments causes the wax to migrate to the surface of the filaments, where it may be intermittently distributed over the filaments surface. The wax is typically distributed in globules over the filaments surface in an amount of about 1% by weight of the material.

25 The polymeric plastics filaments can either be formed into a fibre and subsequently lubricated or lubricated immediately after formation with a surface coating of an oil lubricant. In a preferred embodiment, the filaments are lubricated immediately after extrusion through the multifilament die. In the preferred embodiment, the lubricant is applied to the filaments or fibres in an amount of about 2% by volume of filament.
30

Lubrication is achieved by passing the extruded filaments through a lubricant so that the lubricant is applied to the surfaces thereof. The lubricant is in a liquid state, and is presented to the extruded filaments in drop form. Thus, the extruded filaments pass through the lubricant drops so as to coat the

surfaces thereof with a thin film of lubricant. This is achieved in the described embodiment using a spin finish type process. However, it should be appreciated that other suitable processes such as dipping, pouring, spraying or the like could be used with equal effect.

5 The lubricant may be of any suitable composition having regard to the intended application of the material. In this embodiment, the lubricant is a high viscosity hydrocarbon white oil. One such suitable oil is sold by Exxon-Mobil Corporation under the product identifier N172.

10 It is thought that the oil lubricant produces a material surface tension which is higher than exhibited by the unlubricated material, and thus reduces the capillary action between the material and water.

15 In an exemplary application of the polymeric plastics filaments, the lubricant also has characteristics which include transparency so as to not impact on the appearance of the filaments. In addition, the lubricant should not interfere with subsequent processing of the filaments, including twisting into fibres and weaving into fabric, and any subsequent treatment of the fabric such as coating. Preferably, the lubricant facilitates formation of the filaments into fibres by holding the filaments together, and acting as an anti-static agent during subsequent heating, stretching and twisting into fibres.

20 In this preferred embodiment, the lubricant may include an antistatic agent added to the oil in order to reduce static electricity between the extruded filaments during subsequent processing.

25 The multifilament polymeric plastics fibre may be manufactured using any suitable equipment including conventional equipment used to manufacture current polypropylene filaments and fibres. That equipment can be operated using the same parameters as in the known manufacturing techniques. Fabric manufactured from filaments and fibres composed of the polymeric plastics material of the present invention, can be coated in a similar manner to the previously coated woven polypropylene material base.

30 The polymeric plastics material of the present invention has a reduced propensity to absorb moisture, such as water, through capillary action. The reason for that resistance to absorb moisture is not entirely understood. Without wishing to be limited by any one theory, it is believed that in part, the wax globules distributed over the surface of the material act as barriers to the

capillary flow of water there along. The inhibited water flow tends to accumulate at the globules into water droplets which eventually overcome surface tension between the droplets and material, and fall away under their own weight. The wax therefore interacts with the capillary structure of the material rather than simply being introduced as a hydrophobic barrier.

EXAMPLE

In order to further understand the present invention, an Example polymeric plastics material will now be described.

10 A master batch was prepared having the following approximate composition (% weight):

20% UV stabiliser

30% AdSpere wax

50% Polypropylene carrier

15 The master batch was added to base batch of polypropylene at the rate of about 4.5% (weight % of the final mixture of master batch and base batch) and the resulting mixture thoroughly mixed. In particular, the mixing distributed the wax throughout the mixture.

20 The mixture was then extruded through a multi-filament die to simultaneously produce about 140 filaments.

Downstream of the die the filaments were passed through a hydrocarbon white oil N172 of Exxon-Mobil Corporation so as to film coat the filaments with the oil.

25 The filaments were then twisted into a multi filament fibre which is wound into a skein or roll for subsequent use.

30 In one test, polypropylene fibres manufactured according to the above Example were compared with known polypropylene fibres to quantify their resistance to moisture absorption, particularly atmospheric moisture absorption by capillary action. That test involved suspending lengths of both polypropylene fibres types above a container of tap water, with the ends of the fibres dipping into the water. The fibres were of the same nominal sizes, and the test was conducted in ambient conditions. It was observed that the water was absorbed by capillary action or wicked along the known fibres at a rate of about 1cm per minute. That absorption continued along the entire length of the fibres. In

contrast, the water wicked along the fibres according to the present invention for about 1 cm above the surface of the water over a longer period of time, and then stopped. That is, the water did not continue to wick along the fibres.

In a further test, a 1.5 metre square piece of fabric woven from fibres manufacture according to the above Example was supported horizontally. A hole approximately 50mm was cut in the centre of the fabric piece, and water was applied through a tube at a rate of about 5litres/minute to the edge of the fabric defining the hole. The water was supplied to the tube from a small tank.

Again, the test was conducted in ambient conditions.

Initially, water with a zero pressure head was applied to the fabric for a period of 24 hours. No absorption into the fabric surrounding the hole was observed. The fabric displayed a distinct hydrophobic nature.

The water tank was then raised above the fabric piece so as to apply the water at a pressure head of 1 foot. At that pressure head it was observed that the water was absorbed by capillary action into the fabric piece at a rate of about 0.01 litres/minute.

By way of comparison, the same test was conducted with a 1.5 metre square piece of fabric woven from known polypropylene fibres. With a zero pressure head, water was absorbed by the fabric at a rate of about 0.05 litres/minute, whilst at a 1 foot pressure head the absorption rate increased to about 0.1 litres/minute.

The material of the present invention is suitable for a wide range of uses and applications. Because of the reduced moisture absorption capabilities, fibres composed of the material, and woven or knitted into a fabric, will be more suitable for external and exposed environments. In particular, the fabric will be less prone to staining and bacterial attack, and will also be easier to handle in such environments.

Finally, it is to be understood that various alterations, modifications and/or additions may be made to the material and its manufacture, without departing from the ambit of the present invention as defined in the claims appended hereto.

CLAIMS

1. A polymeric multifilament fibre formed from a multitude of filaments, the
 5 fibre having a plurality of capillaries, each fibre comprising:
 a polymeric composition comprising a mixture of a polymer, copolymer or
 combination thereof of propylene and a wax in an amount between 0.5 and 5%
 by weight of the composition; and
 a surface coating of an oil lubricant in an amount between 0.5 and 5% by
 10 volume of the filaments,
 wherein the combination of the wax and oil lubricant substantially
 prevents the fibre from absorbing moisture by capillary action.
2. A polymeric multifilament fibre as claimed in claim 1, wherein the wax is
 15 present in an amount of about 1 % by weight of the polymeric composition.
3. A polymeric multifilament fibre as claimed in claim 1 or 2, wherein the oil
 lubricant is present in an amount of about 2% by volume of the filaments.
- 20 4. A polymeric multifilament fibre as claimed in one of claims 1 to 3,
 wherein the wax is at a surface of each filament.
5. A polymeric multifilament fibre as claimed in any one of claims 1 to 4,
 wherein the wax is intermittently distributed over a surface of each filament.
 25
6. A polymeric multifilament fibre as claimed in any one of claims 1 to 5,
 wherein the wax is distributed in globules over a surface of each filament.
7. A polymeric multifilament fibre as claimed in any one of claims 1 to 6,
 30 wherein the wax is a hydrocarbon compound or mixture selected from one or
 more of the Fischer-Tropsch range of hydrocarbons.
8. A polymeric multifilament fibre as claimed in any one of claims 1 to 7,
 wherein the wax is Ad Sperse 868.

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9. A polymeric multifilament fibre as claimed in any one of claims 1 to 8, wherein the oil lubricant is present as a film on the surface of each filament.

5 10. A polymeric multifilament fibre as claimed in any one of claims 1 to 9, wherein the oil lubricant is a hydrocarbon white oil.

11. A polymeric plastics material substantially as hereinbefore described with reference to the Example.

10

12. A fabric manufactured from a multitude of fibres as claimed in any one of claims 1 to 11.

13. A method of manufacturing polymeric multifilament fibre, the fibre having
15 a plurality of capillaries, the method comprising the steps of:

preparing a polymeric plastics composition comprising a mixture of a polymer, copolymer or combination thereof of propylene and a wax in an amount between 0.5 and 5% by weight of the composition;

forming the composition into two or more filaments;

20 lubricating a surface of the filaments with an oil lubricant in an amount between 0.5 and 5% by volume of the filaments; and

forming the filaments into a multifilament fibre,

wherein the combination of the wax and oil lubricant substantially prevents the fibre from absorbing moisture by capillary action.

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14. A method as claimed in claim 13, wherein the wax is added to the polymeric composition in an amount of about 2% by volume of the polymeric composition.

30 15. A method as claimed in claim 13 or 14, wherein the lubricant is applied in an amount of about 2% by volume of the filaments.

16. A method as claimed in any one of claims 13 to 15, wherein forming the composition into filaments comprises allowing the wax to migrate to a surface of the filaments.

5 17. A method as claimed in claim 16, wherein the wax is intermittently distributed over the surface of the filaments.

18. A method as claimed in any one of claims 13 to 17, wherein the wax is distributed in globules over the surface of the filaments.

10

19. A method as claimed in any one of claims 13 to 18, wherein preparing the polymeric plastics composition comprises preparing a polypropylene base batch and adding a wax or a mixture including a wax to the base batch.

15 20. A method as claimed in any one of claims 13 to 19, wherein the filaments are formed by extrusion of the composition.

21. A method as claimed in any one of claims 13 to 20, wherein lubricating the formed filaments comprises applying a hydrocarbon white oil to a surface of
20 the filaments.

22. A method as claimed in any one of claims 13 to 21, wherein the oil lubricant is applied by passing the filaments through lubricant drops so as to form a film of lubricant on surfaces of the filaments.

25

23. A polymeric multifilament fibre formed from a multitude of filaments, the fibre having a plurality of capillaries, each fibre comprising:

a polymeric composition comprising a polymer, copolymer or combination thereof of propylene mixed with a wax selected from one or more
30 of the Fischer-Tropsch range of hydrocarbons in an amount between 0.5 and 5% by weight of the composition; and

a surface coating of an oil lubricant between 0.5 and 5% by volume of the filaments, the oil lubricant being a hydrocarbon white oil,

wherein the wax is distributed in globules over a surface of each filament and the oil lubricant is present as a film on the surface of each filament, this combination of the wax and oil lubricant substantially preventing the fibre from absorbing moisture by capillary action.

5

24. A method of manufacturing polymeric multifilament fibre, the material having a plurality of capillaries, the method comprising the steps of:

preparing a polymeric plastics composition comprising a mixture of a polymer, copolymer or combination thereof of propylene and a wax selected from one or more of the Fischer-Tropsch range of hydrocarbons in an amount between 0.5 and 5% by weight of the composition;

10

forming the composition into two or more filaments;

lubricating a surface of the filaments with an oil lubricant in an amount between 0.5 and 5% by volume of the filaments, the oil lubricant being a hydrocarbon white oil; and

15

forming the filaments into a multifilament fibre,

wherein the wax is distributed in globules over a surface of each filament and the oil lubricant is present as a film on the surface of each filament, this combination of the wax and oil lubricant substantially preventing the fibre from absorbing moisture by capillary action.

20

25. A method of manufacturing a polymeric plastics material substantially as hereinbefore described with reference to the Example.