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WO 2010/137030 A2 **WO 2001/083599 A1**
WO 1998/043503 A1 **US 5291617 A**

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INT CL **A41B, A61F**
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(54) Title of the Invention: **Underpants**
Abstract Title: **Underpants with a breathable thermoplastic waterproof layer**

(57) Underpants 1 comprise a central section 2 and two side sections 4, 4', a waistband 8 defining a waist opening and a pair of leg openings 10, 10'. The central section 2 comprises an inner layer (16, figure 3), an outer layer (14, figure 3) and a middle layer (30, figure 3). The middle layer is a breathable thermoplastic waterproof layer which is configured to mitigate transfer of fluid from the inner layer to the outer layer.

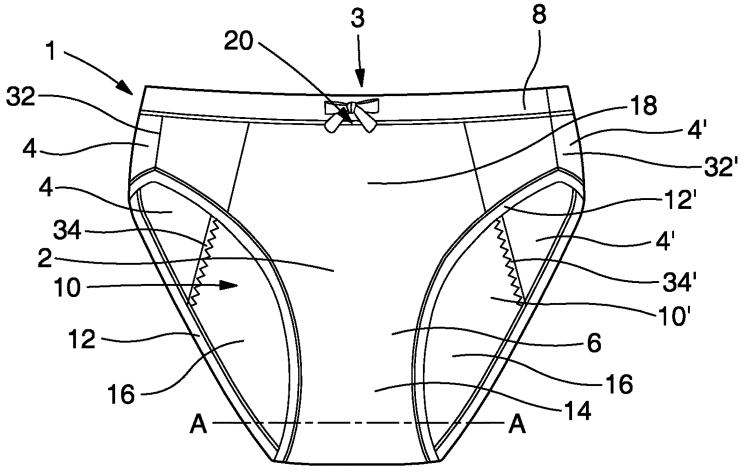

Figure 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

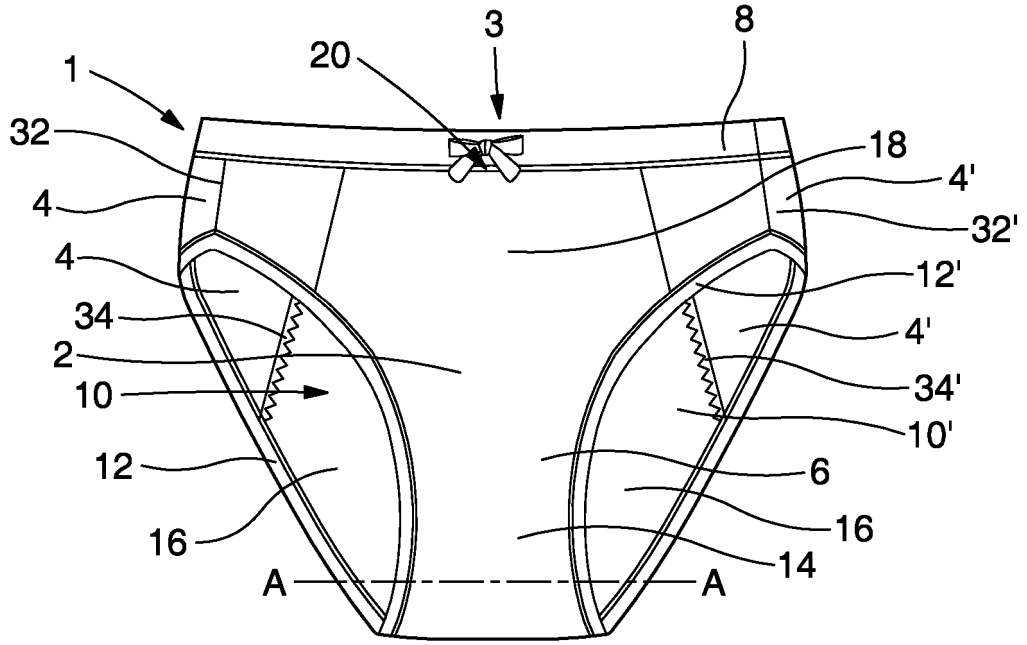

Figure 1

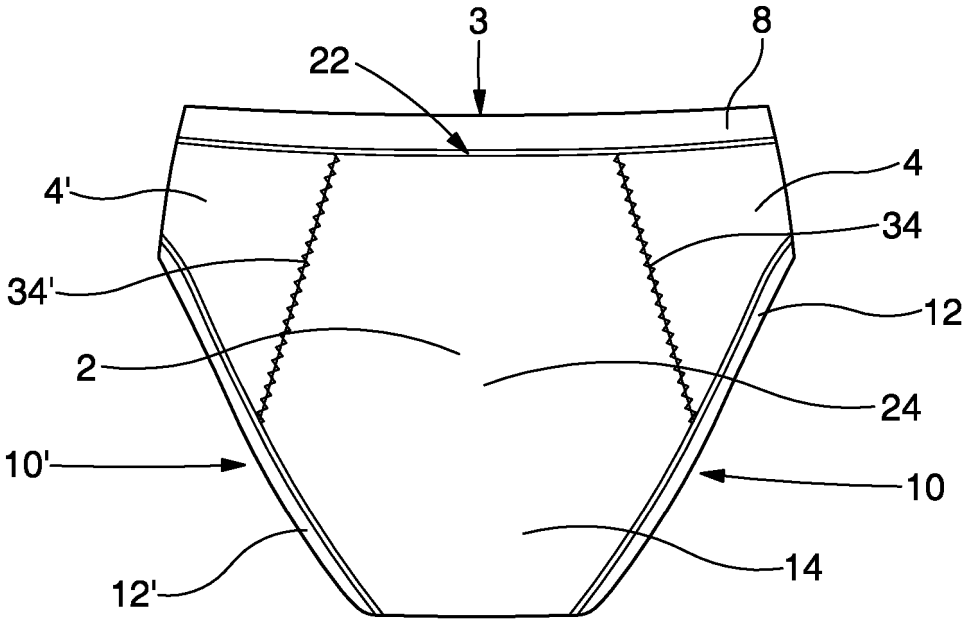

Figure 2

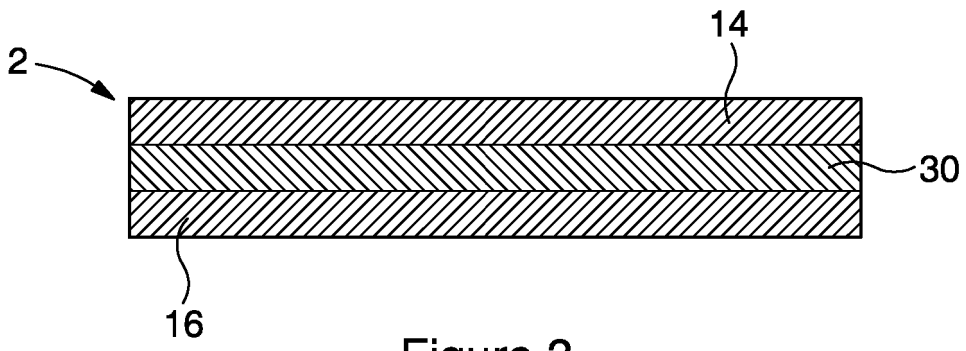

Figure 3

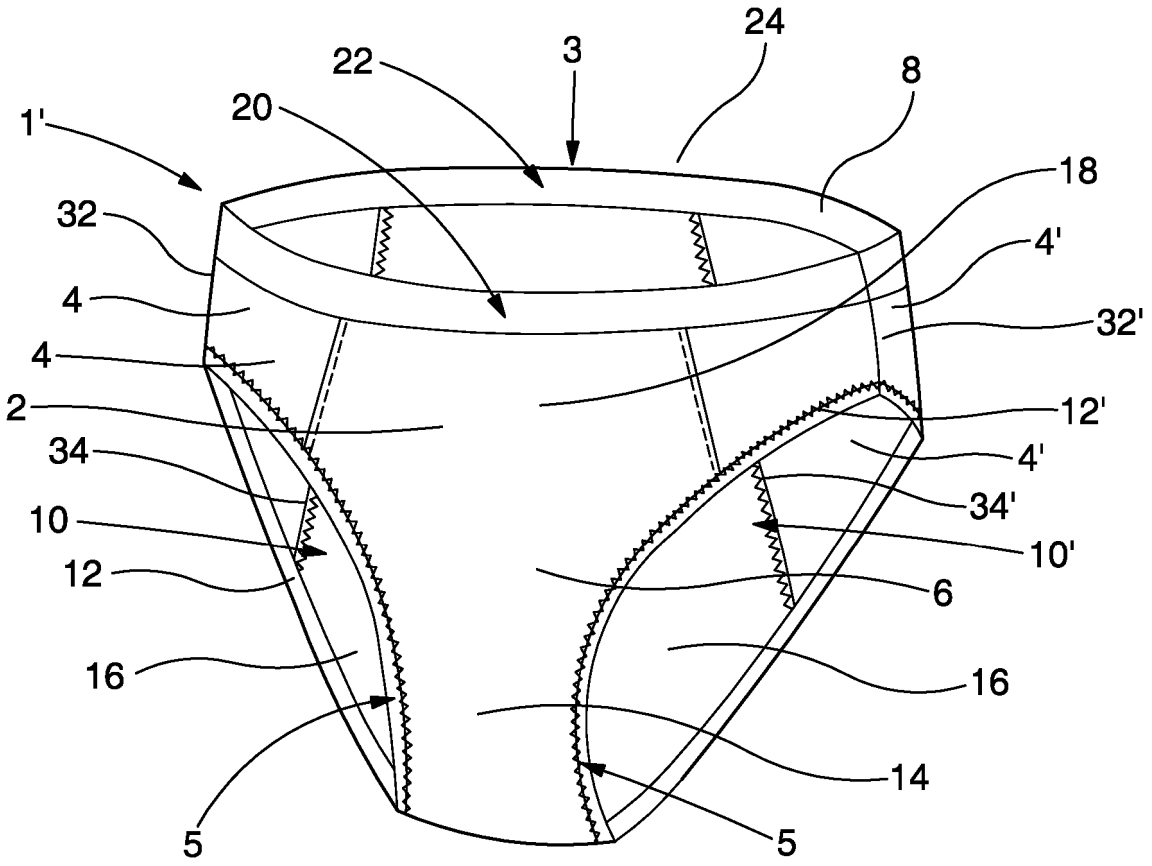

Figure 4

UNDERPANTS

Field of the Invention

This invention relates to underpants for wearing by a user.

Background of the Invention

Many wearers benefit from the use of underpants with at least some waterproofing and/or sealing. Such uses are varied and are generally for mitigating discomfort and obvious visual signs of leakage.

For example, some women experience problems in managing their menstrual cycle. This can range from unpredictability of the timing of menstruation, to predictable menstruation but with a heavy flow. Both of these cases often result in leakage of menstrual fluid, even with the use of tampons and/or sanitary towels. This leakage can cause obvious and embarrassing visual markings on the individual's underpants and/or outer clothing.

Unpredictable menstrual cycles are particularly a problem for young women who are just beginning to menstruate, and who therefore are not adept at managing or predicting their menstrual cycle. This problem can be exacerbated by the unpredictable nature of such young women's menstrual cycles.

The inventors conducted a survey of one hundred teenage women from three separate schools in Glasgow and London. The results revealed that 34% of the surveyed population leaked every single month (i.e., they leaked for every menstrual cycle). Incredibly, the results of the survey also revealed that 91% of the surveyed population were so afraid of experiencing leakage that they actively avoided sports, sleepovers and the

wearing of any light coloured clothing (underpants, shorts, trousers, skirts etc.).

The inventors have noted that peri-menopausal women also experience changes in their menstrual cycle such that it can become unpredictable and uncontrollable, even when there had been no problems previously. Furthermore, the inventors have also noted that post-maternity women experience an unpredictable flow of fluid.

Other users which may benefit from the use of underpants with at least some waterproofing and/or sealing include people who suffer from light stress incontinence, for example women who have weak pelvic floor muscles, for example, after having given birth. Such women often avoid exercise or any physical exertion for fear of leaking. Furthermore, women who have recently given birth may also benefit from the use of underpants with at least some waterproofing and/or sealing, as in the days or weeks after giving birth, there is still an amount of leaking that occurs. Presently, most new mothers are wearing either disposable paper pants or pants they are willing to discard thereafter.

There are currently available several different types of waterproof underpants, or underpants designed for use by women who experience leakage during their menstrual cycle, with stress incontinence or after having given birth. One example is the disposable nappy-like underpants; unfortunately these are uncomfortable, indiscrete and embarrassing to wear. Another example is the re-usable waterproof underpants, which are made from relatively thick neoprene type materials, or swimsuit-like fabrics. Further available waterproof underpants are either very bulky or very noisy, the waterproof material rustling with movement and therefore causing both discomfort and embarrassment.

Ultimately, none of the available waterproof underpants (or underpants designed for use by women who experience leakage during their menstrual cycle, have stress incontinence or after birth) look and feel like ordinary underpants, and therefore they are generally not used. In particular, these underpants are not particularly pleasant to wear and are very indiscrete, making it clear that the wearer is menstruating and/or has a problematic menstrual cycle or the like. This can be acutely embarrassing, particularly for young women and especially for teenage girls.

The inventors have appreciated the shortcomings with such known waterproof underpants.

In particular, it would be of benefit to have underpants that offer at least a degree of mitigation against leakage, but that look and feel substantially like ordinary underpants.

Aims and objects of the invention will become apparent from a reading of the following description.

Summary of the Invention

According to one aspect of the invention there is provided underpants for wearing by a user, said underpants comprising a central section and two side sections positioned either side thereof, a waistband defining a waist opening and positioned at a first terminus of the central section and the two side sections, and a pair of leg openings positioned at a second terminus of the central section and the two side sections, wherein the central section comprises an inner layer, an outer layer and a middle layer, said middle layer being positioned between the inner layer and the outer

layer, and wherein the middle layer is comprised of a substantially waterproof material configured to mitigate transfer of fluid from the inner layer to the outer layer.

The central section may have a front area, a back area and gusset area, said gusset area being located between the front and back areas, the front area terminating at one part of the waistband, and the back area terminating at a second part of the waistband. The first and second areas of the waistband being substantially diametric, or substantially opposite one another. The central section may have a front area, a back area and gusset area, said gusset area being located between the front and back areas, the front area terminating at one part of the waistband, and the back area terminating at a second part of the waistband. The first and second areas of the waistband being substantially opposite one another.

The middle layer may span between approximately the first and approximately the second areas of the waistband. That is, the middle layer may span the entire central section between the front area and the back area thereof. The middle layer may therefore span between the first and second parts of the waistband.

Having the waterproof layer span from waistband to waistband helps to mitigate leakage and gives a feeling of confidence to the user.

Each leg opening may include an elasticated trim. The elasticated trim may extend around the entire leg opening. The elasticated trim may extend around the front area, back area and gusset area of the central section and the side section of the underpants. The elasticated trim ensures that a close fit is provided between the underpants and the user around the leg when in use.

Each elasticated trim may be stitched to the central section and the side section. Each elasticated trim may be stitched to the front area, back area and gusset area of the central section and the side section of the underpants.

The central section may extend around each elasticated trim. The central section may surround the elasticated trim. The central section may extend around the elasticated trim such that the elasticated trim is encased therein.

The central section may extend around the elasticated trim and fastened in place. The central section may be fastened in place by stitching. Stitching may be an example of a fastener. That is, the central section may extend around the elasticated trim and then one or more stitches may be provided to secure the elasticated trim within the extended central section.

The side sections may extend around each elasticated trim. The side sections may surround the elasticated trim. The side sections may extend around the elasticated trim such that the elasticated trim is encased therein.

The side sections may extend around the elasticated trim and fastened in place. The side sections may be fastened in place by stitching. Stitching may be an example of a fastener. That is, the side sections may extend around the elasticated trim and then one or more stitches may be provided to secure the elasticated trim within the extended side sections.

The middle layer may be bonded to at least one of the inner layer and the outer layer.

The middle layer may comprise a first surface which faces the inner layer and a second surface which faces the outer layer, at least one of the first and second surfaces being bonded to at least one of the inner and outer layers respectively. Typically, the second surface of the middle layer is bonded to the outer layer.

The middle layer may be heat bonded.

The middle layer may be a continuous sheet of material.

The substantially waterproof material may comprise thermoplastic polyurethane. Typically the thermoplastic polyurethane is breathable thermoplastic polyurethane.

The substantially waterproof material may be breathable or perspirable.

The substantially waterproof material may have sufficient permeability to enable water vapour to permeate, whilst still retaining liquid water and the like.

The substantially waterproof material may be permeable to approximately 500 g of water vapour per m^2 of material per 24 hours.

The substantially waterproof material may have a maximum vapour permeability (MVP) of approximately 500 g of water vapour per m^2 of material per 24 hours.

The substantially waterproof material may have a thickness of approximately 10 µm to approximately 15 µm, optionally 12 µm.

The minimum width of the central section may be from about 8 cm to about 10 cm, optionally 9 cm.

Having a gusset area of this minimum width helps to retain leakage and sanitary towels, and gives a feeling of confidence to the wearer.

The inner layer, and optionally the outer layer and/or the side sections may comprise cotton modal, typically 95% cotton modal and optionally 5% elastane. The inner layer, and optionally the outer layer and/or the side sections may be entirely cotton modal. That is, the inner layer, and optionally the outer layer and/or the side sections may be made from 100% cotton modal. The inner layer, and optionally the outer layer and/or the side sections may comprise viscose, typically 96% viscose and optionally 4% elastane.

Brief Description of the Drawings

Embodiments of the invention will now be described, by way of example only, with reference to the drawings, in which:

Fig. 1 is a front view of the underpants according to a first embodiment of the present invention;

Fig. 2 is a back view of the underpants of Figure 1;

Fig. 3 is a cross-sectional view of the middle section of the underpants of Figures 1 and 2; and

Fig. 4 is a front view of the underpants according to a second embodiment of the present invention.

Detailed Description

Referring to Figures 1 to 3, underpants according to this embodiment are shown at 1 and are constructed from a 95% cotton modal and 5% elastane fabric. However, it should be appreciated that the underpants 1 may be made entirely from cotton modal, i.e. 100% cotton modal, or the underpants may be made from 96% viscose and 4% elastane. The underpants 1 have a central section 2, either side of which is positioned side sections 4, 4'. In this embodiment, the central section 2 and the side sections 4, 4' are formed from one piece of material, although it will be appreciated that the central section 2 and the side sections 4, 4' could also be formed from more than one piece of material, stitched or glued together.

Positioned at a waist opening 3 of the underpants 1, and attached to both the central section 2 and the side sections 4, 4' is an elasticated waistband 8, which is around 2 cm in width. Also, positioned at the leg openings 10, 10' of the underpants 1 are elasticated trims 12, 12', which are around 1 cm in width. Side seams 32, 32' are located between the waistband 8 and the leg openings 10, 10' and, when combined with the waistband, may be of a width of 6 cm to 7 cm, depending on the intended size of the underpants. Also shown is the outer layer 14 of the central section 2 and the stitching 34, 34' which is used to attach the outer 14 and middle layers 30 (see Figure 3) to the inner layer 16.

The central section 2 has a gusset area 6, at which point the central section 2 is at its narrowest. The gusset area 6 is 9 cm in width and can in other embodiments be from around 8 cm to around 10 cm in width. The central section 2 also has an outer layer 14 and an inner layer 16, both of which are made from 95% cotton modal and 5% elastane, or 100% cotton modal, or 96% viscose and 4% elastane, and between which is

located a breathable thermoplastic polyurethane waterproof layer 30 (see Figure 3). The waterproof material 30 is configured to mitigate transfer of fluid from the inner layer 16 to the outer layer 14.

Referring now to Figure 3, there is shown cross-section A-A of Figure 1, being a cross-section of the central section 2. Located in the central section 2 is an outer layer 14 and an inner layer 16, both of which are made from 95% cotton modal and 5% elastane, or 100% cotton modal, or 96% viscose and 4% elastane. Located between the outer layer 14 and the inner layer 16 is a middle waterproof breathable thermoplastic polyurethane layer 30. The middle waterproof breathable thermoplastic polyurethane layer 30 may have a thickness of 12 µm. The thermoplastic polyurethane layer 30 has a maximum vapour permeability (MVP) of approximately 500 g of water vapour per m^2 of material per 24 hours. One surface of the thermoplastic polyurethane layer 30 is bonded to the outer layer 16 using heat (i.e., it is heat bonded). The thermoplastic polyurethane layer 30 is a continuous sheet of material, which helps to mitigate potential leaks.

The thermoplastic polyurethane layer 30 has sufficient permeability to enable water vapour to permeate, whilst still retaining liquid water and the like. Therefore it is breathable or perspirable.

Whilst in the above embodiment the thermoplastic polyurethane layer 30 is bonded to the outer layer 16, it will be appreciated that in an alternative embodiment the thermoplastic polyurethane layer 30 may be bonded to the inner layer 14. Alternatively both surfaces of the thermoplastic polyurethane layer 30 may be bonded to the outer layer 16 and the inner layer 14. Also, whilst in the embodiment above the thickness of the thermoplastic polyurethane layer 30 is 12 µm, it will be appreciated that

this thickness can be varied whilst still retaining a useable product. For example, the material may have a thickness of approximately 10 µm to approximately 15 µm. In addition, the bonding of the thermoplastic polyurethane layer 30 may be achieved using standard textile glue rather than heat.

The breathability of a material can be measured and defined in terms of the Moisture Vapour Transmission, which is the amount of water vapour in grams per m^2 of material per 24 hours that can pass through a material. This can be measured using several industry standard tests such as the ASTM E 96 upright water cup method. Materials are sometimes referred to in terms of their Maximum Vapour Permeability, which is the maximum amount of vapour in grams per m^2 that will permeate the material in a 24 hour period, again as determined using industry standard methods.

Referring to both Figures 1 and 2, the central section 2 has a front area 18, a back area 24 and gusset area 6, said gusset area 6 located between the front 18 and back 24 areas, the front area 18 terminating at one part 20 of the waistband 8, and the back area 24 terminating at a second part 22 of the waistband 8, the first part 20 and second part 22 of the waistband 8 are located on opposite sides of the waistband 8.

Referring to Figures 1 to 3 the middle layer 30 of the central section 2 extends from the first part 20 to the second part 22 of the waistband 8.

The underpants 1 of the present invention may be constructed as follows. An outer panel (outer layer 16) is cut from 95% cotton modal and 5% elastane, or 100% cotton modal, or 96% viscose and 4% elastane, and a similarly sized breathable thermoplastic polyurethane (middle layer 30) is adhered to one side of the outer panel (outer layer 16) using heat, which

bonds the thermoplastic polyurethane (middle layer 30) to the outer panel (outer layer 16). The combined outer panel/thermoplastic polyurethane (outer layer 16/middle layer 30) is then stitched to the main body (inner layer 14) of the underpants 1, which have been prepared using conventional textile methods, and which also includes the attachment of the waistband 8 and elasticated trims 12, 12'. The section of the main body (inner layer 14) of the underpants 1 to which the combined outer panel/thermoplastic polyurethane (outer layer 16/middle layer 30) is stitched forms an inner layer, which is designed to be in contact with the wearer's skin when in use. The areas to the side of where the combined outer panel/thermoplastic polyurethane (outer layer 16/middle layer 30) is stitched form side sections (side sections 4, 4'). The area where the combined outer panel/thermoplastic polyurethane (outer layer 16/middle layer 30) is stitched, along with the main body (inner layer 14) of the underpants 1 to which it is stitched, forms a central section (central section 2).

In use the underpants 1 are worn by a user along with their normal sanitary towel or tampon. Alternatively, the underpants 1 are carried by a user routinely and are put on if the user's menstrual cycle commences.

Referring to Figure 4, underpants according to a second embodiment are shown at 1'. The general construction of the underpants 1' of the second embodiment is similar to the underpants 1 of the first embodiment. The same reference numerals have been used for the same components of the underpants 1' of the second embodiment. However, the underpants 1' of the second embodiment differ to the underpants 1 of the first embodiment in that the elasticated trims 12, 12' at the leg openings 10, 10' are encased within the waterproof layer 30. In order to achieve this, the central section 2 (which includes the inner layer 14, breathable

thermoplastic polyurethane waterproof layer 30 and outer layer 16) extends around the elasticated trims 12, 12' to enclose the elasticated trims 12, 12' therein. That is, the elasticated trims 12, 12' are sandwiched, or encapsulated, by the central section 2. As illustrated in Figure 4, the central section 2 extends around the elasticated trims 12, 12' and is secured in place by stiches 5. This arrangement provides additional leakage protection in this area.

The inner layer 14 at the side sections 4, 4' may also extend around the elasticated trims 12, 12' and be secured in place by stitches 5.

Referring to Figure 4, underpants according to this embodiment are shown at 1' and are constructed from a 95% cotton modal and 5% elastane fabric. However, it should be appreciated that the underpants 1' may be made entirely from cotton modal, i.e. 100% cotton modal, or 96% viscose and 4% elastane. The underpants 1' have a central section 2, either side of which is positioned side sections 4, 4'. In this embodiment, the central section 2 and the side sections 4, 4' are formed from one piece of material, although it will be appreciated that the central section 2 and the side sections 4, 4' could also be formed from more than one piece of material, stitched or glued together.

Positioned at a waist opening 3 of the underpants 1', and attached to both the central section 2 and the side sections 4, 4' is an elasticated waistband 8, which is around 2 cm in width. Also, positioned at the leg openings 10, 10' of the underpants 1' are elasticated trims 12, 12', which are around 1' cm in width. Side seams 32, 32' are located between the waistband 8 and the leg openings 10, 10' and, when combined with the waistband 8, may be of a width of 6 cm to 7 cm, depending on the intended size of the underpants 1'. Also shown is the outer layer 14 of the central section 2

and the stitching 34, 34' which is used to attach the outer 14 and middle layers 30 (see Figure 3) to the inner layer 16.

The central section 2 has a gusset area 6, at which point the central section 2 is at its narrowest. The gusset area 6 is 9 cm in width and can in other embodiments be from around 8 cm to around 10 cm in width. The central section 2 also has an outer layer 14 and an inner layer 16, both of which are made from 95% cotton modal and 5% elastane, or 100% cotton modal, or 96% viscose and 4% elastane, and between which is located a breathable thermoplastic polyurethane waterproof layer 30 (see Figure 3). The waterproof material 30 is configured to mitigate transfer of fluid from the inner layer 16 to the outer layer 14.

The construction of the central section 2 is as described with reference to Figure 3 above. Located in the central section 2 is an outer layer 14 and an inner layer 16, both of which are made from 95% cotton modal and 5% elastane, or 100% cotton modal, or 96% viscose and 4% elastane. Located between the outer layer 14 and the inner layer 16 is a middle waterproof breathable thermoplastic polyurethane layer 30. The middle waterproof breathable thermoplastic polyurethane layer 30 may have a thickness of 12 μm. The thermoplastic polyurethane layer 30 has a maximum vapour permeability (MVP) of approximately 500 g of water vapour per m^2 of material per 24 hours. One surface of the thermoplastic polyurethane layer 30 is bonded to the outer layer 16 using heat (i.e., it is heat bonded). The thermoplastic polyurethane layer 30 is a continuous sheet of material, which helps to mitigate potential leaks.

The thermoplastic polyurethane layer 30 has sufficient permeability to enable water vapour to permeate, whilst still retaining liquid water and the like. Therefore it is breathable or perspirable.

Whilst in the above embodiment the thermoplastic polyurethane layer 30 is bonded to the outer layer 16, it will be appreciated that in an alternative embodiment the thermoplastic polyurethane layer 30 may be bonded to the inner layer 14. Alternatively both surfaces of the thermoplastic polyurethane layer 30 may be bonded to the outer layer 16 and the inner layer 14. Also, whilst in the embodiment above the thickness of the thermoplastic polyurethane layer 30 is 12 μm, it will be appreciated that this thickness can be varied whilst still retaining a useable product. For example, the material may have a thickness of approximately 10 μm to approximately 15 μm. In addition, the bonding of the thermoplastic polyurethane layer 30 may be achieved using standard textile glue rather than heat.

The breathability of a material can be measured and defined in terms of the Moisture Vapour Transmission, which is the amount of water vapour in grams per m^2 of material per 24 hours that can pass through a material. This can be measured using several industry standard tests such as the ASTM E 96 upright water cup method. Materials are sometimes referred to in terms of their Maximum Vapour Permeability, which is the maximum amount of vapour in grams per m^2 that will permeate the material in a 24 hour period, again as determined using industry standard methods.

The central section 2 has a front area 18, a back area 24 and gusset area 6, said gusset area 6 located between the front 18 and back 24 areas, the front area 18 terminating at one part 20 of the waistband 8, and the back area 24 terminating at a second part 22 of the waistband 8, the first part 20 and second part 22 of the waistband 8 are located on opposite sides of the waistband 8.

The middle layer 30 of the central section 2 extends from the first part 20 to the second part 22 of the waistband 8.

The underpants 1' of the second embodiment are constructed as follows. An outer panel (outer layer 16) is cut from 95% cotton modal and 5% elastane, or 100% cotton modal, or 96% viscose and 4% elastane, and a similarly sized breathable thermoplastic polyurethane (middle layer 30) is adhered to one side of the outer panel (outer layer 16) using heat, which bonds the thermoplastic polyurethane (middle layer 30) to the outer panel (outer layer 16). The combined outer panel/thermoplastic polyurethane (outer layer 16/middle layer 30) is then stitched to the main body (inner layer 14) of the underpants 1', which have been prepared using conventional textile methods, and which also includes the attachment of the waistband 8 and elasticated trims 12, 12'. The central section 2 is then wrapped around the elasticated trims 12, 12' and secured with stitches 5. The side sections 4, 4' may also be wrapped around the elasticated trims 12, 12' and secured by stitches 5. The section of the main body (inner layer 14) of the underpants 1' to which the combined outer panel/thermoplastic polyurethane (outer layer 16/middle layer 30) is stitched forms an inner layer, which is designed to be in contact with the wearer's skin when in use. The areas to the side of where the combined outer panel/thermoplastic polyurethane (outer layer 16/middle layer 30) is stitched form side sections (side sections 4, 4'). The area where the combined outer panel/thermoplastic polyurethane (outer layer 16/middle layer 30) is stitched, along with the main body (inner layer 14) of the underpants 1' to which it is stitched, forms a central section (central section 2).

In use the underpants 1' are worn by a user along with their normal sanitary towel or tampon. Alternatively, the underpants 1' are carried by a user routinely and are put on if the user's menstrual cycle commences.

The underpants 1, 1' of the present invention offer mitigation against leakage, but also look and feel like ordinary underpants. Specifically, the underpants 1, 1' of the present invention have a normal shape and weight, and to the user feel like they are made from normal underpants material. This is achieved by enclosing the waterproof layer 30 within two cotton modal/elastane layers, or viscose/elastane (inner layer 14 and outer layer 16). Furthermore, the bonding of the waterproof layer 30 to the cotton modal/elastane or viscose/elastane layer(s) (inner layer 14 and outer layer 16) prevents the waterproof layer 30 from rustling or crackling, which generally provides an unpleasant feel and embarrassment for the wearer. The underpants 1' of the present invention also provide additional leakage protection by encasing the elasticated trims 12, 12' with the central section 2, as described above.

As the underpants 1, 1' of the present invention look and feel like ordinary underpants, they are very discrete and are therefore much more likely to be used; this is in contrast to waterproof underpants currently on the market. In particular, the underpants 1, 1' of the present invention are much more likely to be used by young women and especially teenage girls, for whom leakage or the wearing of conventional waterproof underpants can be acutely embarrassing.

Therefore, the underpants 1 1' of the present invention will go some way to reduce the large number of young women who experience leakage every single month (i.e., every menstrual cycle), and the even larger number of young women who are so afraid of experiencing leakage that

they actively avoid sports, sleepovers and the wearing of any light coloured clothing (underpants, shorts, trousers, skirts etc.).

As noted above, the underpants 1, 1' of the present invention are particularly advantageous in their use by women who experience problems in managing their menstrual cycle, which can often result in leakage of menstrual fluid, even with the use of tampons and/or sanitary towels. This leakage would ordinarily cause obvious and embarrassing visual markings on the individual's underpants and/or outer clothing. Advantageously, any visual sign of such leakage (such as marking of underpants or outer clothing) is mitigated by the underpants described herein.

In addition, the underpants 1, 1' of the present invention will help to mitigate leakage experienced by other groups of women such as peri-menopausal women, post-maternity women, and women who generally have an unpredictable cycle or a heavy flow. They may also be used by individuals that suffer mild stress incontinence, or in conjunction with nappies or napkins or the like for individuals that experience more severe incontinence.

Furthermore, the underpants 1, 1' of the present invention will help to mitigate leakage experienced by both people who suffer from light stress incontinence and women who have recently given birth to children.

While this invention has been described with reference to the sample embodiments thereof, it will be appreciated by those of ordinary skill in the art that modifications can be made to the structure and elements of the invention without departing from the spirit and scope of the invention as a whole.

CLAIMS

1. Underpants for wearing by a user, said underpants comprising a central section and two side sections positioned either side thereof, a waistband defining a waist opening and positioned at a first terminus of the central section and the two side sections, and a pair of leg openings positioned at a second terminus of the central section and the two side sections, wherein the central section comprises an inner layer, an outer layer and a middle layer, said middle layer being positioned between the inner layer and the outer layer, and wherein the middle layer is comprised of a substantially waterproof material configured to mitigate transfer of fluid from the inner layer to the outer layer.

2. Underpants according to claim 1, wherein the central section has a front area, a back area and gusset area, said gusset area being located between the front and back areas, the front area terminating at one part of the waistband, and the back area terminating at a second part of the waistband, the first and second areas of the waistband being substantially arranged opposite one another.

3. Underpants according to claim 2, wherein the middle layer spans between approximately the first and approximately the second areas of the waistband.

4. Underpants according to claim 2 or claim 3, wherein each leg opening includes an elasticated trim extending around the front area, the back area and the gusset of the central section and the

side section, and the central section extends around the elasticated trim to enclose the elasticated trim therein.

5. Underpants according to claim 4, wherein the central section is secured in place with respect to the elasticated trim with a fastener.

6. Underpants according to any preceding claim, wherein the middle layer is bonded to at least one of the inner layer and the outer layer.

7. Underpants according to claim 6, wherein the middle layer comprises a first surface which faces the inner layer and a second surface which faces the outer layer, at least one of the first and second surfaces being bonded to at least one of the inner and outer layers respectively.

8. Underpants according to claim 7, wherein the second surface of the middle layer is bonded to the outer layer.

9. Underpants according to any one of claims 6 to 8, wherein the middle layer is heat bonded.

10. Underpants according to any preceding claim, wherein the middle layer is a continuous sheet of material.

11. Underpants according to any preceding claim, wherein the substantially waterproof material comprises thermoplastic polyurethane.

12. Underpants according to claim 11, wherein the thermoplastic polyurethane is breathable thermoplastic polyurethane.

13. Underpants according to any preceding claim, wherein the substantially waterproof material has sufficient permeability to enable water vapour to permeate, whilst still retaining liquid water and the like.

14. Underpants according to any preceding claim, wherein the substantially waterproof material is permeable to approximately 500 g of water vapour per m^2 of material per 24 hours.

15. Underpants according to any preceding claim, wherein the substantially waterproof material has a maximum vapour permeability (MVP) of approximately 500 g of water vapour per m^2 of material per 24 hours.

16. Underpants according to any preceding claim, wherein the substantially waterproof material has a thickness of approximately 10 µm to 15 µm, optionally 12 µm.

17. Underpants according to any preceding claim, wherein the minimum width of the central section is from about 8 cm to 10 cm, optionally 9 cm.

18. Underpants according to any preceding claim, wherein the inner layer, and optionally the outer layer and/or the side sections comprise cotton modal, or viscose.

19. Underpants according to any of claims 1 to 17, wherein the inner layer, and optionally the outer layer and/or the side sections are cotton modal, or viscose.

Intellectual Property Office

Application No: GB1317386.9 **Examiner:** Mr Philip J. Roe

Claims searched: 1-19 **Date of search:** 12 March 2014

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-19	WO98/43503 A1 (ECHEVERRIA) see WPI Abstract Accession No. 1999/131680 and all figures, especially figure 3.
X	1-19	WO 2010/137030 A2 (KUMAR) see whole document, especially page 12 line 31 - page 13 line 10.
X	1-19	WO 01/83599 A1 KIMBERLEY-CLARK WORLDWIDE INC), see whole document, especially figure 2.
X	1-19	US 5291617 A (MORETZ et al) see whole document, especially col 6 lines 43-68.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A41B; A61F

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
A41B	0009/04	01/01/2006
A61F	0013/496	01/01/2006