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(54) **Hosiery item**

(57) A hosiery item comprising a hosiery leg or body having an open top, and having adhered thereto with an adhesive a trim (12).

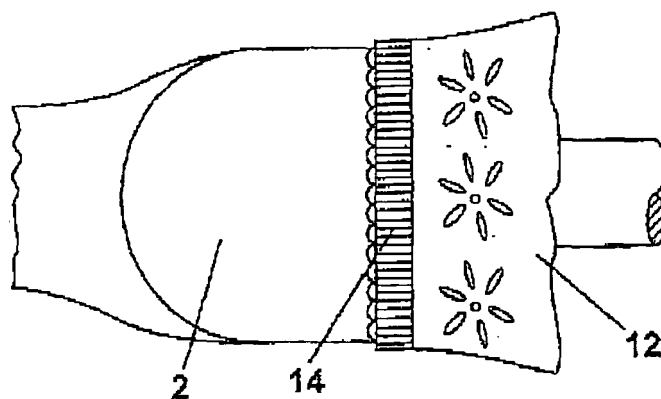


Fig. 3

Description

[0001] This invention relates to hosiery items, including but not limited to stockings) "hold-ups" (i.e. self-suspending stockings) and "knee high" hosiery items, having an adhered trim, as well as pantyhose (tights) and other lengths (e.g. ankle or calf length, ideally having a welt). The invention also relates to a method of manufacturing improved hosiery items.

[0002] It is known that hosiery items such as stockings and hold-ups have attached at their tops a trim. Such trims can take a variety of forms, be made of natural or synthetic materials, and be functional, decorative or both. Tights may also have a both. In the context of the invention tights are synonymous with pantyhose, and a pair of tights typically comprises a body or panty portion having an open top or waistband, with two legs depending from the body portion..

[0003] Conventionally, the trim on a hosiery item such as a stocking or hold up, or the provision of a waistband trim on tights, has been attached to the top of the hosiery item by stitching. Whilst such a method of attachment has generally been adequate in terms of providing the required mechanical strength, it has been less than satisfactory in other ways.

[0004] In more detail, attaching the trim to a stocking, hold up or tights by stitching is labour intensive and time-consuming, and therefore an expensive operation. The resulting hosiery items can also cause a level of discomfort to the user by virtue of the resultant stitched seam, which has a tendency to protrude from the hosiery item. This can dig into the skin of the user when worn, causing an impression to be left on the wearer's skin.

[0005] It is also possible that because the leg or waistband of the hosiery item and the trim are typically made of dissimilar materials, unless the stitching of the trim to the hosiery item is performed accurately and skilfully, there may arise a discontinuity in stretch characteristics, with the stretch characteristics of the trim less than optimally mated to those of the principal fabric used in the hosiery item.

[0006] In addition, attempts to ultrasonically weld trims to hosiery items typically made of nylon such as stockings were unsuccessful, since the nylon so treated becomes brittle and loses elasticity, and the band lacks integrity.

[0007] In a first aspect of the invention, there is provided hosiery item comprising a hosiery leg or body having an open top, and having adhered thereto with an adhesive a trim.

[0008] The resultant hosiery item is conveniently easier quicker and less labour-intensive to make by processes which more readily lend themselves to automation, and provides a hosiery item which is more comfortable to wear, by virtue of the garment not having a protruding seam which can dig into the leg or waist of a wearer, and which may provide improved aesthetic appearance, with no seams being visible through outer clothing. It may also have the benefit that as the trim - and the leg or waistband

of the hosiery item are stretchable, the two parts of the assembled hosiery item may be better able to stretch together.

[0009] Also provided according to a further aspect of the invention is a method of attaching a trim to a hosiery item such as a stocking, hold up, knee high, calf or ankle length items or tights having an open top, comprising the step of stretching the open top of the hosiery item over a mould to stretch it to a pre-determined size, and adhering to the open top a length of trim material.

[0010] Conveniently the resultant hosiery items can contain no stitching at all; conveniently the resultant hosiery items have no stitching attaching the trim to the leg or waistband of the hosiery item.

[0011] In the context of the invention, a welt is considered to be a reinforced edge of a hosiery item, and is often found on hosiery items, for example around the open top of the leg of a stocking, hold up, knee high or calf/ankle length item, or around the waistband of tights.

[0012] Conveniently the hosiery item has a welt around the periphery of the open top, which is stretched over the mould to a predetermined size, the length of trim material being subsequently adhered to welt.

[0013] In the context of tights, the hosiery item may contain no stitching except in the gusset.

[0014] The adhesive used according to the invention is conveniently a. thermoplastic adhesive and conveniently is heat or pressure activated, or both Conveniently it may be adapted to be applied in a number of ways, including but not limited to being applied as a film, a powder, a print, a web, a hot melt or as a spray. The adhesive used according to the invention conveniently has elastomeric properties once cured.

[0015] The adhesive material utilized can be of the type that is activated and has adhesive properties immediately upon application to a layer of the fabric material, or of the type which must be separately activated to exhibit its adhesive properties, of which thermoplastic or pressure activated adhesives are a preferred example. Thermoplastic adhesives are typically dry to the touch prior to activation. Preferred thermoplastic adhesives are polyamides, polyurethanes polyethers and polymethacrylates, as well as silicone adhesives. A preferred polyamide thermoplastic adhesive for use in the present invention is a ternary elastomer having a melting temperature in the range of from 60°C to 120°C. A specific suitable and preferred adhesive is Bemis 3410-001, a polyurethane adhesive with a softening point of 124°C, available from Bemis, Grantham, United Kingdom.

[0016] The adhesive used in the hosiery item of the invention should provide integrity to the hosiery item at washing temperatures of at least 40°C, preferably at least 60°C.

[0017] The adhesive material used in the invention may be applied to one or both surfaces e.g. a welt at the top of the leg or body of the hosiery item, the trim, or to both. Once properly aligned and positioned, the surfaces may then be caused to adhere to each other. Although

adhesion through the entire thickness of the fabric of the leg or the trim is not required, it is desirable that the trim is adhered to the open top of the hosiery item around its entire periphery. Such adhesion can be either intermittent by e.g. using spot adhesion, or it can be continuous

[0018] A suitable process utilizing a thermoplastic or pressure sensitive adhesive involves the formation of both chemical and physical bonds between the adhesive material, the trim and the open top of the leg or body of the hosiery item, due to a combination of temperature and/or pressure effects. However, the adhesive process of the invention does not so restrict or bind the fabrics or the interstitial spacings or pores to significantly impair stretch characteristics.

[0019] If a thermoplastic adhesive is utilized which in some embodiments is preferred, the temperature at which the heating stage to activate the adhesive is conducted must be at or slightly above the melt temperature of the adhesive. However, the heating temperature must be below that which would cause damage to or affect the physical characteristics of the trim or the leg or body of the hosiery item. Conveniently the manufacturing process for manufacture of an item according to the invention utilises a cooling stage at a lower temperature than the heating stage, which causes the adhesive material, particularly a thermoplastic adhesive which is still in a molten or semi-molten stage, to be cooled and to form chemical and physical bonds with the fabric layers.

[0020] The adhesion stage, e.g. the heating stage may be carried out at pressures which are sufficient to cause the molten adhesive to spread and bond with the trim and hosiery item leg or body, without penetrating or bleeding through the fabric, whilst bonding with the fabric layers.

[0021] Any cooling stage may be carried out at a pressure sufficient to maintain the trim and leg or body of the hosiery item together until the adhesive cures and seals the trim and leg or body together.

[0022] Conveniently the dwell time for each of the heating and cooling stages may be in the region of about 2 seconds up to about 100 seconds. Determination of the dwell times for each of the heating and cooling steps may be determined by the skilled person based on the nature of the trim and leg fabrics.

[0023] The trim used in the hosiery items of the invention can be made of synthetic or natural fibres. It is most preferably elastic in its properties. It can simply be a decorative trim, in the case of stockings, or in the case of hold ups or tights, it can have on its inside skin-facing surface one or more friction bands, conveniently made of silicone, for allowing the hold up or tights to be self-suspending. Such friction bands and their attachment to the trim of a hosiery item are well known in the art.

[0024] The leg or body of the hosiery item may be made of any fabrics from which hosiery items such as stockings, hold ups, knee highs and tights are conventionally made. Known suitable materials include nylon, cotton and elastanes. Preferably, the substrate of the hosiery item has a

denier of 5 to 150, which has conveniently been circular knitted and conveniently is low density. Preferably, the adhesive is compatible with the substrate of the hosiery item, in that after the adhesion step is performed the trim has integrity with the hosiery substrate (e.g. the welt or body of the leg of the hosiery item).

[0025] In an envisaged process, according to the invention, the leg or body of the hosiery item such as a stocking, hold up, knee high, calf/ankle length item, or tights will be manufactured with a welt surrounding the top of the leg or the waistband of the hosiery item and the toe closed, by conventional and known techniques. The hosiery item will then be passed to a station where it has the welt stretched to a known diameter. This can be achieved for example by putting the welt of the hosiery item over a mould, conveniently a domed or conical mould, and pulling the welt to a known pre-determined position on the mould, at which point the welt of the hosiery item is stretched to a known size. At this point a pre-prepared length of trim may be formed into a band of a predetermined size, and the band passed over the mould, so that it lies in juxtaposition with the welt. Pre-applied adhesive (applied either to the welt, the trim band or both) is then caused to be activated, conveniently heat activated, so that the trim band may be caused to adhere to the welt.

[0026] In a variation on this method, instead of applying the trim as a pre-prepared band, it may be applied to the welt as a strip, the ends of which may be subsequently or simultaneously joined to form a band, by, the same curing step as is used to adhere the trim to the welt

[0027] The invention will now be described by way of example only with reference to the accompanying figures, in which:

Figures 1 to 5 show schematically a process for manufacturing a hosiery item according to the invention. The equipment and process shown in the figures is particularly suitable for producing a stocking according to the invention.

[0028] Figure 1 shows a hemispherical mould 2 onto which an open top of a stocking may be inserted. The mould is shown as hemispherical, though it could just as readily be frusto-conical. The mould typically has a circumference of 40 to 50 cm. Adjacent its base 4 it has a circumferential recess 6. When the stocking is loaded onto the mould from the left-hand side as shown in Figure 1 by passing it onto the open top of an unfinished stocking, the open top or welt if one has already been manufactured into the stocking being collocated in circumferential recess 6. Figure 1 also shows in cross-section semi-circular heating blocks 8, 10, which may be located above and below circumferential recess 6, and can be reciprocated such that they may be actioned to closely fit into and abut circumferential recess 6. Figure 2 shows a number of ways in which a decorative trim 12 for attachment to the stocking can be prepared,

[0029] In Figure 2a the trim 12 is shown which can conveniently be made of synthetic lace. The trim is 8cm wide, and has attached on one surface a 1cm wide band of thermoplastic adhesive tape 14. The trim is subsequently cut to a desired length.

[0030] In Figure 2b there is shown an alternative method of preparation of the trim. This is generally similar to that shown in Figure 2a, except that on both ends of the trim there have additionally been attached similar strips of thermoplastic adhesive. This way, the ends of the trim can be joined either before or after application of the trim to the stocking.

[0031] Figure 2c indicates a third way of preparing the trim by joining the ends of the trim using a standard heat press. In this embodiment the trim has been prepared to have an internal peripheral band of thermoplastic adhesive (not shown).

[0032] In use, as shown in Figure 3, once the stocking is loaded onto the hemispherical mould 2 with a welt located in the circumferential recess 4, the trim is manipulated such that the adhesive band on the trim overlays the welt of the stocking. The heating blocks are then advanced, for example on reciprocating pistons (see Figure 4), so as to apply heat and pressure to the outside of the trim, and thereby cause the thermoplastic adhesive on the trim to adhere to the welt of the stocking.

[0033] In a preferred embodiment, the process for adhering the trim to a stocking can be a four-stage automated process. In the first stage, a stocking may be loaded onto a mould in the manner described and shown for example in Figure 3. In the second stage, the mould may be moved to a position where it is located proximally to a pair of heating blocks as described above, and the trim may be adhered to the welt by a combination of heat and pressure, as shown for example in Figure 4. Next the mould may be moved onto a third stage, where a cooling step may occur. This may utilize similar equipment shown in Figure 4, except that cooling pads are substituted for heating pads. Finally, the mould can be moved to a fourth position, at which the assembled stocking is unloaded. From the fourth position, the mould can be returned to the first position in the process, at which a stocking is loaded onto the mould, in readiness for a further heating/assembly step. This is shown schematically in Figure 5.

Claims

1. A hosiery item comprising a hosiery leg or body having an open top, and having adhered thereto with an adhesive a trim.
2. A hosiery item according to Claim 1, wherein the hosiery item contains no stitching.
3. A hosiery item according to Claim 2, wherein the hosiery item has no stitching attaching the trim to the hosiery leg.

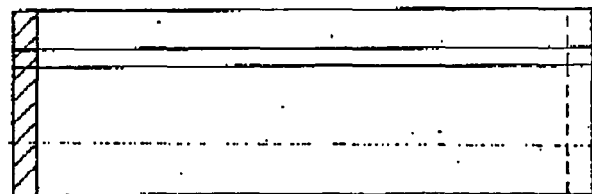
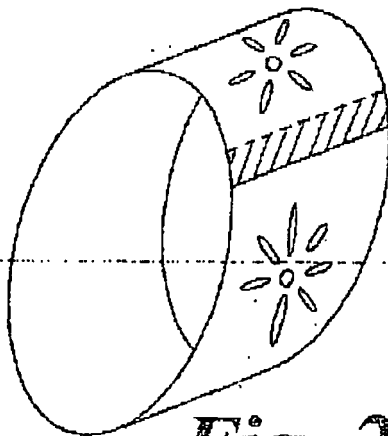
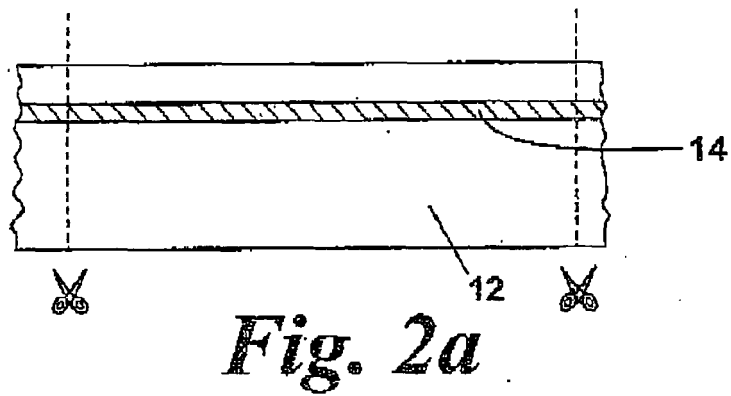
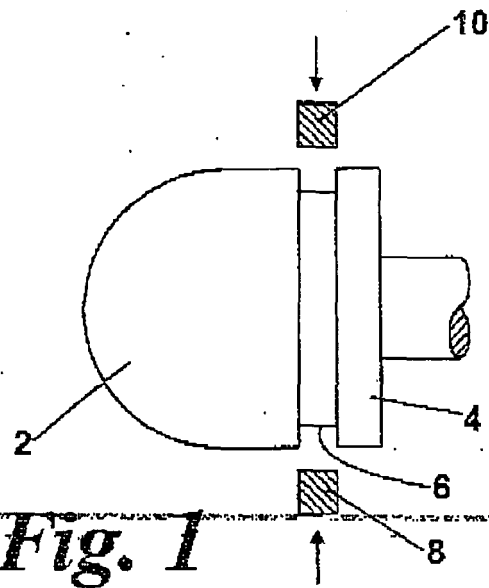
4. A hosiery item according to Claim 1, wherein the hosiery item is a pair of tights, and the only stitching in the tights is in the gusset.
5. A hosiery item according to any one of the preceding claims, wherein the adhesive is a thermoplastic adhesive or a pressure sensitive adhesive, preferably a thermoplastic adhesive.
6. A hosiery item according to Claim 5, wherein the thermoplastic adhesive is heat activated.
7. A hosiery item according to any one of the preceding claims, wherein the adhesive is in the form of a hot melt, power, print, web or an aerosol spray.
8. A hosiery item according to any one of the preceding claims, wherein the adhesive is a polyamide, polyurethane polyether, polymethacrylate or a silicone adhesive.
9. A hosiery item according to any one of the preceding claims, wherein the adhesive has a melting temperature of 60°C to 120°C.
10. A hosiery item according to any one of the preceding claims, wherein the hosiery item has a welt
11. A hosiery item according to any one of the preceding claims, wherein the adhesive is applied to the top or welt of the hosiery item.
12. A hosiery item according to any one of the preceding claims, wherein the adhesive is applied to the trim,
13. A hosiery item according to any of the preceding claims, wherein the hosiery item is a stocking, hold up, knee high, calf or ankle length item or tights.
14. A hosiery item according to any one of the preceding claims, wherein the adhesive is provided along the entire circumference of the open top of the leg or body of the hosiery item.
15. A hosiery item according to any one of the preceding claims, wherein the trim is made of natural fibres.
16. A hosiery item according to any one of the preceding claims, wherein the trim is made of synthetic fibres.
17. A hosiery item according to any one of the preceding claims, wherein the substrate of the leg of the hosiery item has a denier of 5 to 150.
18. A hosiery item according to any one of the preceding claims, wherein the substrate of the leg of the hosiery item is circular knitted.

19. A method of attaching a trim to a hosiery item having an open top; comprising the step of stretching the open top of the hosiery item over a mould to stretch it to a predetermined size, and adhering thereto with an adhesive a length of trim material. 5
20. A method of attaching a trim to a hosiery item wherein the trim material is adhered to the open top using a thermoplastic adhesive or a pressure sensitive. 10
21. A method of attaching a trim to a hosiery item according to Claim 20, wherein the heating stage is carried out at a temperature of 60°C to 120°C.
22. A method of attaching a trim to a hosiery item according to Claim 20 or 21, wherein the process incorporates a cooling stage subsequent to the heating stage. 15
23. A method of attaching a trim to a hosiery item according to any one of Claims 19 to 22, wherein, the adhesion stage is carried out at pressure. 20
24. A method of attaching a trim to a hosiery item according to Claim 22 or 23, wherein the cooling stage is carried out at pressure. 25
25. A method of attaching a trim to a hosiery item according to any one of Claims 20 to 24, where either the heating stage or the cooling stage are carried out for dwell times of between 2 to 100 seconds. 30
26. A method of attaching a trim to a hosiery item according to any one of Claims 19 to 25, wherein the trim is applied to the open top as a preformed band. 35
27. A method of attaching a trim to a hosiery item according to any one of Claims 19 to 25, wherein the trim is applied to the open top as a strip, the ends of which are subsequently or simultaneously joined to form a band. 40

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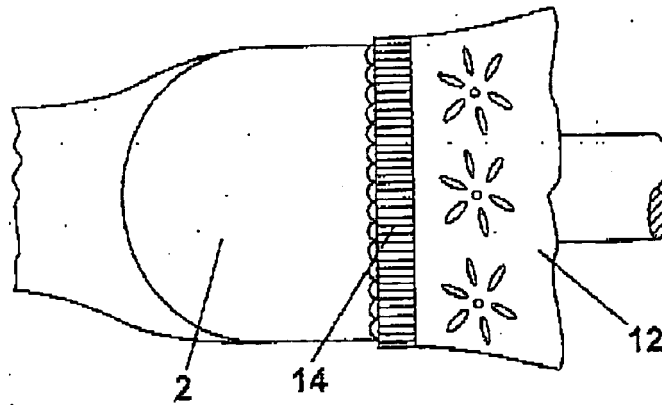


Fig. 3

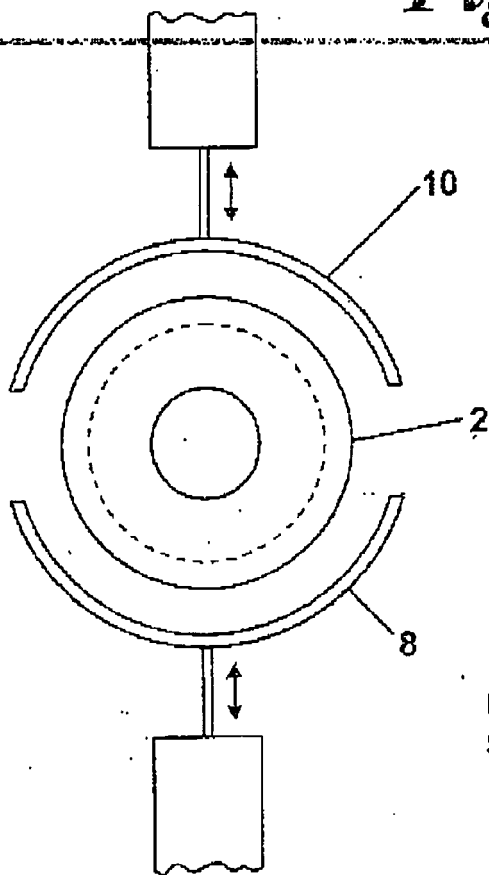


Fig. 4

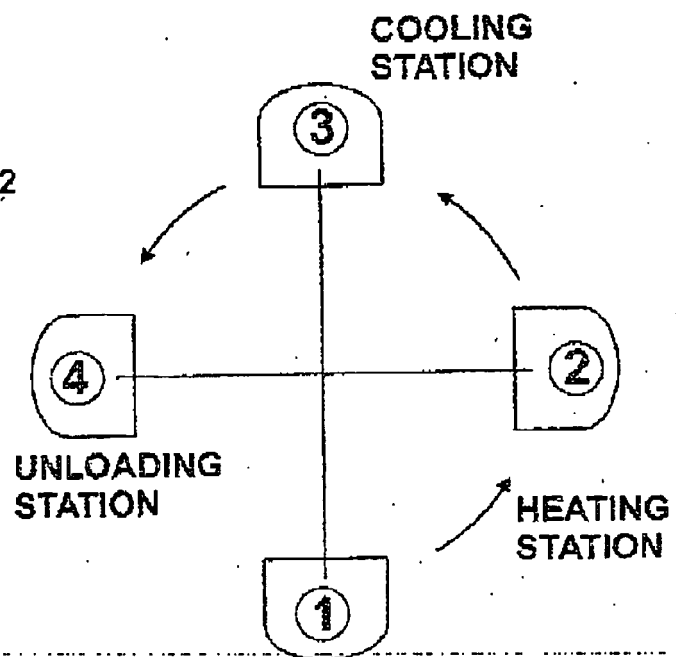


Fig. 5