

# DISPOSABLE TROUSER-TYPE SANITARY PRODUCT

## TECHNICAL FIELD

The present disclosure relates to the field of sanitary products, and in particular to a disposable trouser-type sanitary product.

## BACKGROUND

A disposable trouser-type sanitary product is generally composed of an outer clothing layer and an absorber disposed in the outer clothing layer. The outer clothing layer generally includes a front part and a back part. The absorber has one end fixedly connected to the front part and the other end fixedly connected to the back part. Two transverse sides of the front part are attached with two transverse sides of the back part to form a closed structure with a waist opening and leg openings. Each of the front and back parts is commonly formed in a one-piece structure or a two-piece structure. The outer clothing layers of these two structures are usually composed of two layers of non-woven fabrics with elastic bands in the layers. The outer clothing layers are elastic only in regions where the elastic bands are distributed. Due to the uneven distribution of elasticity and the use of a large number of elastic bands, the outer clothing layer has poor softness and may over-tighten.

Chinese Patent Application 201721925567.5 discloses comfortable-fit pull-up pants, including a diaper body and elastic waist portions. The diaper body is provided with a front waist portion corresponding to a human front waist, a back waist portion corresponding to a human back waist, a front crotch portion corresponding to a human front crotch, and a back crotch portion corresponding to a human back crotch. The elastic waist portions are located between the front waist portion and the back waist portion. The back waist portion is fixedly connected to a middle connecting section of an adjustable band. The adjustable band includes the middle connecting section and buffer sections arranged at two ends of the connecting section. The buffer section covers the elastic waist portion, and the buffer section has a length that is more than 3/2 of the length of the elastic waist portion and a width that is greater than the width of the elastic waist portion. The buffer section of the adjustable band arranged additionally is exactly located between the elastic waist portion and the baby's delicate skin and has a larger area than the elastic waist portion. The adjustable band needs to be smoothed by the parent through hand during wearing, such that the elastic waist portions are directly pressed on the buffer sections of the adjustable band, which plays a role of buffering, so as to prevent bruise or redness on the baby's delicate skin. Therefore, if the adjustable band is not

smoothed due to carelessness, the baby's waist will feel uncomfortable.

## SUMMARY

In view of this, the present disclosure provides a disposable trouser-type sanitary product, which solves the problems of poor softness and uneven elasticity distribution in the clothing layer of a sanitary product and tight feeling during use in the prior art.

In order to achieve the above objective, the present disclosure is implemented through the following technical solution. A disposable trouser-type sanitary product may include an outer clothing layer and an absorber disposed in the outer clothing layer. The outer clothing layer has a length direction defined as a longitudinal direction and a width direction defined as a transverse direction. The outer clothing layer includes a front waist and abdomen elastic sheet, an inelastic crotch sheet, and a back waist and hip elastic sheet, which are connected in sequence along the longitudinal direction. Each of the front waist and abdomen elastic sheet and the back waist and hip elastic sheet is formed by combining an elastic non-woven fabric and a spunbonded non-woven fabric or combining the elastic non-woven fabric and a hot air non-woven fabric. Two transverse sides of the front waist and abdomen elastic sheet are fixedly connected to two transverse sides of the back waist and hip elastic sheet to form a structure with a waist opening and two leg openings. The spunbonded non-woven fabric or the hot air non-woven fabric at the waist opening is folded inward toward a body contact side and then downward to form a folding region with a longitudinal length of 20-50 mm. The folding region is provided with an elastic material. A longitudinal length of the front waist and abdomen elastic sheet is 15-50 mm shorter than a longitudinal length of the back waist and hip elastic sheet.

The absorber includes a top permeable layer, a guide layer, a top absorbent paper layer, an intermediate absorbent paper layer, a bottom absorbent paper layer, and a bottom impermeable layer, which are stacked in sequence from top to bottom. Three to five elastic bands extending longitudinally and spaced side by side transversely are arranged between the bottom absorbent paper layer and the bottom impermeable layer. A longitudinal length of each of the elastic bands is  $\frac{1}{3}$  to  $\frac{4}{5}$  of a longitudinal length of the bottom absorbent paper layer, and a transverse region occupied by the elastic bands that accounts for  $\frac{1}{3}$  to  $\frac{4}{5}$  of a transverse width of the bottom absorbent paper layer. The intermediate absorbent paper layer is provided in a longitudinal upper half region of the absorber. The top absorbent paper layer is provided with a plurality of slits penetrating through the intermediate absorbent paper layer

and the bottom absorbent paper layer. The top permeable layer is provided with a guide groove penetrating through the guide layer, the top absorbent paper layer, the intermediate absorbent paper layer, and the bottom absorbent paper layer. The top permeable layer, the guide layer, the top absorbent paper layer, the intermediate absorbent paper layer, and the bottom absorbent paper layer are connected through the guide groove.

The elastic non-woven fabric weighs 30-80 gsm, and the elastic non-woven fabric weighs includes a top polypropylene (PP) layer, a bottom PP layer, and an elastomer between the top PP layer and the bottom PP layer. The elastomer is a styrene-butadiene-styrene (SBS) block copolymer or polyolefin (PO). The top PP layer and the bottom PP layer have a mass percent of 10-40%, and the elastomer has a mass percent of 30-80%. The top PP layer, the bottom PP layer and the elastomer are fixedly bonded by a hot roller to form the elastic non-woven fabric with an area of rolling points accounting for 10-15%.

As a further improvement, the intermediate absorbent paper layer may have a folded structure with an e-shaped cross-section.

As a further improvement, the longitudinal length of the front waist and abdomen elastic sheet may be 150-230 mm, and the longitudinal length of the back waist and hip elastic sheet may be 180-280 mm.

As a further improvement, four elastic bands may be arranged between the bottom absorbent paper layer and the bottom impermeable layer.

As a further improvement, the elastic material may be an elastic band.

With the above technical solutions, the present disclosure achieves the following beneficial effects:

1. In the present disclosure, the outer clothing layer of the disposable trouser-type sanitary product is formed by combining an elastic non-woven fabric and a spunbonded non-woven fabric or combining the elastic non-woven fabric a hot air non-woven fabric. The elastic non-woven fabric includes a top PP layer, a bottom PP layer, and an elastomer between the top PP layer and the bottom PP layer. The elastomer is an SBS block copolymer or PO. Compared with the traditional double-layer non-woven fabric with elastic bands, the outer

clothing layer is softer, fully and evenly elastic, and prevents over-tightening of the sanitary pants on a human.

2. The waist region is folded, that is, the spunbonded non-woven fabric or the hot air non-woven fabric at the waist opening is folded inward toward a body contact side and then downward to form a folding region, and the folding region is provided with an elastic material. In this way, the elasticity of the waist region is improved.

3. A longitudinal length of the front waist and abdomen elastic sheet is 15-50 mm shorter than a longitudinal length of the back waist and hip elastic sheet, such that the front waist and abdomen elastic sheet and the back waist and hip elastic sheet are figure-hugging.

4. In the absorber, the top absorbent paper layer, the intermediate absorbent paper layer, and the bottom absorbent paper layer are combined with the elastic bands. The three layers of absorbent paper are first subjected to strength fracture by slitting. The elastic bands are provided between the bottom absorbent paper layer and the bottom impermeable layer. In this way, the softness is improved to make for a comfortable fit. Three to five elastic bands are concentrated in a region that is  $\frac{1}{3}$  to  $\frac{4}{5}$  of the transverse width of the bottom absorbent paper layer, and they have a longitudinal length that is  $\frac{1}{3}$  to  $\frac{4}{5}$  of the longitudinal length of the bottom absorbent paper layer. This design makes for a comfortable fit.

5. The top permeable layer, the guide layer, the top absorbent paper layer, the intermediate absorbent paper layer, and the bottom absorbent paper layer are connected through the guide groove. This design accelerates the absorption of the excreta and can direct the diffusion of the excreta.

6. The intermediate absorbent paper layer has a folded structure with an e-shaped cross-section, which improves the absorbency.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a structural view of a disposable trouser-type sanitary product according to an embodiment of the present disclosure;

FIG. 2 is a sectional view taken along line T-T shown in FIG. 1;

FIG. 3 is a sectional view from a top surface of an absorber to a bottom surface of an outer clothing layer of the disposable trouser-type sanitary product according to an embodiment of the present disclosure;

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FIG. 4 is a schematic view of a composite structure of a top absorbent paper layer, an intermediate absorbent paper layer and a bottom absorbent paper layer of the disposable trouser-type sanitary product according to an embodiment of the present disclosure;

10 FIG. 5 is a sectional view taken along line B-B shown in FIG. 4.

FIG. 6 is a sectional view taken along line H-H shown in FIG. 4;

15 FIG. 7 is a schematic view of a folded structure of a spunbonded non-woven fabric according to an embodiment of the present disclosure;

FIG. 8 is a schematic view of an elastic non-woven fabric according to an embodiment of the present disclosure;

20 FIG. 9 is a structural view of an activation system according to an embodiment of the present disclosure;

FIG. 10 is an expanded view of a circumferential side of a gear according to an embodiment of the present disclosure;

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FIG. 11 is a structural view of a gear c1 and a gear c2 that are meshed according to an embodiment of the present disclosure; and

30 FIG. 12 is a flowchart of a preparation method of the disposable trouser-type sanitary product according to the embodiment of the present disclosure.

## **DETAILED DESCRIPTION OF THE EMBODIMENTS**

35 The implements of the present disclosure will be described in detail below with reference to the specific embodiments, so as to help those skilled in the art fully understand how the

present disclosure applies the technical means to solve the technical problems and achieve the technical effects.

Unless otherwise specified, the technical means used in the embodiments are conventional means well known to those skilled in the art, and the reagents and products used are commercially available. The source, trade name and necessary ingredients of the reagents used are indicated at their first appearance.

#### Embodiment

Referring to FIGS. 1 to 11, disposable period panties include an outer clothing layer and an absorber disposed in the outer clothing layer. The outer clothing layer has a length direction defined as a longitudinal direction and a width direction defined as a transverse direction. The outer clothing layer includes a front waist and abdomen elastic sheet 1, an inelastic crotch sheet 2, and a back waist and hip elastic sheet 3, which are connected in sequence along the longitudinal direction. Each of the front waist and abdomen elastic sheet 1 and the back waist and hip elastic sheet 3 is formed by combining an elastic non-woven fabric 4 and a spunbonded non-woven fabric 5. Two transverse sides of the front waist and abdomen elastic sheet 1 are fixedly connected to two transverse sides of the back waist and hip elastic sheet 3 to form a structure with a waist opening and two leg openings. The spunbonded non-woven fabric 5 at the waist opening is folded inward toward a body contact side and then downward to form a folding region 6 with a longitudinal length of 30 mm. The folding region 6 is provided with an elastic band 61. The front waist and abdomen elastic sheet 1 has a longitudinal length of 180 mm, and the back waist and hip elastic sheet 3 has a longitudinal length of 200 mm. The front waist and abdomen elastic sheet 1 and the back waist and hip elastic sheet 3 have different longitudinal lengths to fit the curves of the human body. The elastic non-woven fabric 4 weighs 50 gsm. The elastic non-woven fabric 4 includes a top polypropylene (PP) layer 41, a bottom PP layer 43, and an elastomer 42 between the top PP layer and the bottom PP layer. The top PP layer 41 has a mass percent of 15%, the bottom PP layer 43 has a mass percent of 15%, and the elastomer 42 has a mass percent of 70%. The elastomer 42 may be a styrene-butadiene-styrene (SBS) block copolymer. The three-layer fiber web structure is fixedly bonded by a hot roller to form the elastic non-woven fabric with an area of rolling points accounting for 11%. The PP layers maximize the structural stability of the elastic non-woven fabric so as to avoid elastic loss during the process of winding, cutting, and storage.

The absorber includes a top permeable layer 8, a guide layer 9, a top absorbent paper layer 10, an intermediate absorbent paper layer 11, a bottom absorbent paper layer 17, and a bottom impermeable layer 14, which are stacked in sequence from top to bottom. The top permeable layer 8 includes a hydrophilic non-woven fabric 81 and leak-proof partitions 82 arranged on two transverse sides of the hydrophilic non-woven fabric. An elastic band 83 is provided in the leak-proof partition. The bottom impermeable layer 14 is made of a polyethylene (PE) film. Four elastic bands 15 extending longitudinally and spaced side by side transversely are arranged between the bottom absorbent paper layer 17 and the bottom impermeable layer 14. A longitudinal length of each of the elastic bands 15 is  $\frac{2}{3}$  of a longitudinal length of the bottom absorbent paper layer 17, and a transverse region occupied by the four elastic bands accounts for  $\frac{2}{3}$  of a transverse width of the bottom absorbent paper layer 17. The intermediate absorbent paper layer 11 is provided in a longitudinal upper half region of the absorber. The top absorbent paper layer 10 is evenly spaced with slits 12 penetrating through the intermediate absorbent paper layer 11 and the bottom absorbent paper layer 17. The top permeable layer 8 is provided with a guide groove 16 penetrating through the guide layer 9, the top absorbent paper layer 10, the intermediate absorbent paper layer 11, and the bottom absorbent paper layer 17. The top permeable layer 8, the guide layer 9, the top absorbent paper layer 10, the intermediate absorbent paper layer 11 and the bottom absorbent paper layer 17 are connected through the guide groove 16. The intermediate absorbent paper layer 11 has a folded structure with an e-shaped cross-section. That is, the intermediate absorbent paper layer is a structural layer formed by folding a piece of absorbent paper transversely inward twice (twice in the same direction), and has an increased thickness relative to the top absorbent paper layer 10 and the bottom absorbent paper layer 17.

In addition, an adhesive tab 18 is further provided on an outer surface of the back waist and hip elastic sheet of the outer clothing layer by gluing.

Specifically, a preparation method of the disposable trouser-type sanitary product of the present disclosure includes the following steps:

prepare the outer clothing layer, prepare the absorber, fix the absorber onto the outer clothing layer, combine to form a pant-shaped structure, and cut to form single products, where the step of preparing the outer clothing layer includes:

a. Prepare an elastic non-woven fabric:

a1. Add a layer of elastomer on a PP layer.

a2. Add a PP layer on the elastomer added in step a1, and fixedly bond by hot rolling to

form an integrated elastic non-woven fabric with a three-layer fiber web structure.

The elastic non-woven fabric weighs 50 gsm and is a three-layer structure (PP layer + elastomer + PP layer) prepared by a spun-bonding process. The elastomer is an SBS elastomer. The PP layers have a mass percent of 30%, and the elastomer has a mass percent of 70%. The three-layer fiber web structure is fixedly bonded by a hot roller with an area of rolling points accounting for 11%.

b. Send the elastic non-woven fabric prepared by step a to an activation system for activation.

The activation system includes an input driving roller a, two heating roller sets b, a traction driving roller e, an activation gear c, and an output driving roller d. The input driving roller a, the heating roller sets b, the traction driving roller e, the activation gear c, and the output driving roller d are in transmission connection with a power output terminal. In the activation process, the elastic non-woven fabric is activated sequentially through the input driving roller a, the heating roller sets b, the traction driving roller e, the activation gear c, and the output driving roller d. A linear speed of the output driving roller d is twice a linear speed of the input driving roller a, and a linear speed of the traction driving roller e is identical to the linear speed of the input driving roller a. The heating roller set b includes two heating rollers, which rotate in opposite directions. Front and back sides of the elastic non-woven fabric are contacted with the heating roller. The heating rollers heat at 48°C. Portions of the elastic non-woven fabric in contact with the heating roller form an angle of 180° along a circumferential direction. The activation gear includes a pair of gears, namely, a gear c1 and a gear c2. The paired gears are provided with evenly spaced flat teeth c3 on respective circumferential sides, and the flat teeth are staggered during operation of the paired gears.

c. Cut the elastic non-woven fabric activated by step b along the longitudinal direction; locate cut elastic non-woven fabrics on two longitudinal sides of a spunbonded non-woven fabric, respectively; and combine the cut elastic non-woven fabrics with the spunbonded non-woven fabric by a hot melt adhesive, so as to form the outer clothing layer.

The step of preparing the absorber includes:

1) Prepare the top permeable layer by combining a layer of hydrophobic non-woven fabric on two transverse sides of a hydrophilic non-woven fabric on an assembly line.

2) Prepare the guide layer.

3) Prepare an absorbent core: Prepare and combine the top absorbent paper layer, the intermediate absorbent paper layer, and the bottom absorbent paper layer together; and slit by stacking the top absorbent paper layer, the intermediate absorbent paper layer, and the bottom absorbent paper layer and cutting a surface of the top absorbent paper layer with a cutter to form slits penetrating from the top absorbent paper layer to the bottom absorbent paper layer.

4) Prepare the elastic bands: Prepare the four elastic bands, which have a longitudinal length that is  $\frac{2}{3}$  of the longitudinal length of the bottom absorbent paper layer, and are distributed in a transverse region that accounts for  $\frac{2}{3}$  of the transverse width of the bottom absorbent paper layer.

5) Prepare the bottom impermeable layer: Combine a layer of non-woven fabric on a bottom layer of the PE film by glue spraying on the assembly line.

6) Combine the prepared elastic bands with the prepared bottom impermeable layer on the assembly line, where the elastic bands are arranged on the PE film; then combine the prepared absorbent core, guide layer, and top permeable layer in sequence on the bottom impermeable layer to form the absorber; and cut the absorber into single pieces, rotate the single pieces for  $90^\circ$ , and transfer the single pieces to a next process on the assembly line.

The preparation method further includes: fold the outer clothing layer, specifically, by preparing elastic bands by spraying at 30 mm of two longitudinal ends of the spunbonded non-woven fabric combined with the cut elastic non-woven fabrics in step c, and folding a sprayed region downward and inward to form a folding region.

In the present disclosure, the folding region has a longitudinal length of 20-50 mm, and a longitudinal length of the front waist and abdomen elastic sheet is 15-50 mm shorter than the longitudinal length of the back waist and hip elastic sheet. A longitudinal length of each of the elastic bands is  $\frac{1}{3}$  to  $\frac{4}{5}$  of the longitudinal length of the bottom absorbent paper layer, and the transverse distribution region of the elastic bands is  $\frac{1}{3}$  to  $\frac{4}{5}$  of the transverse width of the bottom absorbent paper layer. The elastic non-woven fabric weighs 30-80 gsm, and the portions of the elastic non-woven fabric in contact with the heating rollers form an angle of greater than  $120^\circ$  along the circumferential direction. The objective of the present disclosure can be achieved within the above-mentioned parameter ranges.

In addition, the disposable trouser-type sanitary product of the present disclosure may be not only the period panties described in the above embodiment, but also pull-up diapers for kids or adults.

5        The front waist and abdomen elastic sheet and the back waist and hip elastic sheet of the present disclosure may also be formed by combining an elastic non-woven fabric and a hot air non-woven fabric.

10       The elastic non-woven fabric of the present disclosure may also be first cut in half, then activated, and combined with a spunbonded non-woven fabric or a hot air non-woven fabric, which may be referred to the flowchart shown in FIG. 12.

15       The elastic non-woven fabric of the present disclosure needs to be rolled up after being prepared, and then sent to the production line for use.

20       The above described are merely embodiments based on the technical contents of the present disclosure. Any modifications and changes made by those skilled in the art based on the present disclosure should fall within the scope of the present disclosure, and the present disclosure is not limited to the above embodiments.

## CLAIMS

What is claimed is:

1. A disposable trouser-type sanitary product, comprising an outer clothing layer and an absorber disposed in the outer clothing layer, wherein the outer clothing layer has a length direction defined as a longitudinal direction and a width direction defined as a transverse direction; the outer clothing layer comprises an front waist and abdomen elastic sheet, an inelastic crotch sheet, and an back waist and hip elastic sheet, which are connected in sequence along the longitudinal direction; each of the front waist and abdomen elastic sheet and the back waist and hip elastic sheet is formed by combining an elastic non-woven fabric and a spunbonded non-woven fabric or combining the elastic non-woven fabric and a hot air non-woven fabric; two transverse sides of the front waist and abdomen elastic sheet are fixedly connected to two transverse sides of the back waist and hip elastic sheet to form a structure with a waist opening and two leg openings; the spunbonded non-woven fabric or the hot air non-woven fabric at the waist opening is folded inward toward a body contact side and then downward to form a folding region with a longitudinal length of 20-50 mm; the folding region is provided with an elastic material; and a longitudinal length of the front waist and abdomen elastic sheet is 15-50 mm shorter than a longitudinal length of the back waist and hip elastic sheet;
- the absorber comprises a top permeable layer, a guide layer, a top absorbent paper layer, an intermediate absorbent paper layer, a bottom absorbent paper layer, and a bottom impermeable layer, which are stacked in sequence from top to bottom; three to five elastic bands extending longitudinally and spaced side by side transversely are arranged between the bottom absorbent paper layer and the bottom impermeable layer; a longitudinal length of each of the elastic bands is  $\frac{1}{3}$  to  $\frac{4}{5}$  of a longitudinal length of the bottom absorbent paper layer and a transverse region occupied by the elastic bands accounts for  $\frac{1}{3}$  to  $\frac{4}{5}$  of a transverse width of the bottom absorbent paper layer; the intermediate absorbent paper layer is provided in a longitudinal upper half region of the absorber; the top absorbent paper layer is provided with a plurality of slits penetrating through the intermediate absorbent paper layer and the bottom absorbent paper layer; the top permeable layer is provided with a guide groove penetrating through the guide layer, the top absorbent paper layer, the intermediate absorbent paper layer, and the bottom absorbent paper layer; and the top permeable layer, the guide layer, the top absorbent paper layer, the intermediate absorbent paper layer, and the bottom absorbent paper layer are connected through the guide groove; and
- the elastic non-woven fabric weighs 30-80 gsm, and the elastic non-woven fabric

comprises a top polypropylene (PP) layer, a bottom PP layer, and an elastomer between the top PP layer and the bottom PP layer; the elastomer comprises a styrene-butadiene-styrene (SBS) block copolymer or polyolefin (PO); the top PP layer and the bottom PP layer have a mass percent of 10-40%, and the elastomer has a mass percent of 30-80%; and the top PP layer, the bottom PP layer and the elastomer are fixedly bonded by a hot roller to form the elastic non-woven fabric with an area of rolling points accounting for 10-15%.

2. The disposable trouser-type sanitary product according to claim 1, wherein the intermediate absorbent paper layer has a folded structure with an e-shaped cross-section.

3. The disposable trouser-type sanitary product according to claim 1 or 2, wherein the longitudinal length of the front waist and abdomen elastic sheet is 150-230 mm, and the longitudinal length of the back waist and hip elastic sheet is 180-280 mm.

4. The disposable trouser-type sanitary product according to claim 1 or 2, wherein four elastic bands are arranged between the bottom absorbent paper layer and the bottom impermeable layer.

5. The disposable trouser-type sanitary product according to claim 1, wherein the elastic material is an elastic band.