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Properties and Applications of Plaited Structures

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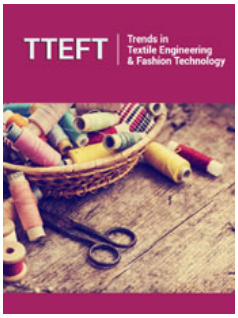

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Abstract

Plaited fabric is a type of textile that is created by interlacement of warp & weft threads or by interloping with two or more sets of yarns or threads, resulting in a unique and distinctive appearance. This unique construction results in a fabric that is both durable and versatile, making it a popular choice for a variety of applications, including apparel, upholstery, and home décor. The two sets of yarns in a plaited fabric are interlaced in a way that each set floats over and under the other, creating a pattern of interlocking loops. This interlocking structure gives plaited fabrics their characteristic strength and resilience. In this article, we will explore the meaning and definition of plaited fabric, its types, handling tips, a brief history/origin, and an overview of its top international users or manufacturers.

Keywords: Plaited fabric; Comfort; Durability; Hydrophobic

Introduction

Plaited fabrics are produced using a variety of techniques, including hand-weaving, power weaving, and knitting. Hand-weaving is the oldest and most traditional method of producing plaited fabrics. Power weaving is a more mechanized method that is used to produce larger quantities of fabric. Knitting is a versatile technique that can be used to produce a variety of plaited fabrics, including those with intricate patterns [1].

History and Origin

The technique of creating plaited fabric has been practiced for centuries across various cultures. Its exact origin is difficult to trace, as it has been used independently in different regions throughout history. However, examples of plaited fabric can be found in ancient civilizations such as Egypt, China, and Peru. Plaited fabric gained prominence during the Middle Ages in Europe, with intricate double weave fabrics being produced for clothing and household items.

Production Methods

Woven structures

Plaited fabric, also known as double cloth or double weave, is a narrow fabric made by crossing several sturdy yarns diagonally, so each strand passes alternatively over or under one or more of the other stands [2-4]. Unlike traditional woven fabrics where the interlacement occurs between warp and weft threads, plaited fabric involves interlacing two set of warps or two set of weft threads, resulting in a reversible fabric with different patterns or textures on each side. Typically used in shoelaces and suspenders.

Knitted structures

Also known as bi-ply knitting, this special knit construction uses the addition of a second yarn within the same stitch. The second yarn is generally of a different colour or type. During

the knitting process the second yarn is placed under the first yarn, so that each yarn can be rolled to a specific side of the fabric. In many cases, one yarn/colour appears on the face of the fabric, and the other yarn/contrast colour appears on the back. Also, the knitted plated fabrics are produced by an arrangement of needles that do not bring the back yarn to the face (also called right side of the fabric) or the face yarn to the back. Knitting machines allow the selective knitting of separate yarns on the face and back to form plated fabrics [5,6] (Figure 1).

Figure 1: Representation of plaited twill & plaited jersey structure.

Plaited fabrics are used in a wide variety of applications, including:

A. Apparel: Plaited fabrics are often used to make coats, jackets, suits, and dresses. They are also used to make hats, scarves, and gloves.

B. Upholstery: Plaited fabrics are used to make furniture upholstery. They are durable and resistant to fading and wear.

C. Home decor: Plaited fabrics are used to make curtains, blinds, and throw pillows. They can also be used to make tablecloths and napkins.

Plaited fabrics are typically made from natural fibres such as cotton, wool, or silk. However, synthetic fibres such as polyester or nylon can also be used [7,8]. The type of fibre used will affect the properties of the fabric, such as its weight, drape, and wrinkle resistance. Plaited fabrics boast a unique set of properties that make them suitable for various applications such as

a) Durability: Their construction featuring interwoven sets of yarns lends them exceptional strength and resilience. They resist tearing and withstand heavy wear and tear, making them ideal for upholstery and other high-demand applications.

b) Versatility: The ability to use different fiber types and colors in each yarn set allows for vast design possibilities. This makes plaited fabrics suitable for diverse uses, ranging from apparel and accessories to home décor and even technical applications.

c) Reversible: Most plaited fabrics have two distinct faces, each showcasing a different set of yarns. This characteristic makes them reversible, offering two different visual textures and colors, depending on the chosen side.

d) Dimensional Stability: The interlocking nature of the yarns in plaited fabrics minimizes any stretching or distortion, resulting in excellent dimensional stability. This property leads to excellent drape and form retention, desirable for garments and upholstery.

e) Insulating Properties: Some plaited fabrics, particularly those with multiple interwoven layers, offer enhanced insulation properties. This makes them suitable for crafting warm garments and bedding accessories.

f) Texture: Due to the interlaced yarns, plaited fabrics frequently sport a distinctively textured surface. This tactile property adds visual and textural interest, making them visually and physically appealing.

g) Wrinkle Resistance: Though dependent on the chosen fiber type, plaited fabrics typically exhibit good wrinkle resistance. This makes them relatively low-maintenance and ideal for garments and upholstery that need to maintain a neat appearance.

h) Strength: Plaited fabrics are also known for their strength. The interlocking of yarns creates a dense, compact structure that can withstand significant stress and tension. This strength makes plaited fabrics suitable for applications where strength is crucial, such as protective clothing and industrial textiles.

i) Texture and Pattern: Plaited fabrics offer a wide range of textures and patterns, depending on the yarns used, the weaving technique, and the arrangement of the two sets of yarns. This versatility allows designers to create visually appealing and tactile fabrics that suit various applications and aesthetic preferences.

j) Insulation Properties: Plaited fabrics can provide a degree of insulation due to their air-trapping structure. The interlocking yarns create small pockets of air within the fabric, which can help to retain heat and provide warmth. This property makes plaited fabrics suitable for applications like winter coats and jackets.

k) Breathability: Some plaited fabrics are breathable, allowing air to pass through them. This breathability is particularly important for applications like sportswear and apparel, where comfort and moisture management are crucial. Breathability can be enhanced by using breathable yarns and weaving techniques that promote airflow.

l) Drape and Handle: Plaited fabrics exhibit a range of drape and handle, depending on the fibers used, the yarn weight, and the weaving technique. Drape refers to the fabric's ability to flow and conform to the wearer's body, while handle refers to the fabric's tactile properties. These properties are essential for creating garments that are both aesthetically pleasing and comfortable to wear.

Here is an additional breakdown of how properties can vary based on factors influencing the fabric:

A. Fiber Type: The choice of natural or synthetic fibers impacts properties like drape, wrinkle resistance, and breathability. Cotton plaited weave might be breathable and comfortable, while nylon plaited fabric could be water-resistant and resilient.

B. Yarn Thickness: Using thicker yarns yields a heavier and warmer fabric with increased durability and insulation. In contrast, thinner yarns create a lightweight and less bulky fabric.

C. Interlacing Technique: Different interlacing methods can affect the fabric's overall texture and visual design. Complex interlacing patterns can create intricate designs and textures, while simpler patterns offer a smoother surface.

D. Finishing Techniques: Finishing processes like calendaring or brushing can alter aspects like drape, texture, and wrinkle resistance.

E. Always consider the specific plaited fabric type and its construction details when deciding its suitability for your intended application.

Function and Use

Fibers with conflicting properties contribute to the production of functional garments. Careful selection of fibres on both sides will give you better opportunities and results. Different fibres have different characteristics, such as natural fibres being hygroscopic and synthetic fibres being hydrophobic. Characteristic contrasts are used to achieve different results in shaping patterns and features. For example, fabrics with cotton on the outside and polyester on the inside are good for wicking. The same goes for plating fabrics made from cotton and polypropylene. Plated fabric can improve clothing comfort through thermo-physiological and moisture comfort by reducing the sensation of dampness [9].

Types of Plaited Fabric

There are several types of plaited fabric, each with its unique characteristics and construction techniques:

Simple Plaited Fabric: In simple plaited fabric, two sets of yarns are interlaced to form a reversible fabric. The two sets of yarns can have different colours, textures, or fibre compositions, allowing for diverse design possibilities [10-12].

a) Compound Plaited Fabric: Compound plaited fabric involves three or more sets of yarns interlaced together, resulting in a fabric with multiple layers and textures. This type of plaited fabric offers increased thickness and insulation properties.

b) Warp-faced Plaited Fabric: In warp-faced plaited fabric, the warp threads dominate the fabric's surface, creating a distinctive pattern or design. The weft threads are less visible and are primarily used for structural support.

c) Weft-faced Plaited Fabric: Weft-faced plaited fabric is characterized by the prominence of the weft threads on the fabric's surface. The warp threads play a supporting role and are less visible in the final fabric.

Care and Maintenance

It is essential to consider a few tips to ensure proper handling and maintenance:

A. Care Instructions: Check the care instructions provided by the manufacturer to determine the appropriate washing, drying, and ironing methods for the specific type of plaited fabric.

B. Prevent Snagging: Plaited fabric can be prone to snagging due to the multiple interlaced yarns. Take care to avoid sharp objects or rough surfaces that could catch and pull the fabric.

C. Reversible Usage: Exploit the reversible nature of plaited fabric by utilizing both sides in your designs. This allows for creative possibilities and versatility in the final garment or product.

D. Seam Finishes: Consider the thickness and structure of plaited fabric when choosing seam finishes. Flat-felled seams or French seams are often suitable to enclose the raw edges and provide a clean finish.

Top International Users and Manufacturers

Plaited fabric is widely used by numerous international brands and manufacturers across the textile industry. Here are some of the top users and manufacturers:

a) Prada: Prada, an Italian luxury fashion house, incorporates plaited fabric in their designs, often utilizing its reversible nature to create unique garments with contrasting textures and patterns.

b) Burberry: Burberry, a British luxury brand, features plaited fabric in their collections, adding depth and dimension to their iconic trench coats and outerwear.

c) Issey Miyake: Issey Miyake, a Japanese fashion designer, is known for his innovative use of plaited fabric, creating avant-garde garments with architectural silhouettes and textural variations.

d) J.W. Anderson: J.W. Anderson, a British fashion label, incorporates plaited fabric in their designs, exploring the contrast between different yarns to achieve a unique tactile experience.

e) Max Mara: Max Mara, an Italian fashion brand, utilizes plaited fabric in their collections, particularly in their tailored coats and suits, showcasing the fabric's versatility and elegance.

f) Comme des Garons: Comme des Garons, a renowned Japanese fashion label, experiments with plaited fabric to create unconventional and artistic designs that challenge traditional garment construction.

Conclusion

Plaited fabric, also known as double cloth or double weave, is a versatile and reversible textile construction that offers unique design possibilities. With its various types and historical significance, plaited fabric continues to be utilized by leading international fashion brands to create garments and products that showcase its distinctive texture, pattern, and reversible nature. Understanding the handling tips and exploring the top users and

manufacturers of plaited fabric provides insight into its continued relevance and innovation in the ever-evolving textile industry.

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