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Weave and Process Design of Monolayer Two-sided Velvet Fabric

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Abstract: Weft pulling weave structure on double segmentation method of two-sided velvet fabric is studied based on single-shuttle loom. Through reasonable weave design, raw materials of warp and weft yarn selection and finishing process, adopting inner pile formed technology of double-cutting process and outer pile formed technology of weft pulling, the monolayer two-sided velvet fabric is developed. That product with comfortable and novel style will broad the application of silk velvet fabric on home textile and clothing and provide certain guiding significant on velvet product development.

Introduction

Velvet fabrics are varied and many, each has its own merits and different processes of production, which are widely used in textile and garment in recent years[1]. There are basically two kinds of common two-sided velvet fabrics. One is done by teasing method, the other is sewn together by two single-sided raising fabrics, and most them with chemical fiber soft pile. The production and processing technology of monolayer two-sided velvet fabric can solve the shortcomings of the current two-sided velvet through research and analysis, which is rarely reported in domestic and abroad. Therefore, the study of monolayer two-sided velvet provides a new direction for velvet products. Inner pile formed technology of double-cut pile process and outer pile formed technology of weft pulling are used in this paper, by reasonable weave structures and finishing, developing the two-sided velvet fabrics can be weaved on single-shuttle loom.

Design ideas

Currently velvet products on the market mostly choose chemical fiber as raw material, which have a great influence on the product of air permeability and comfort. In order to reinforce the fastness of the fabric, chemical fiber is used as ground warp in the paper. Silk as pile warp became soft nap after cutting that directly contacting with the skin and improved the fabric softness comfort and air permeability. It does not affect the use effect because of chemical fiber hidden in the middle of silk pile on both the face and back.

The cooperation of pile binding weave and ground weave impacts on pile stability. In this paper, warp pile weave using 3 picks N-type structure, makes the pile firm and not easy being taken out from external friction. Ground weave whose primary role is to make fabric well-set and consolidate pile is plain in monolayer two-sided velvet design to make fabric neat and crisp, and convenient for double cutting process. Warp pile fabric contains three systems of warp and two systems of weft.

The face and back fabrics are stitched on the loom by means of pile warp, i.e. by interlacing the threads of this warp with the face and back weft. The pile warp should be wound on a separate beam, and the face and back warp on another beam due to the different warp consumption. Two ground cloths are produced on top of each other with space between them. Pile ends interlacing alternately with face and back picks. The distance from face to back fabric determines the height of the pile[2]. The two fabrics are separated by cutting the pile threads to form two single-side velvet fabrics. Auxiliary weft exists to interlace with pile warp, not with ground warp, so it is easy to be pulled out in weft-pulling process, to form outer layer nap.

The choice of raw materials

In order to achieve neat velvet effect and present tidy clean nap and delicate soft luster, spun silk is used as warp material and forms soft nap after cut pile process. Ground warp is polyester yarn with better strength to enhance fabric tensile strength. At the same time, using fine polyester weft yarn, to increase weft density and pile density, can guarantee the fastness of fabric structure when interweaving, helping solve the problem that pile easy to be taken out[3]. It does not affect fabric softness comfort when directly contacting with skin since polyester yarn hidden in the middle of silk nap on both the face and back. The fabric is full piles and delicate color, skin-friendly, soft hand when contacted with the skin, which really reflects the value of silk.At the same time, by considering fabric tightness, ground warp cover factor suit 85%, pile warp cover factor suit 15%—20%, and ground weft and auxiliary weft are 40% and 15%.

Weave design

See Fig.1 construction of N-type weave and cross-section. Face: on ends and picks 1,2,3. Back: on ends and picks I, II, III. Pile warp: ends a,b. Repeat:5 ends/6 picks. Warp: three systems, arrangement 26261. Weft: 3face-3back picks. "■": ends over back picks; "⊠" represents warp up; "⊙"face ends are lifted over back picks; "▲" pile warp riser.

Weave structure including plain weave for face and back cloth and N-type structure of pile warp ensures pile warp firm without taken out, so that has great gloss effect. Ground weft chosen polyester yarn with better strength ensures fabric fastness in weaving. With silk pile on the surface of fabric, polyester yarn is not able to directly contact with skin and not lessen softness.Auxiliary weft is easy to pull out from fabric to form out-side nap since it just interwoven with pile warp not ground warp.

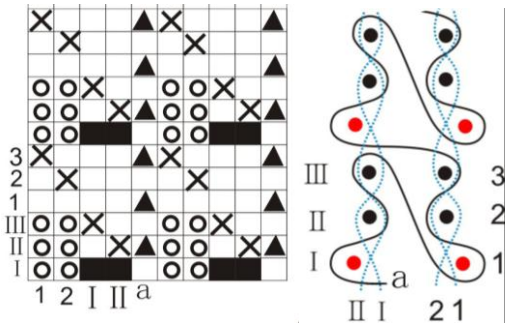


Fig.1 Construction of N-type weave and cross-section

Ground warp with different weaves, different raw materials and different shrinkages, which is respectively wound on the different beams in warp pile fabrics weaving. Divided draft is used in this weave design, and loom draft need 10 head shafts, two for pile warp, eight for ground ends. Pile

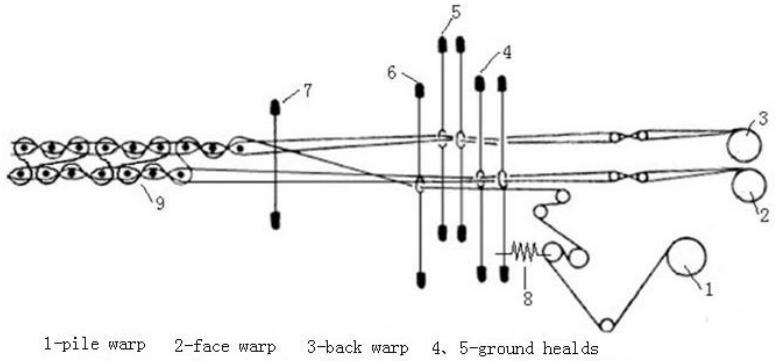
warps requiring smaller tension than ground ends are drawn into 1, 2 shafts in front, the back ground ends needing least lifters are drawn into 7, 8, 9, 10 shafts, the rest piece3, 4, 5, 6 shafts are for the face ground ends. Pile warp need reed-in one by one, the face and back cloth ground are respectively inserted into one dent.

Technical specifications

- Fabric technics: width 186cm, selvage width 1cm ×2,warp density 38 ends/cm, weft density 22 ends/cm
- Loom technics: reed width 200cm, selvage width 4 cm ×2;reed size 82.6dents/10cm; denting for ground warp 2 ends/dent, denting for pile warp 1 end/dent; harness for pile 2,for ground 8; warp density on loom: ground warp 22 ends/cm, pile warp 10 ends/cm; weft density on loom: ground weft 22 ends/cm, auxiliary weft 14 ends/cm.
- Warp materials: ground warp 200^{D} DTY, pile warp $65^{N}/2$ spun silk.
- Weft materials: ground weft 200^{D} Polyester DTY, auxiliary weft 100^{D} Polyester DTY

Weaving process

Three warp beams are needed for face and back ground warp and pile. The balance between warp tension need be noticed when beam-warping, to prevent ice phenomenon. Ground warp uses negative letting-off, while pile warp is on the contrary. According to the weaving requirements, position adjustments about pile warp constant linear speed feeding device, pile warp tension compensation device and Speed tension compensation device are done. Due to the tension difference between face and back ground warp impacting pile warp conveying, tension compensation device is added to ensure the two parts smooth in weaving process. When winding drum, a licker-in roller with tension wire cloth on the surface, installation position raised, is conducive to support the selvage and double-layers cloth edge and prevent wrinkling. Fig.2 shows the structure diagram of retrofitted rapier loom.



1-pile warp 2-face warp 3-back warp 4、5-ground healds
6-pile headles 7-reed 8-spring tension compensation 9-fabric

Fig.2 Structure diagram of retrofitted rapier loom

Finishing

Woven fabric turns out two clothes of single-sided warp pile fabrics by inner pile formed technology of double-cut pile process. Then eventually monolayer two-sided velvet fabric is produced with outer pile formed technology of weft pulling. Due to ground warp and weft used polyester fiber, anti-static treatment id needed. To achieve good nap effect, dyeing, rolling water, brush hair, carding and cutting wood are necessary in finishing processes, which ensures the length of face and back piles consistent, presents tidy and clean nap effect and delicate soft luster.

Summary

Through reasonable weave structure, auxiliary weft position arrangement and the selection of raw materials, adopting inner pile formed technology of double-cutting pile process and outer pile formed technology of weft pulling, the monolayer two-sided velvet fabric is developed. The final effect of the whole design intends to show the face and back side presenting tidy and clean nap effect and delicate soft luster, soft hand. The monolayer two-sided velvet fabric provides a new kind of processing technology, leads to a new use with more additional value, helps velvet fabrics have a broader application prospect in the textile development.

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