A Kind of Song Brocade Fabric with NFC Data Masking Function Used for Making Purse

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Abstract. This paper designed a kind of Song brocade fabric that can prevent NFC data of bank cards from being read. It is based on the Faraday cage principle, special metal fiber and Mulberry silk were designed in the fabric. In order to maintain the original texture and gentle luster of the Song brocade fabric, the traditional mulberry silk was designed as the surface layer and the other intertwined silver fiber or metal fiber were designed at the back of the fabric through special binding weave. It can prevent NFC data of bank cards from being read when the fabric was applied to the wallet, which ensure the bank card information’s secure.

1. Introduction
NFC (Near Field Communication), also known as short-range wireless communication, is a short-range high-frequency wireless communication technology that allows non-contact point-to-point data transmission between electronic devices to exchange data. It is widely used in Alipay treasure wallet, the user simply need to attach the bank card (or bus card) on the back of the phone, pay treasure wallet can read the bank card (or bus card) information, and complete consumption transfer and other operations. There is a big risk in NFC function, the phone can read the information inside the card and complete the payment operation without direct contact when the conditions of hardware and software were satisfied. This can lead to a serious consequence, the bank card in the wallet is likely to be illegal hacking in the public places in a flash, then the user will not only disclose the privacy information but also may lose a lot of money in this case.

2. Pattern design
According to the characteristics of the wallet, designed the pattern of the product. Firstly, auspicious symbol with representatives of the Swastika grain, Chinese traditional auspicious patterns for the design of the country. Then decorated the pattern with moire, floral patterns and geometric flowers. Finally designed three programs as a jacquard pattern to meet the different aesthetic needs of different consumers. Bring Chinese traditional decorative grain type into contemporary designing will push forward the development of traditional Chinese art and culture. Patterns are shown in figures 1a, 1b and 1c.
3. The raw material selection and weaving process design
In order to overcome the limitation of current fabric technologies, this paper designed a kind of Song brocade fabric with NFC data masking function used for making purse [1]. There were two groups of warp, ground wrap and face wrap. Raw material selection of ground wrap was mulberry silk while the face wrap used sliver ion fiber [2-3]. Two groups of warp were designed with mulberry silk and silver ion fiber at the ration of 3:1. There were N groups of weft, and N groups of weft ratio were 1:1, the front N-1 group of weft were designed with mulberry silk, the last group of weft (N group) used the silver fiber or metal fiber [4]. In order to maintain the original texture and gentle luster of the Song brocade fabric, the traditional mulberry silk was designed as the surface layer, the the face wrap (wrap B and weft N were silver ion fiber intertwined at the back of the fabric through special binding weave. This paper was designed with N=4, weft A : weft B : weft C : weft D =1:1:1:1. The number of ground warp density was set as 90 roots/cm, the number of face warp density was set as 30 roots/cm, the number of weft density range from 30 roots/cm to 50 roots/cm.

4. Weave structure design
The song brocade fabric with NFC data masking function was weaved by two groups of wrap and N groups of weft[5]. The surface layer used mulberry silk, the face wrap (wrap B and weft N were silver ion fiber intertwined at the back of the fabric through special binding weave[6]. This paper was designed with N=4, the following offered a more thorough explanation of weave design.

This Song brocade jacquard fabric had three classes and 7 kinds of weaves. The three classes weaves were shown in Figures 2, and 3a, 3b, 3c, and 4a, 4b, 4c. As seen in the following pattern drafts, ■ means the wrap A over weft A, ○ means wrap A over weft B, △ means the wrap A over weft C, □ means the wrap A over weft D, ◻ means wrap B over weft A, ◼ means wrap B over weft B, ○ ◼ means wrap B over weft C, ◻ ◼ means wrap B over weft D. The arrangement of the warp were wrap A, wrap A, wrap A, and wrap B from left to right, the arrangement of the weft were weft A, weft B, weft C and weft D from top to bottom.

The first class of weaves were shown in Figure 2. The upper layer was interwoven by wrap A and weft A with two-down wrap twill weave, and the surface of fabric showed the color of wrap A. The middle layer was interwoven by wrap A and weft B, weft C with one-two down weft twill weave. The lower layer was interwoven by wrap B and weft D with two-down wrap twill weave.

![Figure 2. The first class of weaves](image)

The second class of weaves were shown in figures 3a and 3b and 3c. There were three kinds of weaves in this class. The first kind of weave is one-two down weft A twill. The upper layer were interwoven by wrap B and weft A with one-two down weft twill weave, wrap A and weft A with all weft float line, wrap A and weft B, weft C, weft D with all wrap over weft, the surface of fabric showed the color of weft A. The middle layer was interwoven by wrap B and weft B, weft C with one-two down weft twill weave. The lower layer was interwoven by wrap B and weft D with two-down wrap twill weave. The second kind of weave is one-two down weft B twill. The upper layer was interwoven by wrap B and weft B with one-two down weft twill weave, wrap A and weft B with all weft float line, wrap A and weft A, weft C, weft D with all wrap over weft, the surface of fabric showed the color of weft B. The middle layer was interwoven by wrap B and weft A, weft C with one-two down weft twill weave. The lower layer was interwoven by wrap B and weft D with two-down wrap twill weave. The third kind of weave is one-two down weft C twill. The upper layer was interwoven by wrap B and weft B with one-two down weft twill weave, wrap A and weft C with all weft float line, wrap A and weft A, weft B, weft D with all wrap over weft, the surface of fabric showed the color of weft C. The middle layer was interwoven by wrap B and weft A, weft B with one-two down weft twill weave. The lower layer was interwoven by wrap B and weft D with two-down wrap twill weave.
Figure 3a. The second class of first weaves

Figure 3b. The second class of second weaves

Figure 3c. The second class of third weaves

The third class of weaves were shown in figures 4a and 4b and 4c. There were three kinds of weaves in this class. The first kind of weave is one-two down weft A and weft B twill. The upper layer was interwoven by wrap B and weft A, weft B with one-two down weft twill weave, wrap A and weft A, weft B with all weft float line, wrap A and weft C, weft D with all wrap over weft, the surface of fabric showed the color of weft A and weft B. The middle layer was interwoven by wrap B and weft C with one-two down weft twill weave. The lower layer was interwoven by wrap B and weft D with two-down wrap twill weave. The second kind of weave is one-two down weft A and weft C twill. The upper layer was interwoven by wrap B and weft A, weft C with one-two down weft twill weave, wrap A and weft A, weft C with all weft float line, wrap A and weft B, weft D with all wrap over weft, the
surface of fabric showed the color of weft A and weft C. The middle layer was interwoven by wrap B and weft B with one-two down weft twill weave. The lower layer was interwoven by wrap B and weft D with two-down wrap twill weave. The third kind of weave is one-two down weft B and weft C twill. The upper layer was interwoven by wrap B and weft B, weft C with one-two down weft twill weave, wrap A and weft B, weft C with all weft float line, wrap A and weft A, weft D with all wrap over weft, the surface of fabric showed the color of weft B and weft C. The middle layer was interwoven by wrap B and weft A with one-two down weft twill weave. The lower layer was interwoven by wrap B and weft D with two-down wrap twill weave.

Figure 4a. The third class of first weaves

Figure 4b. The third class of second weaves

Figure 4c. The third class of third weaves

Finally, weaving the fabric on electronic jacquard machine after completion of jacquard cards in the jacquard weaving cad software[7-8].

5. Summary
Using textile CAD digital design technology, electronic jacquard weaving technology and fabric weave design technology, this paper designed a kind of Song brocade fabric that can prevent NFC data from being read. Two groups of wrap and N groups of weft (N = 2, 3, 4, 5, etc.) were designed on the fabric. Two groups of wrap ratio were ground warp (wrap A) : face warp (wrap B) = 3 : 1. Ground warp use silk, and the face wrap used mental silver fiber or metal fiber. N groups of weft ratio were 1 : 1, the front N-1 groups of weft for the silk, the last group of weft (N group) for the silver fiber or metal fiber. In order to maintain the original texture and gentle luster of the Song brocade fabric, the traditional mulberry silk was designed as the surface layer, the face wrap (wrap B and weft N were silver ion fiber intertwined at the back of the fabric through special binding weave. Compared with the existing technology, this fabric has the following advantages. Firstly, it can prevent NFC data from being read when the fabric is applied to the wallet, which effectively ensure the bank card information security. Secondly, the use of silver fiber can also effectively block the respiration and reproduction of bacterial cells, so the fabric has anti-bacterial deodorization ability[9].

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