Review Paper on Schiffli Embroidery

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❖ABSTRACT

Schiffli embroidery is one of the defined and intricate beauty of embroidery world and have upscaled a lot due to the revolution in textile industry by providing high end speed, good finish and multi-dimensional production. This review paper provides in-depth analysis of parts of machine, functioning and types of designs. Additionally the paper explores the materials and substrates best suited for Schiffli Embroidery. By providing a comprehensive understanding of machines and its functionality, the paper aims to serve as a valuable resource for those who seek to understand the know how of Schiffli embroidery and its working to explore the vast innovative field.

❖HISTORY OF SCHIFFLI EMBROIDERY

What does come to your mind after hearing of Switzerland? It's stunning snowy mountains, premium Toblerone chocolate or timeless Swiss watches. But there's way more than that and that is the rich history of Schiffli embroidery which it holds.

Schiffli was termed from a Swiss – German word meaning a "little boat" which characterizes the boat shaped shuttle in the respective embroidery machine.

Embroidery in the Middle Ages was very prolific. Rich traders and merchants were willing to pay a large sum of money for the luxury of embroidered clothing. In America, the first commercial embroidery manufacturing establishment was started in 1848 in New York by Jacob Schiess. He came from Switzerland and within a year had his own embroidery plant in operation. All the stitching was done by hand by fifteen woman stitching exquisite designs by hand. Joshua Heilmann from Mulhouse worked on the design of a hand embroidery machine and it revolutionized the embroidery industry. Heilmann's invention was quickly followed by the "shuttle embroidery" and the "chain stitch embroidery" methods.

The beginnings of shuttle embroidery dates back to the 1860's when Isaac Groebli, from St. Gallen, Switzerland, was inspired by the work produced on the sewing machine. The first schiffli embroidery machine was invented in 1863 by Isaak Gröbli (1822–1917). He developed a prototype at Benninger AG in the municipality of Uzwil, Switzerland. The first practical machines were made available in 1868. However, the machine's full

potential was not realized until the beginning of the 1870s. In 1876, Kursheedt also imported a number of schiffli machines, thereby making him the real founder of the schiffli embroidery industry in the United States. In 1898 Joseph Arnold Gröbli (1850-1939), the eldest son of Isaak Gröbli, developed the fully automated embroidery machine. The pantograph and thus the operator were replaced by a punch card reader. But currently paper punch cards have since been replaced by a computer. The punching process is now called digitizing.

❖PARTS AND FUNCTIONS OF SCHIFFLI EMBROIDERY MACHINE

i. The structure of the machine is fabricated with Mild Steel.

ii. CPU (Central Processing Unit) – To control the processing work of the machine of all the units wholly.

iii. Multi X Box – To control the movement and functioning of the frame.

iv. Frame – The metalled structure on the machine to hold the fabric firmly from all the sides.

v. Computer panel – To view and edit the settings of the machine-like speed, frame placement, needles and borer settings etc.

vi. Needle shaft – To hold the needles and to impart movement to them for stitching purpose.

vii. BTG shaft (Big Thread Guide) – For the movement of the thread guides for proper alignment

viii. Cloth Pressure shaft – For the movement of the cloth to give appropriate pressure and tension.

ix. Shuttle shaft – To give up and down movement to the shuttles for locking purpose.

x. Borer shaft – To give movement to the borers for imparting the holes in fabric.

xi. Cam Box – To control all the shafts of the machine collectively.

xii. Side frame – To provide stretching to the fabric which is held on the frame.

xiii. Servo Motors – Provided to perform the particular operations in the running machine.

(The data is with respect to LASSER machines)

❖CHARACTERISTICS OF SCHIFFLI EMBROIDERY FABRIC

- Complex and intricate designs :- It is able to produce complicate and magnificent designs, apart from mundane embroidery.
- Versatility :- It can be used for variety of products like dresses, decorative laces, accessories and on wide range of fabrics like cotton, polycotton, silk , net , organza etc.
- Breathability :- It incorporates comfortable and easy to breathe structures making it suitable for humid and hot climates.
- Drapability :- It provides good drapability for almost all types of garment and fits for every fashion trend along with complementing the natural hue of the body.
- Standard and formal look :- Due to its detailed and comprehensive designs it is widely preferred for rich choices and formal attire.
- Cultural representation :- By using cultural and ethnic motifs and designs one can create traditional outfit for festive wear.
- Cost :- It is an expensive production process due to demands of high end machineries and skilled labour so the produced embroidered fabric is also costly compared to the normal fabric.

❖WORKING OF SCHIFFLI EMBROIDERY MACHINES

The Schiffli machine uses two threads – one on the front side and one on the back side of the fabric. The first thread is entwined with the second thread to form a lock stitch. The front side thread, or embroidery yarn, is held on a spool, or rather a creel of spools. Shuttle carries the bobbin thread, which is also known as the schiffli yarn. There is one shuttle per needle. When the front-side needle pierces the fabric it passes the embroidery thread through the fabric from front to rear. As the needle withdraws it forms a loop on the back side of the material. The shuttle which trails the bobbin thread passes through this loop. Finally, the front-side thread is pulled tight.

Schiffli machine uses a row of needles and a movable frame that holds the fabric. A shuttle embroidery machine can have several hundred needles per row. The needles are stationary and the frame moves. A stitch that occurs in any given direction is accomplished by moving the frame in the opposite direction. Different manufacturers achieved different minimum stitch lengths. There were also attachments for boring holes in the fabric. Both stitching and boring require very precise frame movement. Once a row of embroidery is completed the material is rolled upwards and the design is repeated.

Unlike the hand embroidery machine, the needles do not pass completely through the fabric. A schiffli spool on the other hand, could hold more than 500 yards of embroidery thread. The schiffli machine is only limited by the length of thread that can fit on the bobbin.

Like the hand embroidery machine, early schiffli machines used a manually operated pantograph to trace a pattern and translate the location of each stitch. Later, a card reader was used to program the machine. The punch card, a concept borrowed from the Jacquard loom, recorded the end points of each stitch, as well as other functions that could be performed by the machine, e.g. stitching, boring, or advancing the material. The conversion of the design into a punch card was known as punching.

Needle spacing, or pitch, limited the width of the embroidered design. The spacing between the needles is known as rapport or gauge. Standard spacing was known as 4/4rapport Machines with 3/4, 4/4, and 6/4 were typical. Wider needle spacing and thus larger designs could be produced by removing some of the needles. This was known as 6/4, 12/4, or 16/4rapport.

❖LENGTH, NO. OF NEEDLES AND SPEED OF SCHIFFLI EMBROIDERY MACHINES

LENGTH :-

Machine length ranges from 21.30 mts to 29.40 mts according to the number of needles.

Embroidered fabric length ranges from 20.40 mts to 28.30 mts.

NUMBER OF NEEDLES :-

No. Of needles ranges from 750 to 1050 according to the length of machine.

SPEED OF THE MACHINE :-

The speed ranges from 180 rpm to 525 rpm according to the capacity of the machine and for the boring process generally the speed is around 200 rpm.

(The data is with respect to LASSER and SAURER machines)

❖TYPES OF STITCHES FOR SCHIFFLI EMBROIDERY MACHINES

i. Lock stitch :- This is the basic stitch type used to loop the front thread with the back thread. There are several advantages to using a lock stitch: significantly longer threads can be used, the threads are less prone to breakage, and the stitch rate is much faster. This means fewer interruptions and less frequent stops to re-thread.

ii. Chain stitch :- It is a series of connected loops resembling a chain structure, mostly used for outer linings and to fill texture.

iii. Satin stitch :- It is generally used in filling shapes and to create smooth, solid areas of embroidery.

iv. Running stitch :- It is a basic simple line of evenly spaced stitch used to create borders, small patterns or acts as guide for making blueprint of texture to be made.

v. Triple run :- It is a form of running stitch but with the same line repeating 3 times over each other forming a thicker line. Used in creating heavy details.

vi. Back stitch :- It is especially an outlining stitch which overlaps each other forming solid continuous lines.

vii. Cord stitch :- This is used to add cord thread to the design to apply a raised 3D effect to the fabric for additional dimension.

viii. Cross stitch :- This stitch is a continuous line of small ‘X’ structures for decorative patterns or grid formations. It is widely used for folk and traditional embroidery.

ix. Tatami stitch :- It is a series of parallel lines for filling large areas and to create uniform design with minimal look.

❖TYPES OF YARNS AND FABRIC FOR SCHIFFLI EMBROIDERY MACHINES

- YARN TYPES

FRONT YARN:-

2/30 Ne Cotton

2/40 Ne Cotton

150/2 denier semi dull polyester

150/2 denier bright polyester

150/2 denier full dull polyester

150/2 spun polyester

BACK YARN:-

2/60 Ne Cotton

100 Tex polyester

150 Tex polyester

2/60 denier polyester

- FABRIC TYPES

Cambric cotton fabric

Chambray fabric

Dobby fabric

Double cloth fabric

Net fabric

Organza fabric

Polycotton (PC) fabric

Poplin cotton fabric

Rayon fabric

Satin fabric

Voile fabric

❖PUNCHING DESIGNS FOR SCHIFFLI EMBROIDERY MACHINES

Punching is one of the intricate and important process where the puncher determines start point and end point of the design and position of each stitch. The puncher bears big responsibility for final look and machine run ability of the embroidered design.

The basic punching knowledge can be taken from design schools, but to master it one have to gain experience on own. It is essential for puncher to not only work with the computer but to achieve satisfactory results and for that puncher checks his work directly while running sample on machine.

Nowadays, puncher mostly makes both drawing and punching and in addition editing. In olden times it was done manually on punch cards without any software application. Various programs are now available like WILCOM for facilitating the work. The knowledge of puncher about drawing, punching and capabilities of machine will produce the end product.

❖DIFFERENT WAYS OF MAKING EMBROIDERY FOR SCHIFFLI EMBROIDERY

- ALL OVER EMBROIDERY

The particular pattern or motif which covers the whole length and width of the fabric to be embroidered from selvedge to selvedge. The design could be of any repeat (4/4 , 8/4 , 12/4 … etc.) and the spacing and orientation of the pattern can be set accordingly. It could also be designed with borders on one or both sides.

- BORER EMBROIDERY

Boring holes are made with borers in various shapes like circle, square, rectangle, triangle, hexagon etc. It is generally made with hole in the centre and series of stitches surrounding it, along the outside of borer hole. It can be of various sizes according to the effect to be produced.

- COLOUR CHANGE (ATC) DESIGNS

There is no limit to colour that can be used if the costs don't matter to enhance the design look. The machine has one separate thread roller for each needle which is only active if needle is on. Usually colour changes are used for repeats 8/4 or larger ones, allowing two or more colours to be used. All thread colours and their shuttles are set right from the start.

- APPLIQUE EMBROIDERY

When designs are made to pop out as addition of second fabric over the base fabric then is termed as applique embroidery technique. The application fabric is attached with the base fabric from the beginning but is rolled up and fixed on upper roller while base fabric is embroidered. After the fabric is off spanned it is hand cut as close as possible and laser cut.

- GUIPURE LACES

The basic idea of the laces is to run a design on a fabric, generally chemical or non-woven fabric, which will be then removed and only stitches will be left. Removing the fabric can be made with dry or wet process. One thing must be taken care that stitches of the lace design should remain in one piece. The empty spaces in the chemical lace designs are not work of borers.

- SEQUIN EMBROIDERY

Sequins are the small, shiny materials generally metal or plastic disks, used for decorating the men and women dresses. They are of various shapes and sizes and colours. They possess a hole in the centre by which they are attached on the fabric with the thread passed through it.

- CORD EMBROIDERY

Cord is the type of thread but the only difference is in its orientation. They are quite rigid and stiff and don't misplace from their position. This is why cord thread lies on the front side of fabric pulling shuttle thread to the front as well. They are always embroidered as running stitches due to their stiff nature.

❖ CONCLUSION

In conclusion, Schiffli embroidery machines have played a pivotal role in growing production. Over the years technology has changed the face of industry with enhancing the capabilities of the machine to produce high quality products. Due to computerized advancement the efficiency of machine has reached at par and has provided ample of opportunities to compete worldwide. Also, it adopts eco friendly practices and reduced waste and energy consumption. In a nutshell, the technology of the machines has improved a lot and have several scopes for future too.

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