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TECHNOLOGY, STRUCTURE AND APPLICATIONS OF FANCY YARNS

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ABSTRACT

Majority of the yarns produced for commercial production pattern exhibit evenness of colour, appearance and texture. These are basically the outcome of the extent of uniformity of yarn structure attained. Thereby highest stress is given on the achievement of the regularity of the yarn structure during the yarn manufacturing process. However, at some point in the past, a fabric designer realized that what seemed to be an imperfection or irregularity in the yarn could become best value adding tool. As a result researches were undertaken to devise new ways of manufacturing yarns with these 'planned imperfections', or "deliberate irregularities". Use of such yarns in making fabrics has demonstrated the textural variety that seems to be greatly appealing. These yarns are described as 'fancy yarns' or 'novelty yarns'. This article gives a brief summary of varieties of this special category yarn engineered using different technologies during the course of research along with their specific domains of end user.

***Key Words*: Colour, Effect material, Fancy Yarn, Irregularity, Structure, Technology,.**

1. INTRODUCTION

Yarn refers to a structure composed of continuous length of interlocked fibers. They are suitable for use in the production of textiles, sewing, crocheting, knitting, weaving, embroidery and rope making. However, fancy yarn deviates from the normal yarns. These deviations occur mainly due to introduction of deliberate decorative discontinuities in the form of colour, structure or both [1]. Based on these deviations varieties of definitions were put forward for the fancy yarn by the researchers [2-5]. The size and value of the market for fancy yarn is negligible. However, fancy yarns appear mainly in high value items, so their small volumes cannot be ignored [2].

2. CLASSIFICATION OF FANCY YARNS

There are four main criteria recognized for the classification of fancy yarns. They are,

- Type of raw material used for effect making
- Number of Ground and Effect making material components
- Method of manufacture
- Type of Effect produced
- End use of fancy yarns.

Classification of fancy yarns is done according to the type and form of material used for effect making. Type of material used for effect making refers basic material of the components, viz; cotton, wool, silk, polyester, nylon, blend etc. Whereas form of material refers forms of components used for the intended purpose. The components can be not only yarns made from staple fibers or filaments but also the lengths of yarns and/or filament, fabric pieces made up of woven material or knitted material or non-woven material as well as the polymer cover for the decorative coating of core component. They can be tape/ ribbon, metallic yarns etc. added for decorative means.

The number and type of components virtually change the structure and exterior of the fancy yarn. The number of the components can differ from one to six and more.

The classification based on method of manufacturing basically deals with direct or indirect process of getting fancy effect. Direct group deals with production of fancy yarn in single step by specialized equipment, viz; twister for fancy yarn making, special knitting machine etc. Whereas, indirect category does not use specialized

equipment for the production of fancy yarn. The production delays by the number of machines in sequence. Fancy yarn produced by ring spinning system is the best example for this category.

Fig. 1 describes the classification of fancy yarn based on the type of effects. Grouping of fancy yarn is based on the type of effects earned. Mainly deals with the variation in the optical, structural and compound effect. Fig. 2 illustrates the structures of these three categories [6 -7].

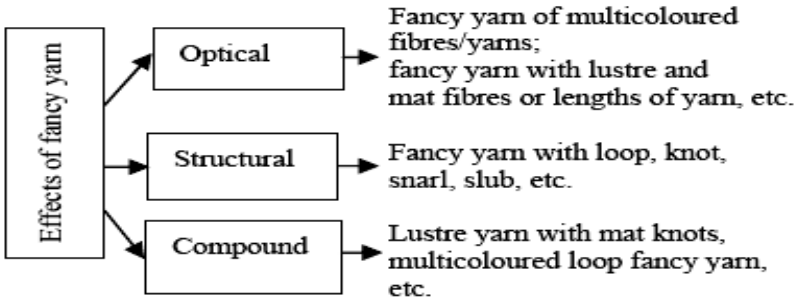


Figure 1: Classification of Fancy Yarns according to the type of the Effect

Figure 2: Structures of Fancy Yarns with types of Effects

a – optical [color (brocade yarn)], b – structural (slub yarn), c – Compound (spiral-loop mauling yarn)

Major application area of fancy yarn is ornamentation [2, 8]. Ornamental fancy yarns are created to impart special aesthetic appeal to fabrics to find applications in normal and high fashion clothing, curtain, upholstery and many other areas [8]. Apart from that fancy yarns are also engineered to fulfill peculiar function(s) by combination of one or two or more basic yarns. They are also known as functional yarns [2]. Thus fancy yarns vary in their appearance, depending on their fashion value and also according to the function they have to perform. Various categories of fancy yarns developed by researchers have been briefly summarized in Fig. 3.

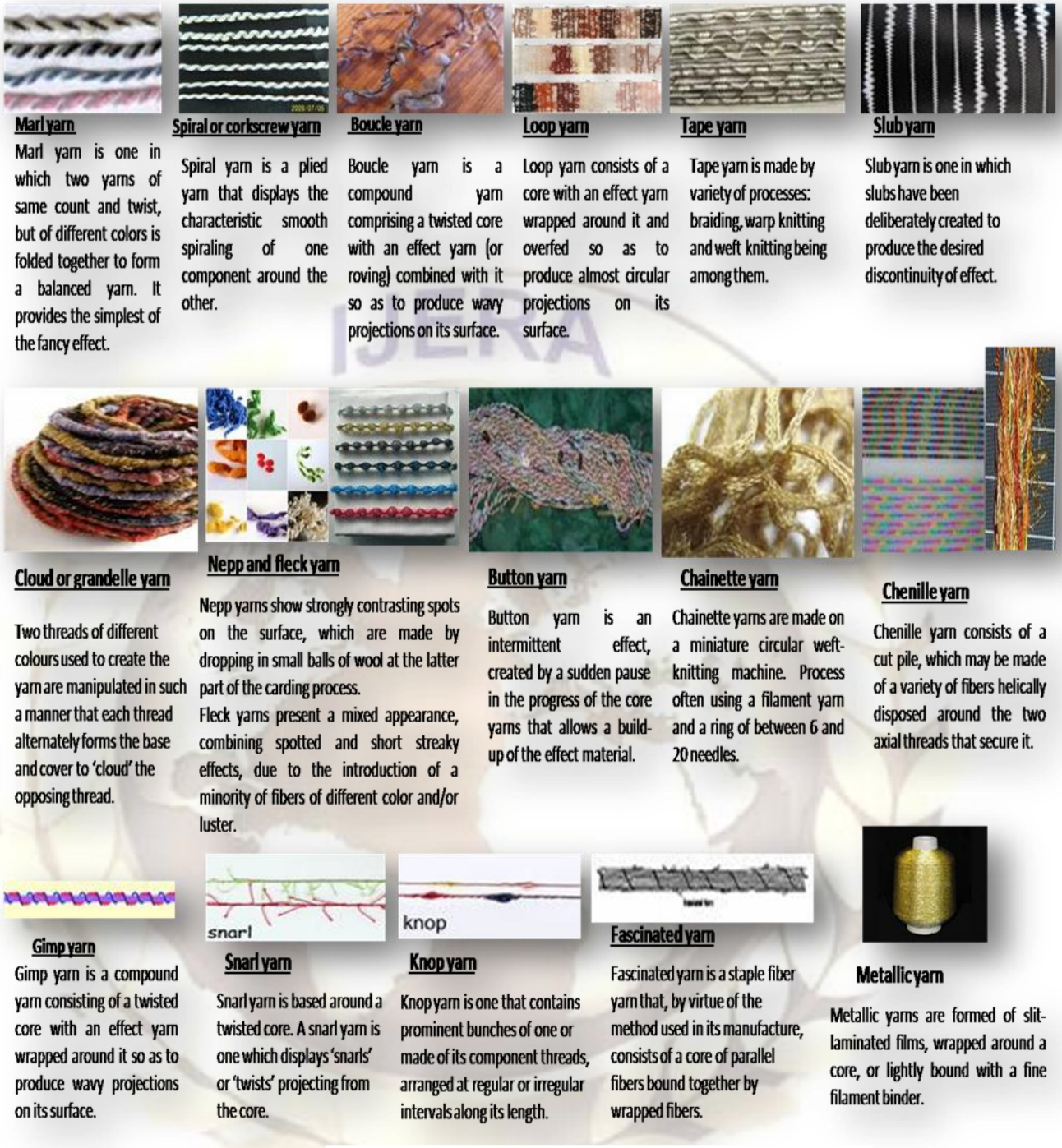
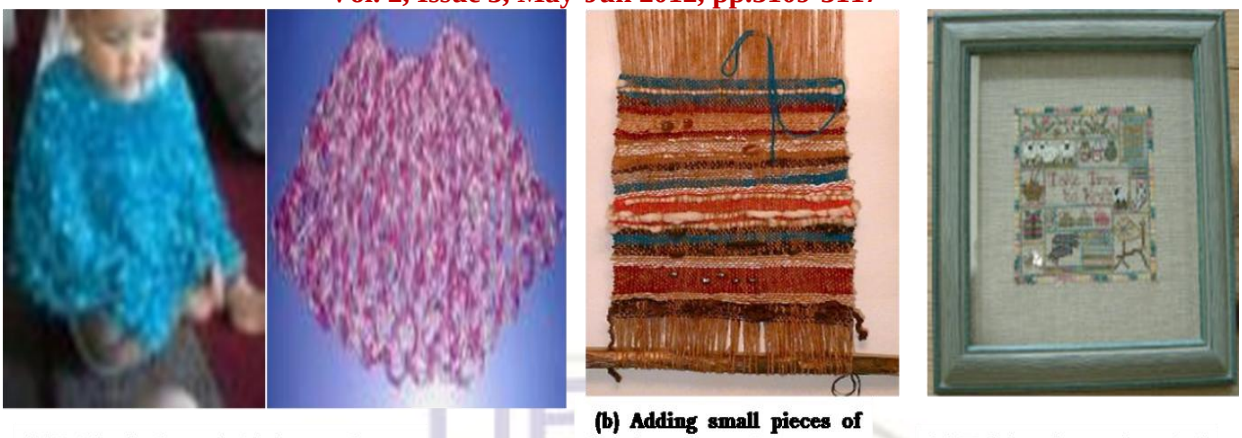


Figure 3 Varieties of ornamental fancy yarns

End use examples of few ornamenting fancy yarns and the functional fancy yarns have been illustrated in fig. 4 and fig. 5 respectively.



(a) Lattice look crochet baby poncho

(b) Adding small pieces of boucle yarn and Turquoise yarn to add texture.

(c) Wall hanging made out of fancy yarn

Figure 4 End uses of ornamental fancy yarns

Entire range of winter wear produced out of fancy yarns.

Double Rope: High proportion of sheath makes these double ropes extremely durable and abrasion resistant, with very high safety reserves and excellent handling.

Universal Light Weight Rope: Stronger and lighter preferred for climbing in mountain

Figure 5 End use of Functional Fancy Yarns

3. PRODUCTION TECHNOLOGIES USED FOR FANCY YARNS:

Three main methods have been used for the production of fancy yarns differing in their structural characteristics, viz; Ring twisting method, Hollow spindle method and Open end rotor spinning method [2].

3.1: Ring twisting method

Ring twisting is the well established yarn spinning method. Ring spinning system is the oldest and versatile in terms of types of materials (100% pure cotton, Blend, man-made staples) and fineness of yarn (wide range of count 6^s to 120^s). Ring and traveller are used for the insertion of the twist. In spite of the encroach of a variety of new spinning methods in recent years is still regarded as the 'standard' spinning method and it remains the benchmark, against which all other yarn production processes are measured [2]. Varieties of fancy yarns can be produced with the added set up in the feeding zone, tensioning zones. Set ups used at ring frame for the production of loop yarn, bunch yarn and spiral yarn have been illustrated in figure 7 [10]. The fancy yarn produced by this system exhibits high strength, bulkiness and regularity [11].

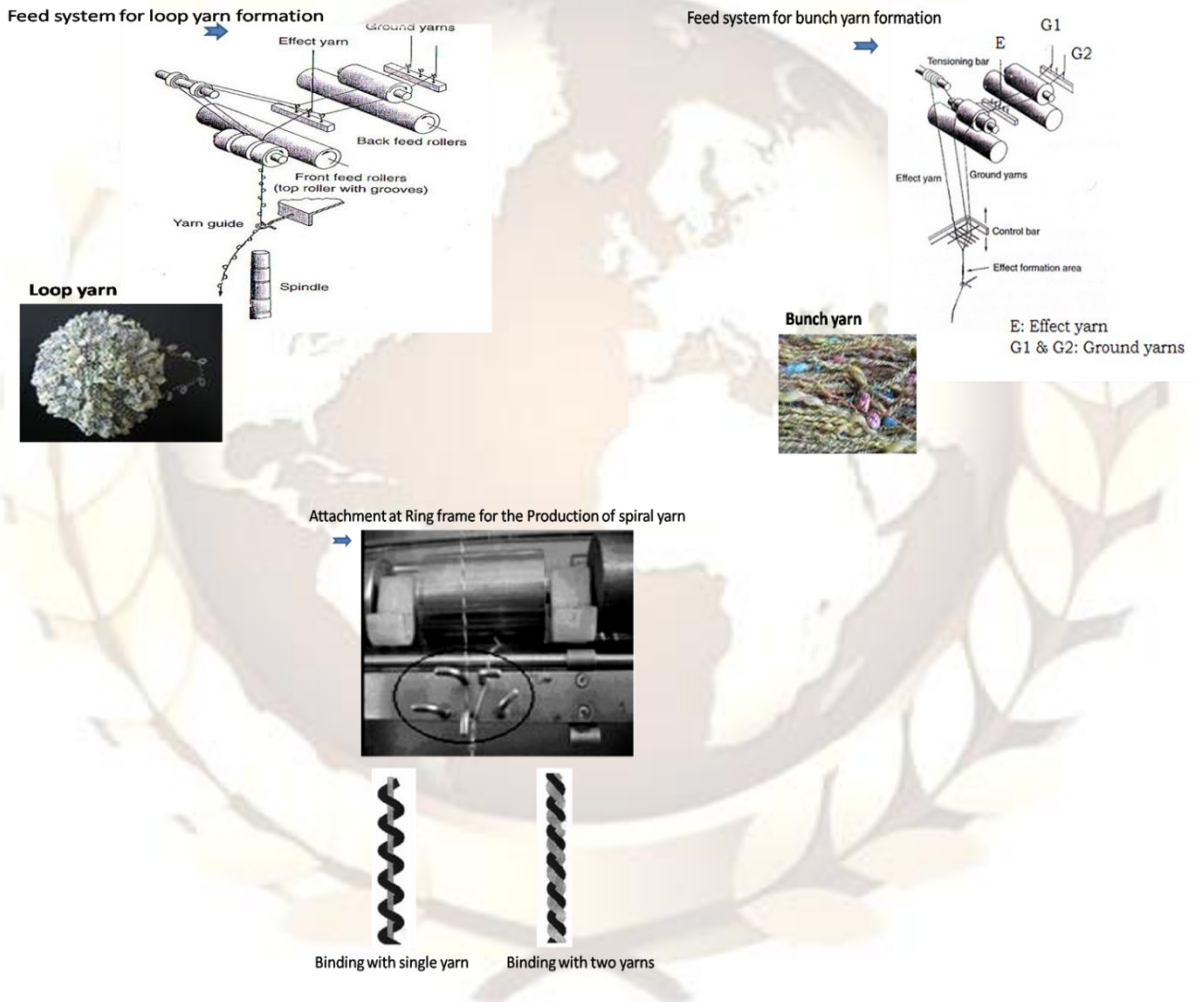


Figure 7: Various Fancy yarn Production Set up used at Ring frame

Although good quality fancy yarn attained by ring spinning, process stages involved are more numerous. Ring and traveller system itself limits the delivery speed of the process adversely affects economy of the product. However many modifications are done in the metallurgy as well as design features of this assembly still they prone to add hairiness as well as end breakage rate due to higher friction offered between them and the material. They also restrict the full package size and increase the downtime of the machine due to higher doffing frequency. Higher revolving mass increases energy consumption and thereby power cost. Nett effect is good quality product charged at higher production cost [11, 12].

3.2 Hollow spindle method

The hollow spindle principle of spinning was first developed by George Mitov at the Institute of Clothing and Textiles in Bulgaria [2]. The process he devised, replaced twist in a yarn by wrapping a filament binder around the material being used. This resulted in a fascinated yarn structure, in which most of the elements lie parallel to one another while the binder imparts the necessary cohesion. This system is suitable for making plain as well as fancy yarns. Principle of formation of fancy yarn by hollow spindle and popular varieties of fancy yarns produced by different researchers using this system are illustrated in figure 8.

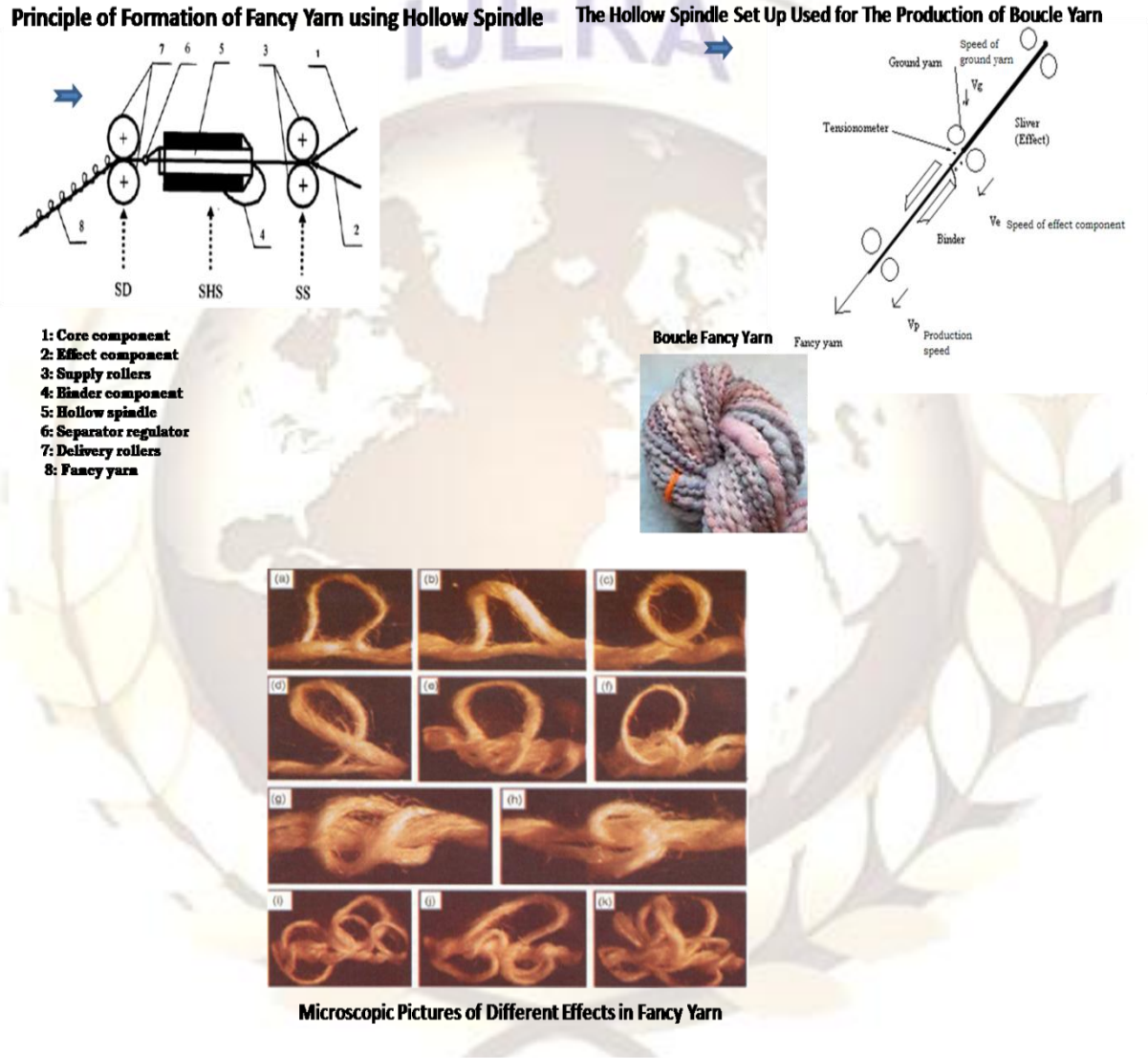


Figure 8: Hollow Spindle Concept for Fancy yarn Production and Popular Varieties of Fancy Yarns Developed using this Concept.

conventional yarns. The relaxation characteristics of wrap yarns are similar to those of conventional two-fold yarns. Pliability of wrapped yarns is superior to that produced by other systems. With conventional yarns, neps and slubs tend to come to the surface, but with wrapped yarns they tend to stay in the centre, because of the absence of the twist [13]. However tenacity of the yarn depends on filament strength. Filament yarn is expensive, although the extra cost may partially be offset by the elimination of slashing costs. The wrapped yarn with a twist less core lacks abrasion resistance and therefore tends to pill or shed during weaving when used as warp yarns. More specifically, when tension is applied on the one directional

wrapped yarn (either Z or S), such as in the weaving operation, stress starts to build up on the filament wrapper and elongation begins. Consequently, wraps per unit length of the core decrease, resulting in less control of the core fibres by the wrapping filament [13].

3.2.1 Fashionator**:**

Falise et al.[1] re-developed Saurer-Allma's hollow spindle fancy twister type ESP/ESC to manufacture a new modern fancy twister with numerous innovations- the Fashionator EHP/EHC. Fig. 9 illustrates the major features of this system.

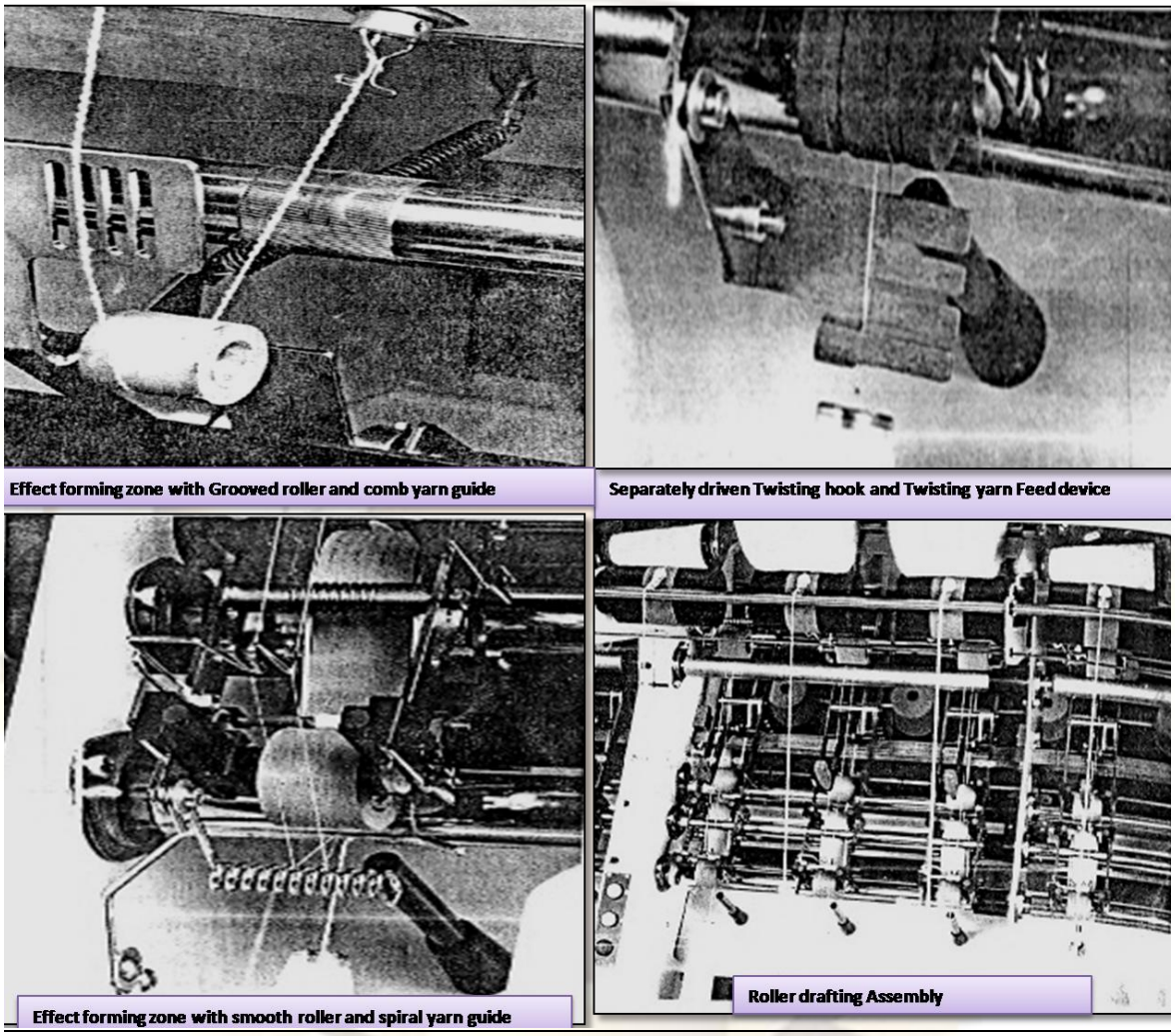


Figure 9: Major Features of Fashionator

It offers higher efficiency as compared to conventional hollow spindle fancy twisters due to;

i. The spindle and the twisting hook are driven independently from one another.
ii. The false twist, which is important for the effect formation, is bound immediately after the effect material leaves the effect yarn feed device.
iii. Considerably reduced spinning triangle
iv. Large separation sheets between the spindles avoid series of thread breaks in case the binder yarn breaks.
v. The suction duct is dimensioned in such a way that a constant suction power is ensured at every spindle.

vi. A new bottom apron tensioner in the 3 roller drafting assembly ensures optimal draft and uniform fiber guidance.

vii. An elastomeric device can be integrated. Fine fries and node yarns with elastic core are necessary particularly for the circular knitting sector. This device permits the processing of low cost elastomeric monofilaments, which will be integrated in the fancy yarn construction.

viii. A modern industrial PC is used in the Fashionator. The PC is integrated in the headstock of the machine. The user is guided through the effect program via a menu control.

3.3: Open end rotor spinning method:

Farshid Pouresfandiary[14] proposed a modified open-end rotor spinning for producing loop fancy yarn. They used a cotton sliver as the binder fiber and two coloured polyester filaments as the core and effect yarns. The fig. 10 shows the diagram of this new spinning process developed on experimental rotor spinning frame. The core component was fed into the yarn formation zone from the supply bobbin (1) by suitable guides and a tensioning device through the filament feed tube. They installed an electric tension meter (Shimpo Co., DTMX-0.5) between the tensioning device and the feed tube to measure core tension during the spinning. the effect filament yarn was fed from the supply bobbin (2) through the effect filament feed rollers with a constant feeding speed.

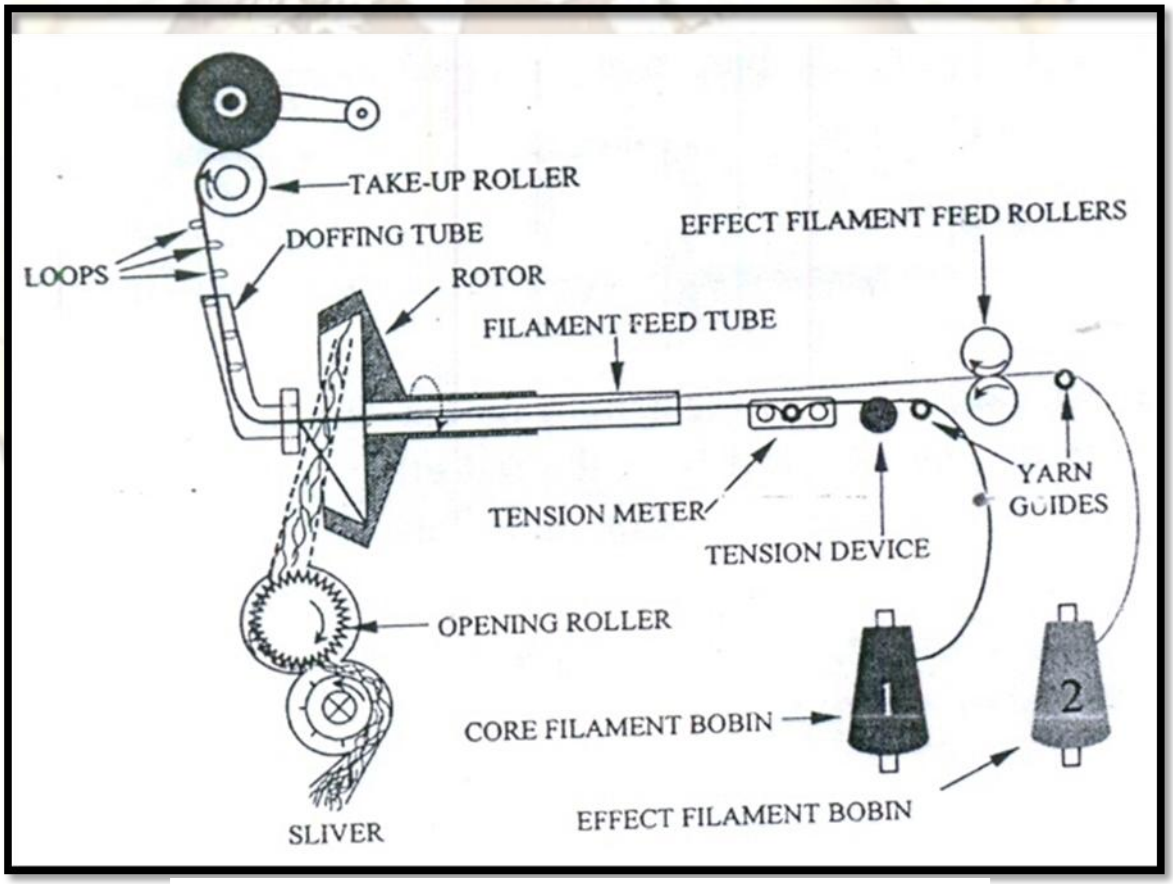


Figure 10: Loop yarn Open End Rotor Spinning Process

However due to the back-doubling action inside the rotor, it is not possible to produce slub shorter than the circumference length of the rotor because any variation in the fibre feed stock is spread over a minimum length of the rotor circumference.

They have also attempted to use injections of pressurized air into the fibre transportation tube to alter the fibre flow and thus introduce variations in the yarn. However, the effects created using this approach are

very limited, since the fibre flow in the transportation tube is extremely thin and the variation in the yarn caused by changes in the airflow is consequently very small.

4. MARKET POTENTIAL OF FANCY YARNS

While considering the market for fancy yarns, we need to remember that these goods are not commodity items, and nor will they ever be. Their purpose is to add colour or texture, or both. So market value of fancy yarns will remain negligible with compared to the rest of the textile market. But due to the consequence of liberalization in trade with countries like China a great interest in fancy yarn area is noticed in textile market all over the world. Due to liberalization in fancy yarns sector trade between Europe and Asia, the main Asian producers of fancy yarns compete with each other to offer more and more sophisticated products.

5. CONCLUSION

Fancy yarns are special products of spinning with deliberately introduced irregular characteristics in either diameter, bulk or in colour. Products made from fancy yarns are not commodity items. Although market value of fancy yarns is negligible with compared to the rest of the textile market research and development in this area has become very important. This is mainly attributed to the value addition obtained in terms of fashion or function of the yarn.

The production of fancy yarns has been differentiated and enriched in such a scale that makes almost impossible to categorize and standardize all the products. Regardless the explosion of the new fancy yarns products without the proper standardization procedure or at least classification, the process of evolution of yarns, in general, lasts, both in the context of the components and final products as well as trade.

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