Modification of Tappet Shedding Reversing Motion for Dhotis

By:
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Abstract

Dhotis are woven in shuttle looms to get conventional selvedge for neat appearance and better stability. It is a cross border fabric consist of, generally, plain body and rib border. It can be woven using cross border dobby. However loom speed will be limited when using dobby in general and particularly cross border dobby than tappet shedding. It will lead to production loss.

Thereby it is better to use tappet shedding, modified suitably to produce body and border design, to produce dhoti. It won't affect the speed and production. This is possible because of using plain weave in the body and simple rib weave in border most of the cases.

1. Introduction

Weaving is defined as the process of interlacement of the warp and weft yarn to produce woven fabric. It has three primary motions namely shedding, picking, and beat- up. The machine used for weaving is called as loom. Hand looms and power looms are two types of loom used to produce woven fabrics. Further, power looms can be classified into three categories. They are plain power looms, automatic shuttle looms and shuttleless looms.

Dhotis are woven in shuttle looms to get conventional selvedge for better stability. It is a cross border fabric consist of, generally, plain body and rib border. It can be woven using cross border dobby. However speed is limited when using cross border dobby, it will lead to production loss

Thereby using of modified tappet shedding is appropriate for dhoti production without composing the speed to produce body and border. This is possible because of simple rib in weave border.

2. Materials and Methods

2.1. Materials

- Shaft,
- Ball bearing,
- Clamp,
- Spur gear,
- Idler,
- Reversing roller.

2.2 Machine Specification

- Plain power loom
- Negative tappet shedding mechanism
- Number of heald frames used – 4.

2.2.1 Design of Tappet Shedding Arrangement

Basic idea of the new development is choosing an appropriate drafting order on four shafts and altering the lifting order in order to weave plain and rib weave. Figure 2.2 shows the drafting order for the warp threads. The drawing order is 1,3,1,3,2,4,2 and 4. And choosing the lifting order as shown in the same Figure will give plain weave.

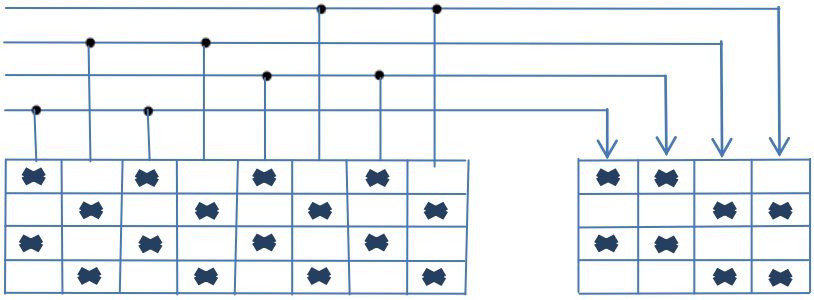


Figure 2.1 Plain weave

By changing the lifting order as shown in the Figure 2.2 in the same drawing order discussed above will give rib weave as shown in the same Figure 2.3. Practical weaving with the above concept with tappet shedding mechanism requires modification of the existing tappet shedding.

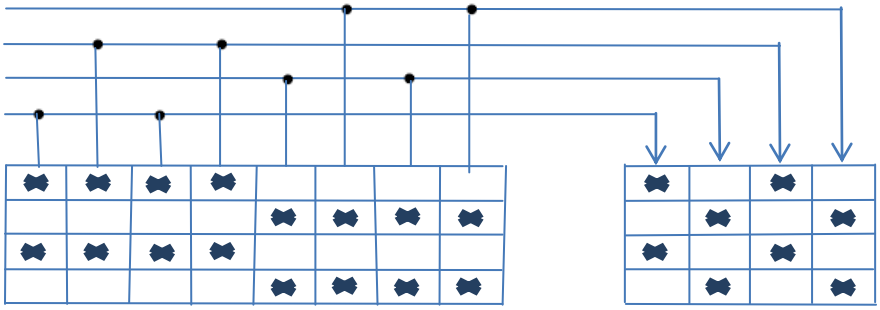
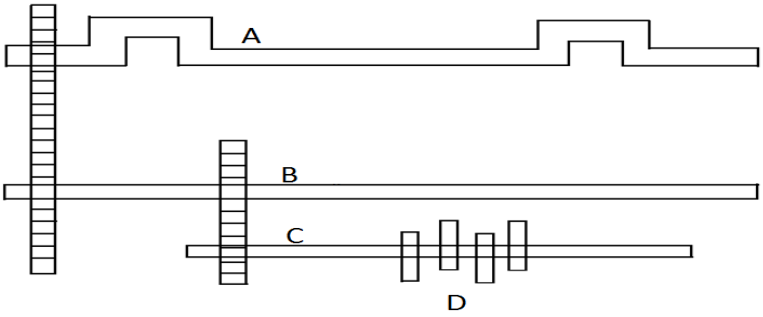


Figure 2.2 Rib weave

2.3 Tappet Shedding

The shedding tappets are mounted in bottom shafts or a separate shaft; the settings are operated by heald frames according to the weave structure. The no of tappets depends upon the weave and two tappets are required to produce the plain weave structure. For twill weave, repeating on 4 end and 4 picks, four tappets are required.



A = Crank shaft, B = Bottom shaft, C = Tappet, D = shedding tappets

Figure 2.3 Three shafts of a loom

2.4 *Working principle of reversing rollers*

Looking at the both lifting plan the shaft 1 and 4 operate opposite to each other and similarly shaft 2 and 3 operate opposite to each other. Thereby these are made in groups and placed on reversing roller shaft L1 and L2.

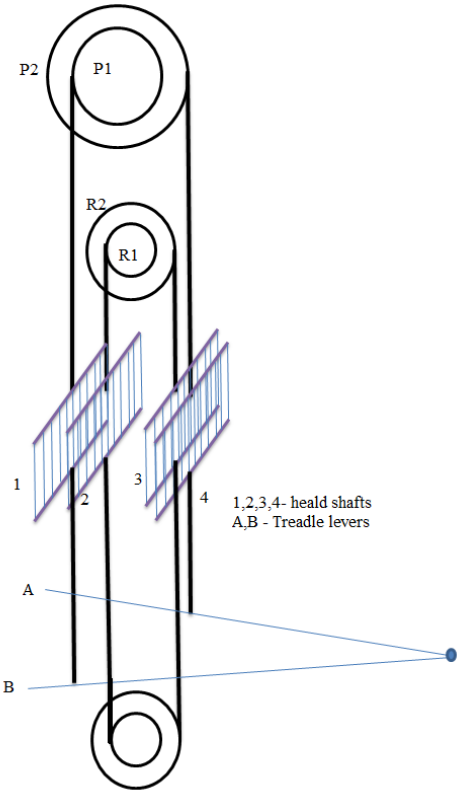


Figure 2.4 Schematic diagram of reversing roller

2.5 *Analysis of existing loom*

- Fabric construction:

Warp count	- 40Ne
Weft count	- 40Ne
Picks per inch	- 80

Width of the fabric - 135cm

- Machine specification

  Picks per minute - 106
  Pirn changing time - 15 seconds
  4 feet length of fabric - 12×4 = 48”

We know

Picks per inch = 80
Total picks for 48 fabric = 80×48
= 3840 picks

We know

Picks per minute = 106
Total time required for insertion of total picks (Without pirn change) = 3840/106
=36.22minutes
Number of times pirn changed during weaving (Body) = 4 times
Pirn changing time for body of the fabric =4×15seconds
= 60 seconds
= 1minutes
Number of times pirn changed during border weaving = 8 times
Time taken for one time lever change (border) = 2 seconds
Pirn changing time for border of the fabric = 8× (15+15)
= 4 minutes
Total time required for insertion of 3840 picks including pirn change = 36.22min + 1min + 4min
= 41.22 min

From snap study taken, I found that

Time taken for 3840 picks insertion including pirn change = 60min

So this difference of 18.88 minutes was due to interference loss.

3. Results and Discussions

In the current loom, which has picks per minute of 106, takes a time of 36.22 minute for pick insertion without pirn change. For the production of 1 meter fabric, 4 times pirn changing is required for body (total 60 seconds for pirn changing i.e. 15 seconds × 4 times) and 8 times pirn changing required for border design (8 times (15+15) = 4 minutes). So total time required for insertion of 3840 picks was 41.22 minutes. But from the snap study taken it was found that time taken for 3840 picks (including pirn change) was 60 minutes. The difference of 18.88 minutes was due to interference loss.

For reducing this interference loss, a modified reversing roller tappet shedding was used; the interference loss was reduced up to 2 minutes for 1 hour production which significantly improved the production efficiency of the loom.

4. Conclusions

In this project, an attempt was made for reducing the downtime of looms (interference loss) thus improving the production efficiency of the looms and analysed. I found that,

there was a significant improvement in reducing the downtime of looms (looms waiting for attending). The snap study was taken and found that for producing 1 meter dhoti fabric; there was an overall savings of 2 minutes taken for changing the pirn for border and body design. Thus, approximately 50 minutes per day can be saved by which a weaver can weave an extra dhoti.

Acknowledgement

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