International Journal of Engineering Technology Science and Research
IJETSR
www.ijetsr.com
ISSN 2394 – 3386
Volume 5, Issue 1
January 2018

Mechanical Developments in Design Aspects of Textile Warping Machines

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ABSTRACT

Warping is one of the most important processes for manufacturing woven fabrics. There are many systems used for the same but two systems are highly used viz. Direct and Sectional. In the paper an attempt has been made to review some mechanical modifications patented so as to provide more flexibility and adaptability. Also, it contains limitations of the mechanical modifications attempted so far. Out of two main systems of yarn warping, users have their own application area for selecting a particular system. Critical review of both systems is discussed in the paper. Finally, a new design concept for unifying both systems is included in the paper.

KEYWORDS

Warping, Direct, Sectional, Creel, Beaming, Bobbin, Head Stock, Drive

INTRODUCTION

As mentioned by Thakkar et.al. (1), there are many systems of warping for preparing warp to manufacture woven fabrics. But two systems are highly preferred for most of the production of fabric for apparel application. These systems are direct and sectional. The direct warping consists of preparing a full width warper's beam in one step which contains lesser number of threads, while the latter consists of preparing only one section at a time, many such sections making a full width weaver's beam (2). Users have their own set of application for either or both types of warping systems. There is no single system which can provide solution to all types of yarns i.e. mono-colored and patterned warp. Many attempts have been made to provide solution to some extent and the same have been discussed below.

REVIEW OF LITERATURE

Most of the standard textbooks about weaving preparatory contain an account of production and process aspects and few talk about control of process parameters. (2, 3, 4). As far as the developments in the machinery is concerned one is required to go through the patent literature. There have been many attempts towards unifying both systems in to one but the machinery manufacturer and the textile goods producers still rely mainly on two main systems of warping. As mentioned by Thakkar et.al. (1) some of patents were discussed about mechanical modifications made in the direct and sectional warping machines. These patents were by Loncteaux H.J. & others (1937), Harris (1961), Erwin (1978), Scholze (1974) etc.

Some of the more attempts which were made at solving the problem are presented here. Hiroshi and Shozo (5) have files patent regarding automatic switching of patterned warp on a sectional warping machine. They have tried to provide solution to the problem of reducing creeling time which is lapsed when running patterned warp. Also changing the creel at the end of the beam is a highly time consuming operation. (Fig. 1). This

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system offers a novel solution but is limited to very less number of the bobbins in the creel. In the patent a total of 148 positions have been considered.

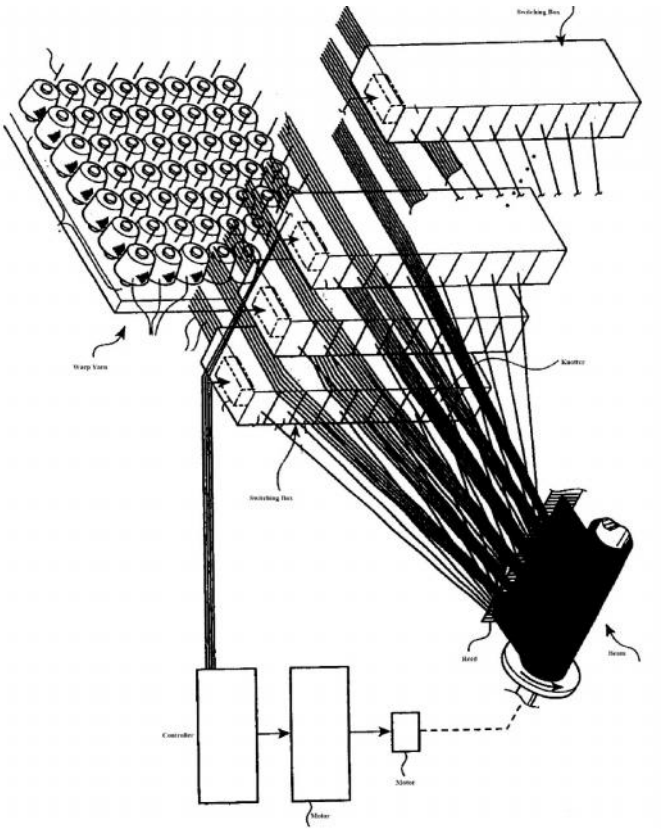

Fig. 1 Arrangement of switching creel (Hiroshi & Shozo, 2007)

There have been few attempts related to modifications in the beams used for smaller widths like the ones used for warp knitting machines. A patent filed by Storey (6) is related to modifications in the warp knitting beams. He has mentioned that fixing flanges on a barrel involves many parts and complexity of adjusting the same on the barrel. Also the material used is quite heavy and causes problems during shipping internationally. These problems were addressed by Storey in his patent. The objectives as stated in the patent were as below:

(i) Use of light weight beams
(ii) Simplified manner of mounting
(iii) Decreasing thickness of the flanges
(iv) Limited play after fixing of the flanges

The flanges were made by aluminum or aluminum alloys to reduce the weight. Also in place of threaded part on the barrel, a plug mounted on barrel and pin mounted on the flange arrangement was offered for fixing the flange. A typical arrangement is as shown in the figures 2 and figure 3 below.

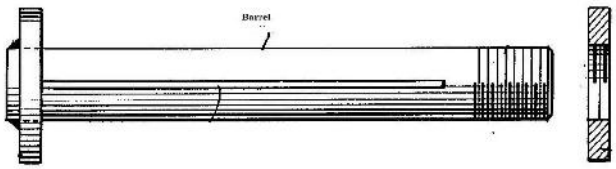

Fig. 2 Warp knitting beam (Storey, 1965)

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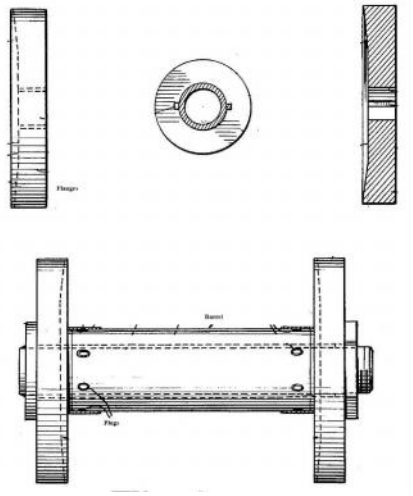

Fig. 3 Warp knitting beam- Detailed view (Storey, 1965)

One more interesting patent has been filed by Fuhr (7) for Karl Mayer Company. The patent has been filed in various countries and currently European filing is considered. The flange of the beam is differently designed in this patent as shown in figure 4 below which shows the full view of the whole system during working.

As shown in figure 4, the flange itself is shaped in to conical way. The angle of the conical surface can be up to 45 deg but in the patent it is recommended to keep it up to 20 deg. As mentioned earlier that the sectional warping machine works with the one side conical shaped drum. The same function will be carried out by the beam itself.

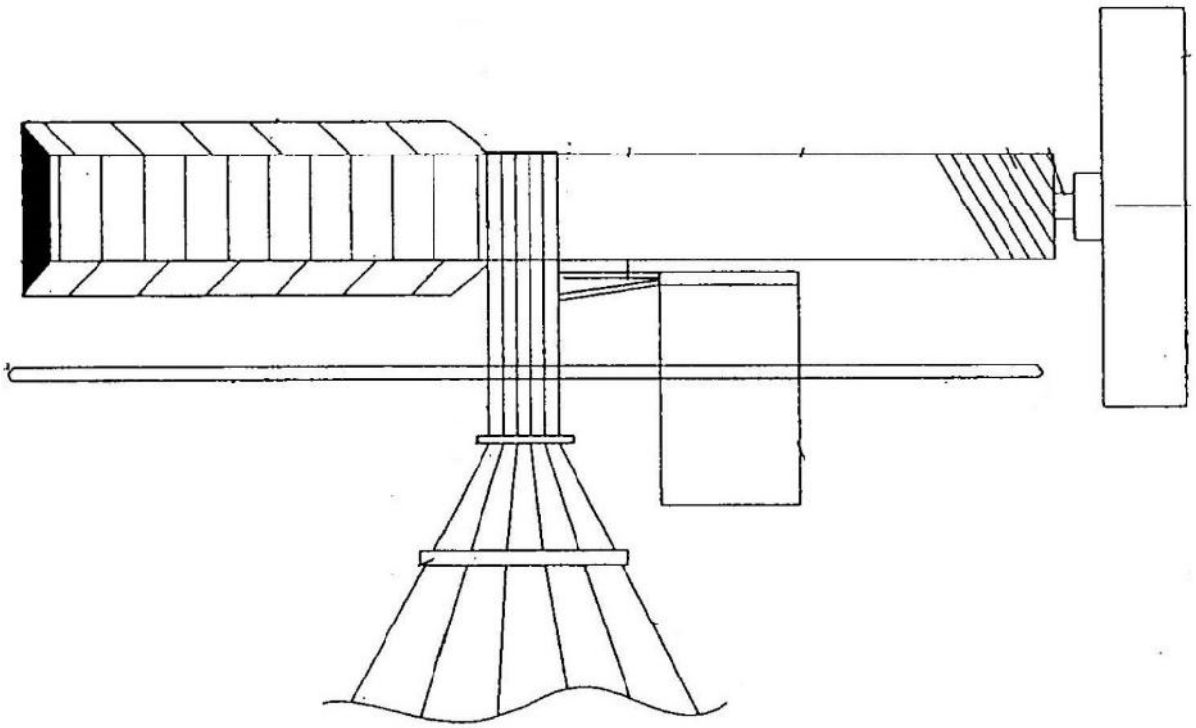

Fig 4 Full view of the conical flange in use (Fuhr, 2010)

The sections will be wound on the beam directly one after the other till all ends are wound on the beam. During winding of the sections, as the beam rotates, there will be lateral shift of the sections which is similar to sectional warping. The mechanism for shifting is similar to sectional warping machine. The beams later on can be taken to sizing or on the loom shed directly.

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COMBINED DESIGN OF A BEAM

As seen in earlier part, there have been many attempts to provide solution to the problem of requirement of two systems of warping. There have been some attempts which addressed the problem directly but were not fully able to solve problem in total. The question of adjustment of section width is still not addressed anywhere. An attempt has been made by the author of the paper to offer the solution to the problem by a novel design of a beam which is to be used on a direct warper and at the same time one will be able to wind the sections of the threads in a limited width like sectional warping. If one wants to prepare the beam containing mono-colored warp, then normal beam as used regularly on a direct warper is to be used. The novel designed beam is to be used when it is required to warp multicolor warp with complicated design.

It will be useful to list down basic requirements out of a beam if it is meant to run all kinds of warp threads. Following is the list of such requirements.

i. A beam should be able to contain large length of yarn. To ensure, it should be able to take enough diameter of the flanges.
ii. A beam should have provision to accommodate multi-color warp threads to be wound in small width sections.
iii. Beam should have flanges which are adjustable.
iv. It should be possible to adjust width of all the sections independently in a quick manner. The adjustment should be sufficiently accurate.
v. Beam should have the provision for locking all segments after all adjustments have been done so they are held firmly during running of the same.
vi. The beam should have an even surface of the barrel so all threads are under same tension.
vii. The beam should be able to be processed in the next level i.e. sizing or loom.

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