

**EVOLVING AN INDIVIDUAL WARP THREAD
CONTROL SYSTEM IN RESPECT TO
DESIGNING OF VERTICAL BI-PHASE LOOM**

by

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Thesis submitted

in fulfilment of the requirements

of the degree of

DOCTOR OF PHILOSOPHY



to the

INDIAN INSTITUTE OF TECHNOLOGY, DELHI

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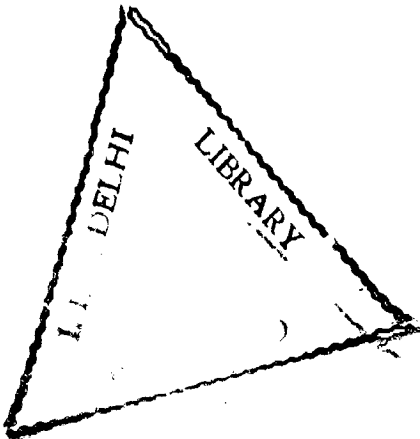
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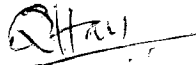


*Dedicated to
my dear
grandmother
Palaniammal*

CERTIFICATE

This is to certify that the thesis entitled "EVOLVING AN INDIVIDUAL WARP THREAD CONTROL SYSTEM IN RESPECT TO DESIGNING OF VERTICAL BI-PHASE LOOM" being submitted by Mr. K. P. Vetrivel, to the Indian Institute of Technology, Delhi, for the award of the degree of Doctor of Philosophy in Textile Technology, is a record of bonafide research work carried out by him. Mr. K. P. Vetrivel has worked under our guidance and supervision and has fulfilled the requirements for submission of this thesis, which to our knowledge has reached the requisite standard.

The results contained in this thesis have not been submitted, in part or in full, to any other University or Institute for the award of any degree or diploma.



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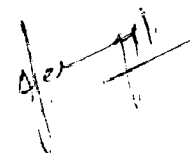
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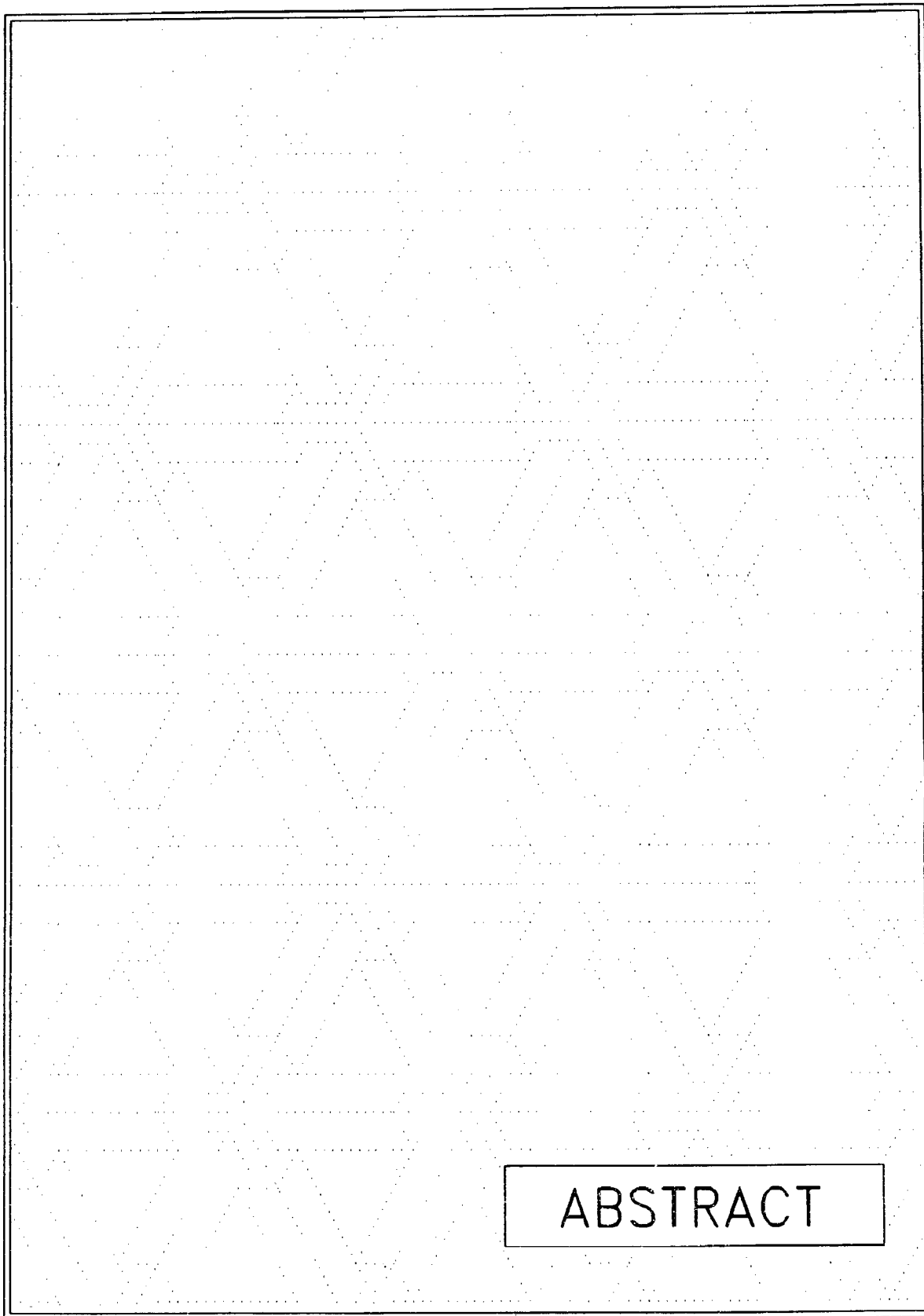
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K.P. Vetirvel



ABSTRACT

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The development of an individual warp thread control system is important for enhancing the versatility of looms in terms of unlimited possibilities in warp patterning. In such development, while utilizing the present electronic selection technique which uses electromagnets, the need for reducing the electrical energy demand of selection process becomes critical. Based on this critical requirement, the Conveyor System for Selection (CSS) technique is evolved which further achieves two phenomenal developments, viz. integrating of the shed forming mechanism with the loom and bi-phase utility.

The CSS loom design process centers around various parameters associated with textile as well as mechanical. For the purpose of relating these parameters and to establish the critical parameters of the CSS loom design, a general mathematical model has been developed. The design conditions for varying of warp sett have been established through this model. The CSS loom design sequence is explained through a rough estimation of various parameters concerned.

The CSS technique demands alteration of pattern data in two respects; 1) conversion of pattern data to meet the requirements of CSS logic and 2) modification of such converted data to facilitate the provision for varying warp sett. In this research work, a suitable logic and methodology have been developed for the necessary pattern data conversion and their subsequent modification. The procedure for developing two new factors which are essential in CSS patterning process viz. Repeat Linker Data and Stoppage Linker Data have been established. Further a simulation work is carried out to simulate the pattern

diagrams using their respective modified CSS pattern data.

In CSS loom shedding, the functional characteristics of conveyor make it feasible to generate larger dwell to the extent of 180° by using a link mechanism. Therefore, it is aimed to focus on the prospects of utilizing a simple link mechanism in CSS technique. For this purpose and based on the mechanical requirements of CSS technique, a combination of quick-return mechanism (four-bar mechanism) and slider-crank mechanism is proposed to generate the necessary shedding motions.

The influence of CSS loom's certain negative and positive factors on its loom efficiency is analysed. Further, the factors which make the CSS loom efficiency comparable with that of single-phase loom have been studied. The CSS loom efficiency is comparable with that of single-phase loom only when significant time savings are achieved in warp breaks/slack end repair time and walking & inspection time. The required levels of savings are about 40% and 30% respectively.

The economic considerations viz. i) Floor space economy and ii) Energy economy, have been studied. It is realised that the CSS loom possesses good scope for doubling the W.I.R./m² floor space irrespective of the kind of weft insertion system utilized.

A miniature working model based on the CSS principle has been fabricated and the working principle of the conveyor system for selection has been demonstrated. The model is designed for providing shed forming movements to one warp thread.



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BIO-DATA
