DEVELOPEMNT OF NEW MECHANISM BASED ON ELECTROMAGNET PICKING SYTEM FOR WEAVING LOOM

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Abstract

In a weaving loom there are three primary motions namely shedding, picking and beat up. In a loom speed of picking is important since it determines the production. There are various picking mechanisms which are commercially available in market such as jet machines both water and air, rapier, projectile and multi-phase looms. In this paper designed a new picking mechanism knows as magnetic picking mechanism. In magnetic process by using magnetic levitation concept picking can be done. The problem occurs with old systems are energy uses, speed, production and the stress on warp yarns while shedding and picking device size. It can be introduce and conventional or existing loom in low cost.

Key word- Primary Motion, Jet Machine, Rapier, Projectile, Magnetic Levitation.

Introduction

First loom was developed in 4400 BC in Egypt for weaving, in China silk is woven around 2600 BC and later in Roman it is used to wove wool and linen for European people [1]. Due to slow production and requirement Edmund Cartwright design the first mechanical loom which increases production [2]. Following is the chart 1. of different loom from conventional to unconventional it can be classified according to picking method or supply package used in weft and according to automation in loom [3]. Now about primitive looms in this pit and looms are used where a pit is made as frame looms for example Naga gamcha are made in India. Other loom is frame loom or fly shuttle loom where wooden loom is made as in picture. Now comes to semi automatic loom where most of the motion is automatic like beat up is done as in picture. And in power loom all the motion are control by mechanical parts like gears etc. in automatic loom like Pirn changing is introduced where shuttle pirn is changed within the loom [5]. In unconventional loom/ shuttle less loom new methods of picking are introduced like rapier, projectile, jet and multiphase looms. In rapier two carriers are used known as rapier where one carrier carries the yarn from the package to the half way through shed and other half is carried out by another carrier a complete cycle makes a picking. In projectile by used of projectile which is a bullet like where torsion bar is used to give motion to the gripper who help in picking. In jet two methods are used water and air where water and air are used to pass the pick from one end of the loom to another side [6]. In multi phase electromagnetic shuttle is used which make it pick insertion rate high.

The main objective of this new development is to reduce time consumption, increase in speed, quality, flexibility in sense of yarn etc, less sound produced, simple machine for use I.e. easy handling less complicated.

By using electro magnets, it can be achieved which will help in full filing the drawback of the previous generation looms. Mainly the cost of the machine is to high and complicated machine parts are used [7].

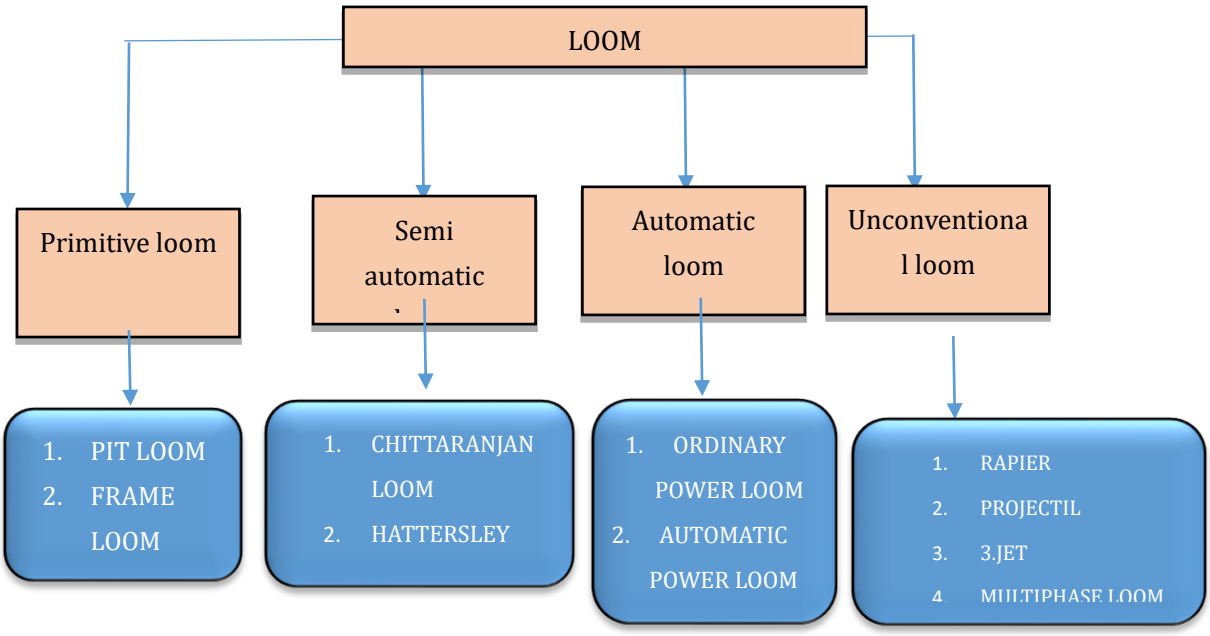

Fig.1: Classification of loom

There are basically three motions in a loom primary motion, secondary motion and auxiliary motion. In primary motion (shedding, picking, beat up), secondary motion like take up and let off, in auxiliary motion various stop motion. Mainly primary motion is most important motion without which a loom cannot run. Secondary motion is motions which are essential but partially important. Auxiliary motion is motion which main focus is to improve quality of the production [4].

Picking is a part of primary motion where a yarn is passing through a shed or warps from one side to another side of the loom by using various methods. In recent development of picking the main objective is to increase production with less energy uses, less sound and great flexibility of loom and improve quality. There are various picking mechanisms but, in this paper, mainly focusing on shuttle less mechanism.

There is various unconventional picking mechanism which are commercialized like Rapier loom, projectile, air jet, water jet and multiphase loom. Discussion of picking mechanism is in below-

Rapier loom

In this type of loom two carriers known as rapiers are given in figure 1. are used one half uses to bring the pick to the half way through the shed and then it is pass to the other carrier which carry the pick to the other half of the loom which complete the picking [5].

Classification of rapier loom

- Type of rapier like flexible where tape wheels are used, rigid where rapiers are in rigid form and telescopic where the extra length goes inside like telescope.
- Number of rapiers- double picks with single rapier, single pick with single rapier and two phase or twin.
- Method of weft insertion that is Dewas and gabler system
- Picking mechanism position.

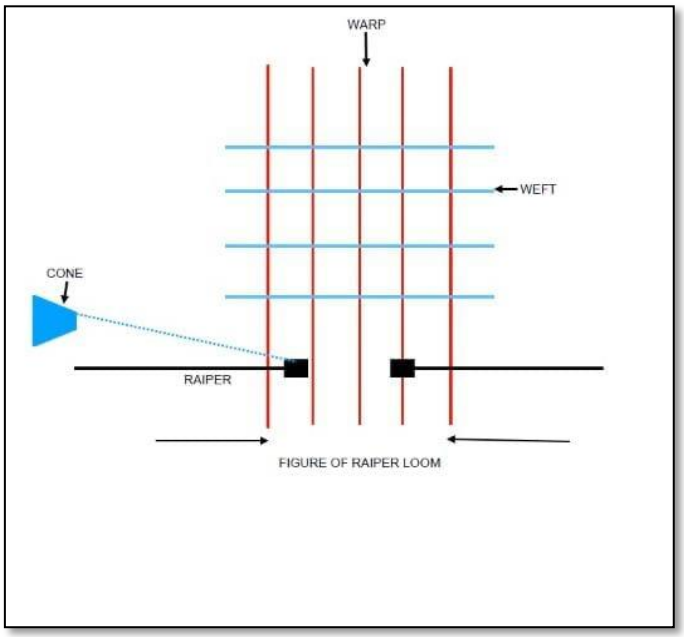

FIG 2. OF RAPIER LOOM

Projectile Loom

This was invented by Sulzer brother and introduce in market in 1953. Here a Bullet like shuttle known as gripper projectile was used which diameter is 90mm long, weight is around 40 grams. The main feature of this loom is the picking mechanism which does not touch the warp because of the use of guide through which the gripper is moved from one part to another of loom [6]. The projectile is accelerated with the help of torsion bar. Fig. 3.

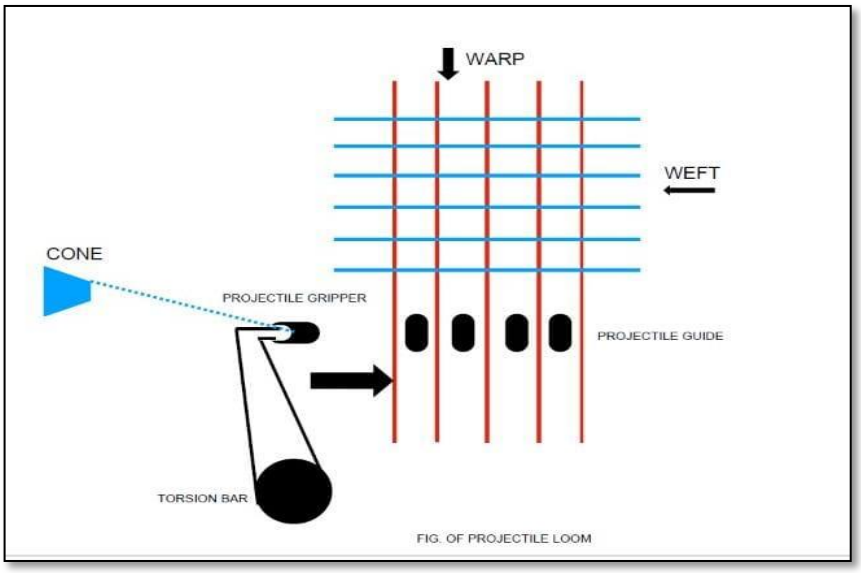

Fig.3: Projectile loom

Air Jet Loom

In this picking method air used because of which sound produce was less fig.4. Nowadays relay nozzles are used. First there is a main nozzle from where the air is passed with high vortex of air which carries the weft after that by using relay nozzles and profile reed the weft is passing to other side of the loom and picking takes places [7].

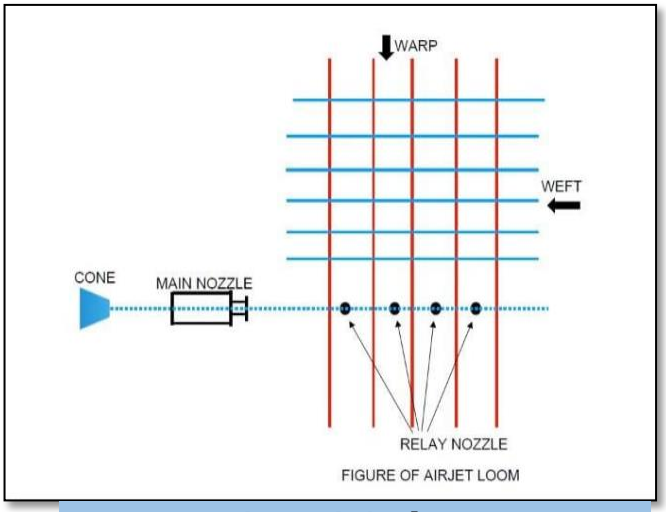

Fig.4: Air jet loom

Water Jet loom

In this system fig. 5 in case of air, water is used for picking where water is pumped through nozzles at high pressure which pass the weft from one position to other side of the loom. It was developed by Svaty and was commercialized in 1955[8].

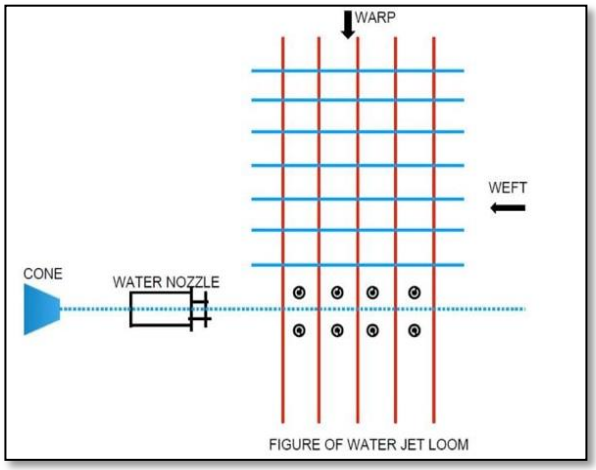

Fig.5: water jet loom

Multi phase loom

The concept to this loom is that in single phase loom all the primary motion that is shedding, picking and beat up is on warp direction but According to multi phase both warp and weft direction shedding can be achieved. There are two types of machine flat i.e. rectilinear or circular [8].

In mention all above picking system there are drawbacks like

- In rapier noise is high and production is less
- In projectile cost is high, complicated, noise is high
- In jet machine in air jet machine picks are broken due to pressure of air, pilling up of yarn due to air resistance and in water loom only hydrophobic Fibres can be weave
- In multi phase loom moiré effect is produced,light fabric can be produced, cost is high etc.
- Therefore, to overcome these drawbacks a new picking

method is required which will work on electromagnetic.

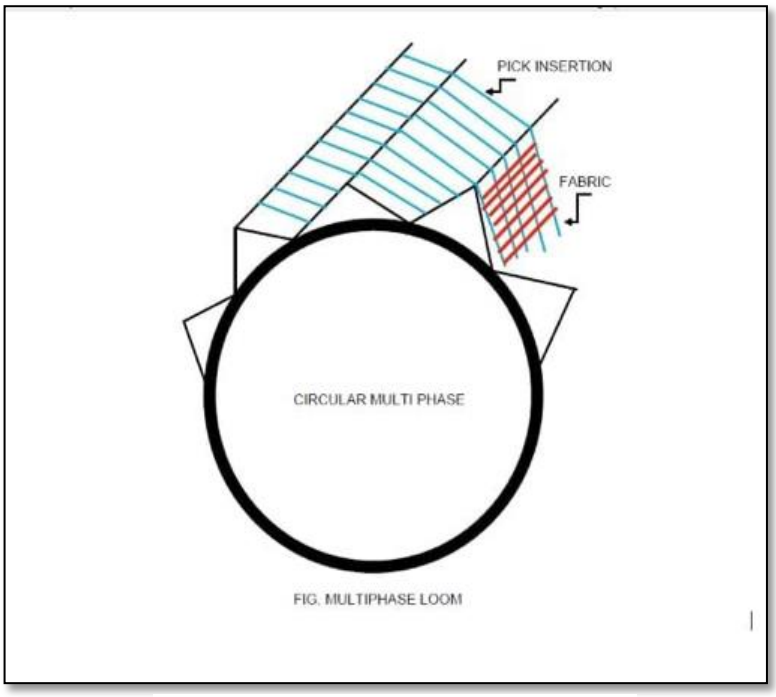

Fig.6: Multiphase loom

Electro Magnet

Electronics magnets are made of number of wire coils which has electricity passing through it which make the core magnetised. Engineers use solenoids by using length of metal around a template mainly round. And the electromagnet power can be adjust by using formulas is

Force = charge * velocity of charge *(magnetic constant * number of turns in solenoid * current)

Calculation for force of electro magnet fig.7.

$J= (n*i)^2 * \text{magnetic constant} * a/ (2* g^2)$ ……..(Eq. 1)

Where,

- j is the force
- i is the current
- g is the length of gap between the solenoid and a piece of metal
- a is the area
- n is the number of turns the solenoid and magnetic constant = $4*PI* 10^{-7}$.

By using this method in the picking motion there is advantages

1. Due to its small picking method no shed is possible the weft carrier is can be use much smaller than projectile gripper.
2. The speed of the picking is determined by magnetic field produced
3. Due to no use of moving mechanism torsion etc the sound can be reduced
4. Flexibility is also increased due to its versatility every fibre can be used
5. Due to small carrier delicate yarn or fine count can be produced due to less opening of warp with high speed and quality is also improved.[9]

There are many advantages of this picking method and can replace other picking mechanisms drawbacks.

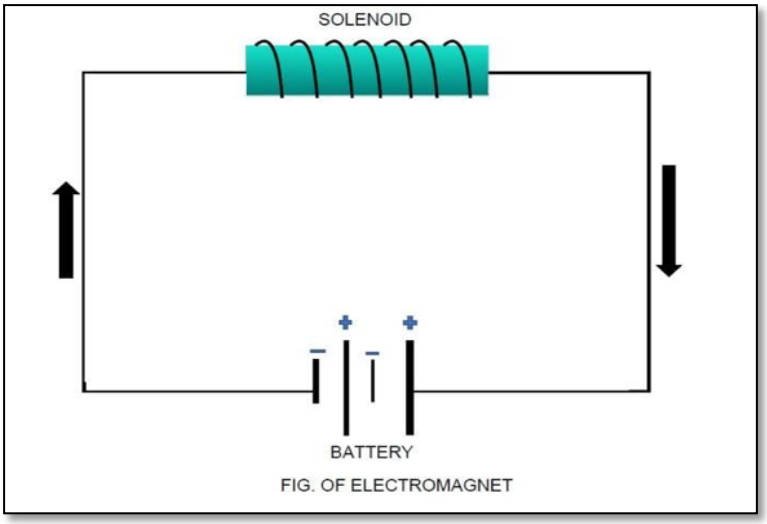

Fig.7: Electromagnet

In present scenario there are three methods:-

1. Electromagnetic projectile
2. Magnetic timing belt
3. FOR- Maglev

- **Electro Magnetic Projectile**- In this method electromagnetic method fig. 8 is use where the carrier is moved by electromagnetic force direction. Here only two main components coil and the carrier. After a pick the motion is reversed for another pick. It is a two ways direction as compare to conventional projectile loom.

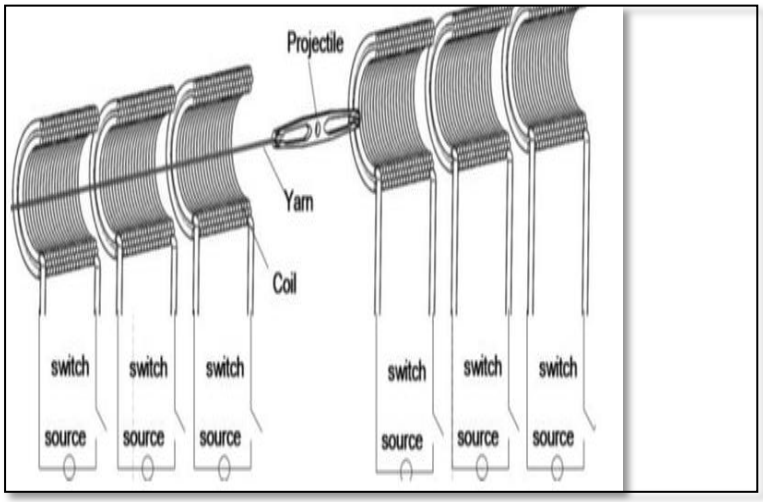

Fig.8: Electromagnetic Projectile [10]

Magnetic Timing Belt- in this method two pulleys and a belt is used where two permanent magnets are used which move along with magnetic projectile with a special kind of reed. Fig. 9. Both side of the reed there is ramps so that the weft can move freely over the reed. After picking the pick is released and beat up takes place.

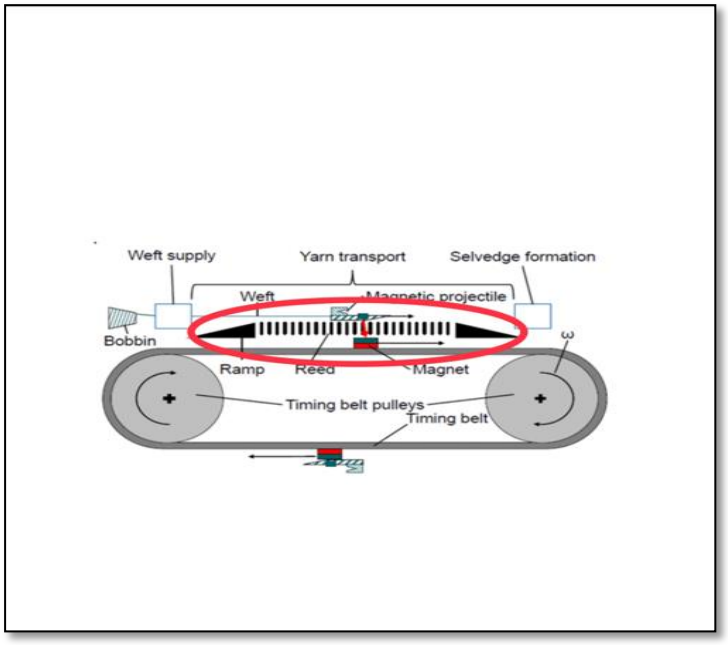

FIG.9 Magnetic Timing Belt[9]

For Maglev:- In this method fig. 10 basic magnetic concept is used where like poles repels and unlike pole attract. It is like the maglev train concept by changing the polarity of the electromagnet so that the carrier moves in forward and backward movement. Special kind of reed is used so that poles does not influence each other.[10]

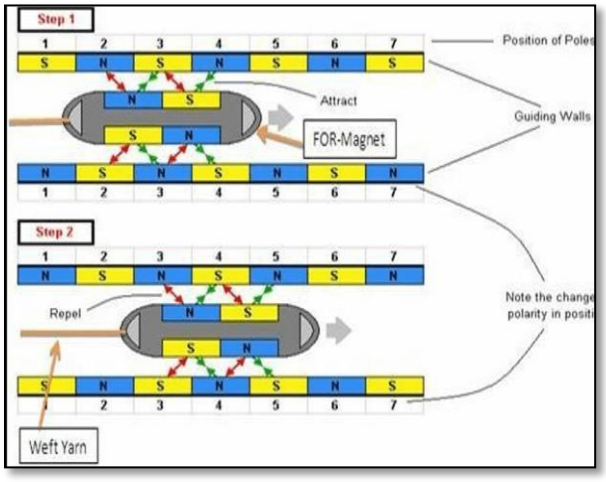

Fig. 10 FOR-maglev [10]

Innovative Design Based on New Concept

As per above discussion about all types of loom and studied the technology based on all these looms create a new idea that will be different from these existing loom it will be created, innovative and same production will be delivered in short time. This loom will be known as "**NO SHED LOOM or ALLURING LOOM".** The line diagram of the new concept loom is given in figure 11. It will solve the problem occurs with old systems are energy uses, speed, production and the stress on warp yarns while shedding and picking device size. Since the size of the carrier will be small the shed opening is next to no shed.

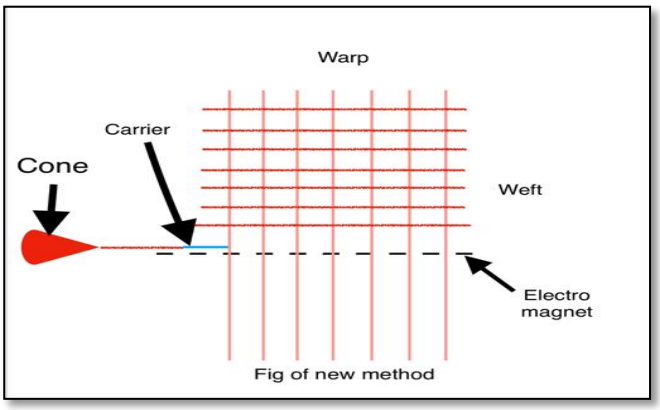

FIG. 11 OF NEW PICKING MECHANISM

Conclusion

This is concluded from the study that the problem which is find out in the current loom picking mechanism can be reduce by using newly developed electro-magnetic mechanism. The main motive is to make a picking mechanism which reduce the complication in modern looms with high speed than other picking method. And also to reduce the sound or noise that is made by the existing loom and much more production. The versatility is also important which can make according to fabric width whether wide or narrow it can be produce easily.

At the end the new mechanism can solve many problems and can use it for future development.

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