DEVELOPMENT OF ELECTRONIC WARP PROTECTOR MECHANISM FOR CONVENTIONAL LOOMS

PROJECT REPORT

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CERTIFICATE

This is to certify that the Project report entitled

DEVELOPMENT OF ELECTRONIC WARP PROTECTOR MECHANISM FOR CONVENTIONAL LOOMS

has been submitted by

Mr...

In partial fulfilment of the requirements for the award of

Bachelor of Technology in Textile Technology

of the ***Bharathiar University,*** *Coimbatore*

during the academic year 1999-2000.

Faculty Guide | *Head of the Department*

Certified that the above candidate was examined by us in the project work Viva-Voce examination held on...24.3.2000.and the

University Register No. is....................

Internal Examiner | *External Examiner*

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SYNOPSIS

Warp Protector motions play an important role in any Power Loom (or) Automatic looms in getting the required efficiency of loom and quality of fabric. Since there are lot of settings involved in a loom coupled with proper power supply any slight deviations in the above may cause a "shuttle trap" (or) "smash" which will damage shuttle, reed and warp there by affecting the efficiency and Quality.

Most of the conventional looms are equipped with mechanical type warp protector motions either with loose reed (or) with a fast reed. Since a mechanical type takes a little time to act by its nature, and if it is a loose reed type and the cover of fabric will also be affected to the some extent besides starting marks. By developing a suitable electronic type warp protector motion, all the drawbacks of mechanical type will be eliminated.

In this Electronic type warp protector motion the presence and absence of shuttle in the shuttle box is suitably monitored by keeping fork type sensors in shuttle box and bottom shaft. The exact arrival time of shuttle in shuttle box is monitored. The pulses generated by sensors in shuttle box & bottom shaft must coincide and if any one fails, immediately the system sends signals for stopping the machine there by totally avoiding damage to machine elements, warp and as well as shuttle, thus weaving efficiency and quality of fabric is greatly improved.

1.0 INTRODUCTION

Textile Industry in India ranks second to Agriculture, in terms of providing employment and foreign earnings. In a country like India where the population is increasing by many millions, employment is a key factor for any individual survival and also to cater the fabric needs have also to be taken care of. Textile Industry is one of the pioneering industry in the world and has its own significance.

Although there are a lot of developments that have taken place in weaving industry including the invention of shuttle less looms, statistics shows majority of looms in India belong to power looms and auto looms category.

By the time liberalization takes place in the year 2005, India which is not modernized as to the extent which its neighboring countries had, while definitely face tough competitions in order to sustain in the world market.

Hence in order to give a thrust on this part of Textile Industry in India, we have focussed our attention on the development of a electronic warp protector motion catering to the needs of Power looms and Auto Looms which are in total majority in India.

The success of this project was aimed at Power looms and Auto Looms, so that by incorporating this mechanism a substantial increase in efficiency of loom and quality of fabric is guaranteed. Also, the loss due to damage of Shuttle/Reed will be totally eliminated, which in turn will reduce the overhead cost drastically and value loss of fabric is minimized to great extent.

Cost analysis study is also done to show the entrepreneurs the feasibility of incorporating this on their looms

2.0 LITERATURE SURVEY

2.1 OBJECTS OF WARP PROTECTOR MECHANISM:

- The object of this motion is to stop the loom, immediately as the shuttle fails to reach the opposite side.
- Prevents the damages that may be caused to the warp, when shuttle traps in the middle of the shed
- This can be done by throwing the reed back from its holder (or) by stopping the loom instantaneously by some mechanical means.
- Prevents damages caused to reed and shuttle.

2.2 Classification of Warp Protector Mechanism :

- Loose reed warp protector motions.
- Fast reed warp protector motions.
- Electro magnetic warp protector motion.

2.3 PRINCIPLE OF WARP PROTECTOR MECHANISM:

It is possible that the shuttle may fail to reach the opposite box as a result of improper settings or some obstructions in the warp shed. In this case many ends may be broken if the sley comes forward to the beat up position with the shuttle lying between top and bottom shed lines and resting against the reed. Hence it is desirable to prevent this from occurring.

The swell spring in the box on either side of the loom is utilized as sensing point for stopping the loom in the event of a shuttle trap.

The most popular motion available for this purpose is the fast reed warp protector, although a method known as loose reed warp protector was very popular for many years for weaving light weight fabrics.

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2.4 WORKING OF LOOSE REED WARP PROTECTOR MECHANISM

2.4.1 Principle:

The principle of the mechanism is that the reed is forced out of its support whenever the shuttle is trapped in the shed and this backward inside movement of the reed will cause a knock off device to act and stop the loom.

2.4.2 Construction:

The reed A is held at the top in the slotted reed cap B. The bottom part of the reed is held firmly against the raceboard C by the reed case D which extends the whole width of the reed. This reed case is connected to a stop rod S by means of several brackets. The stop rod also extends the width of the sley and it is fixed to the sley below the raceboard. There are two, three or four frogs (duckbills) E, depending upon the width of the loom, mounted on the stop rod. Infront of each frog (duckbill) there is a heater F fixed by means of a bracket to the breast beam.

2.4.3 Working:

During the normal working of the loom there are three devices to keep the reed firm.

a) Frog And Hitter:

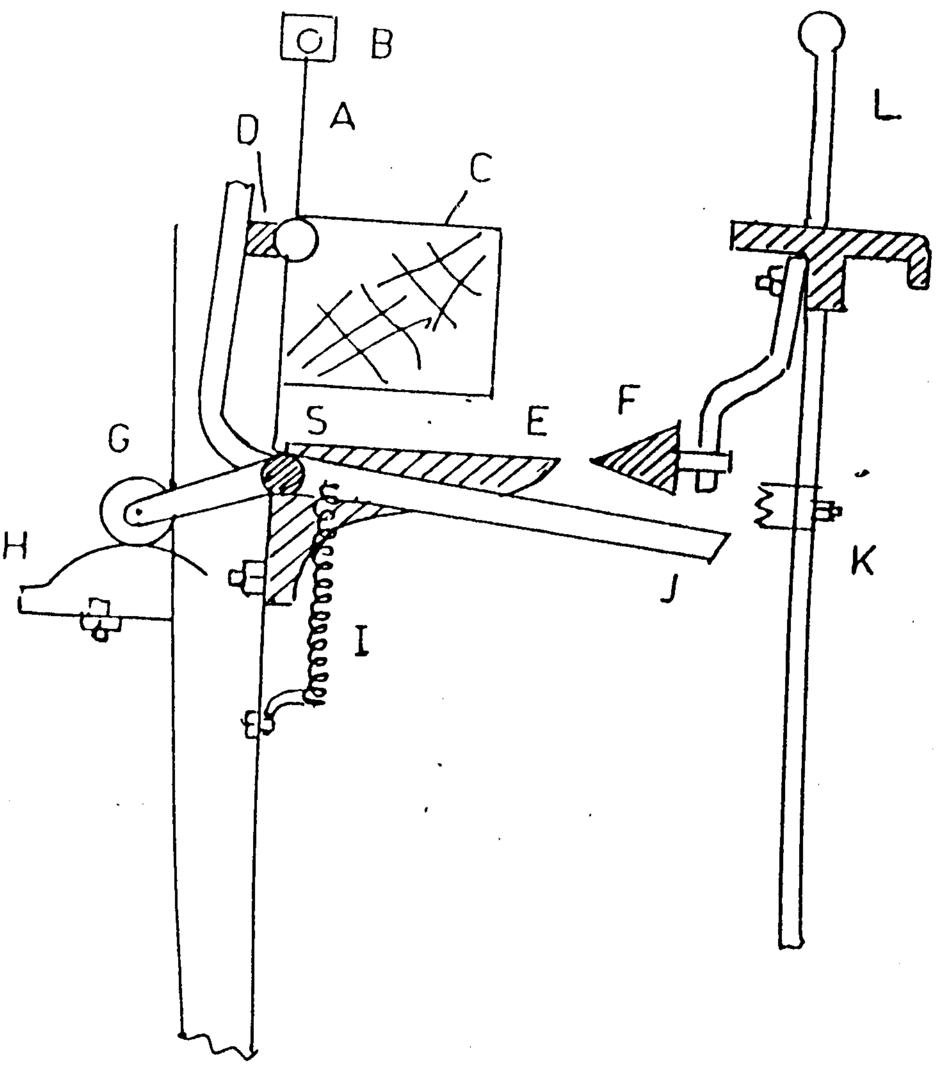
When the sley moves forward the frogs (duckbills) slide under the heaters thus locking the reed firmly for a good beat up of weft.

b) Bowl and bow spring:

During the backward movement of the sley the bowl G rides on the flat bow spring H and keeps the reed firm to enable the smooth fight of the shuttle during its traverse from one box to another.

c) Spiral spring:

The light spiral spring keeps the reed case tensioned all the time. A stop rod finger J is also mounted on the stop rod, and facing this finger is a serrated bracket K fixed to the starting handle L. When the shuttle



A = Reed, B = Reed Cap, C = Race Board, D = Reed Case, E = Frog (Duck Bill), F = Heater, G = Bowl, H = Bow Spring, J = Stop Rod Finger, S = Stop Rod, K = Serrated Bracket, L = Starting Handle.

Fig. 8.11. Loose Reed Warp Protector

is trapped in the warp shed it presses against the base of the reed during the forward movement of the sley, with the result the reed is swung backwards turning the stop rod S through the reed case. When the stop rod is turned all the frogs and the stop rod fingers are raised. During further forward movement of the sley the frog ride over their respective hitter and the stop rod finger hits the serrated bracket and stop the loom. The frog riding over the hitter will enable the reed case to move backwards easily.

The loose reed motion is only intended for light and medium weight fabrics. It is therefore necessary that the spiral spring I should only be strong enough to prevent the reed case from vibrating during running of the loom. If it is too strong the shuttle has to exert a greater force to push the reed back, which means more strain on the warp threads. Delicate warp used for lightweight fabrics will not stand such strains with the result more warp breakage will occur.

2.4.4 Advantages of Loose Reed Mechanism:

- Used for weaving light and medium weight fabrics.
- Reed becomes loose on a shuttle trap thus avoiding damage to the warp sheet and shuttle.
- No "BANG OFF" on the loom thus reducing jerk and wearing of parts.
- It is mainly used for slow speed looms.
- Consumption of parts is minimum.

2.4.5 Disadvantages of Loose Reed Mechanism:

- It is mechanically operated so less accurate.
- Chances of damage to reed, shuttle and fell of the cloth when caught between a temple.
- Exact pick spacing is not possible.
- Heavy weighted fabrics cannot be woven due to minimum beat up force.
- Takes more time for restarting the loom.
- Starting marks are inevitable.

2.5 WORKING OF A FAST REED MECHANISM

2.5.1 Principle:

Fast reed warp protector is used for heavier fabrics because it works on the principle of fixed reed and the protector mechanism is operated by the shuttle box swell that reacts directly through the stop rod and the stop rod dagger to knock off the loom. Also, for heavier fabrics the beat-up of weft by the sley should be very firm.

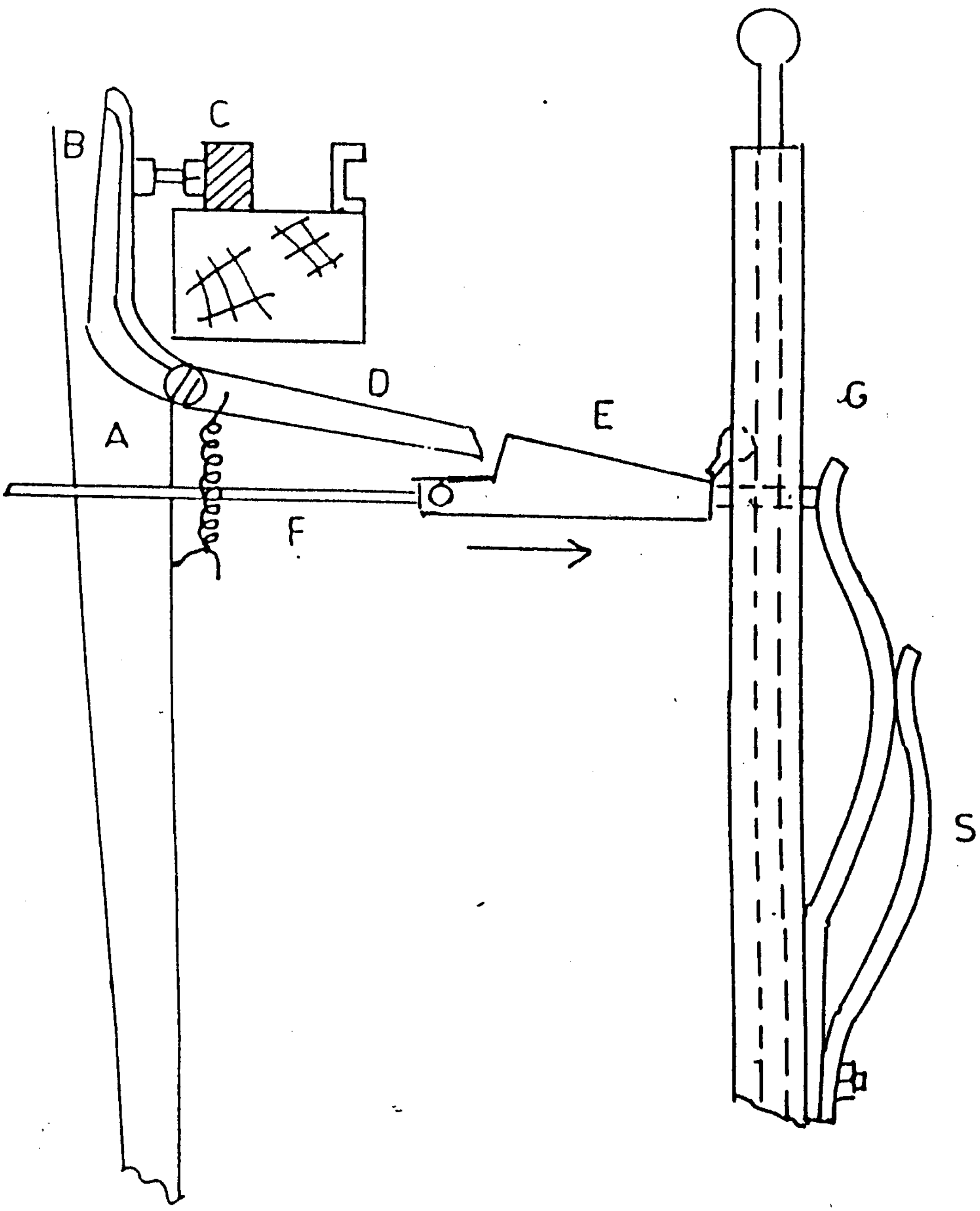
2.5.2 Construction:

The stop rod A which runs beneath the sley has two fingers B fixed to it; one finger on each side of the shuttle box. These fingers with adjustable nuts are kept pressed against the swell C. To the same stop rod are fixed two daggers D, one on each side of the shuttle box. The daggers face a sliding frog E mounted on the side frame. The sliding frog on the starting handle side carries the brake lever F at the rear and at the front it contacts the adjustable bolt that knocks off the starting handle.

2.5.3 Working:

When the shuttle enters the box at either side, it presses the swell which makes the dagger raise above the frogs and the loom continues to run. If the shuttle fails to reach the box or if it rebounds owing to insufficient checking, then the swell will not be pushed back sufficiently to raise the daggers clear off the frogs with the result the daggers will dash against the frogs and push it backwards. Then the sliding frog will knock off the starting handle and the loom will stop. At the same time the brake lever F pulls the brake close on the brake drum to an almost instantaneous halt of the loom. The shock of the sudden stoppage is taken by the two strong vertical springs S which are connected to the frog through a bolt G.

While setting the frogs with respect to the distance from the daggers, it is better to set so that the sley comes to a halt before the crank has passed the top center. The sudden impact of the dagger on the frog if commonly known as BANG-OFF. Sometimes frequent bang-off will cause the parts that are taking such force of the shock to fracture.



A = Stop Rod, B = Fingers, C = Swell, D = Daggers, E = Frog,
F = Brake Lever, G = Bolt, S = Vertical Springs.

Fig. 8.12 Fast Reed Warp Protector

2.5.4 Advantages of Fast Reed Mechanism:

- Heavy beat up is possible so it is used for weaving denser fabrics.

  (e.g.) : 10 s : 52 s X 52s

  2/ 40 s: 92 s X 72 s

- Reed is fastened to the machine frame.
- Slightly higher loom speeds are possible than conventional loose reed.
- Pick spacing is very precise.
- Instantaneous stopping of the loom is possible.
- No starting marks.

2.5.5 Disadvantages of Fast Reed Mechanism:

- Parts consumption cost is very high.
- If the setting is not correct the loom cannot be worked further.
- Heavy BANG OFF occurs.
- Chances of damages to the reed, shuttle and fell of the cloth are possible.
- It is mechanically operated so less accurate.

2.6 WORKING OF ELECTROMAGNETIC WARP PROTECTOR MECHANISM

2.6.1 Principle:

This system of warp protection was developed by Crompton & Knowles, which a magnet is used to energize a coil in the sley at a point at which the shuttle should pass at the same time on each pick, irrespective of its direction of flight.

2.6.2 Working:

The position of the coil in the sley must be off set from the center of the sley because, it is only possible to carry the magnet in the end of the shuttle opposite to the shuttle.

The passage of shuttle over the coil causes a pulse to be fed to electrical control unit. This pulse must alternate with a second pulse generated by a magnet mounted on the loom shaft gear wheel and thus occurring at a fixed time in each loom cycle.

The steel is directly connected to the starting handle, so that the loom brake is immediately applied to disengage the clutch (or) switch off the motor depending on the method of drive and thus over heating of the parts will be prevented.

If the shuttle is correctly boxed at the end of the flight, then the swell and thus the finger will be pushed back, the rod will rotate and the dagger will be raised clear of the steel so that the loom will continue running.

2.6.3 Advantages of Electro Magnetic Warp Protector Mechanism:

- Operated electro mechanically.
- Chances of damage to reed, shuttle and fell of the cloth are avoided.
- Stopping is instantaneous.
- Bang Off is completely eliminated, noise is reduced to a greater extent.
- Very high loom speeds are possible.

2.6.4 Disadvantages of Electro Magnetic Warp Protector Mechanism:

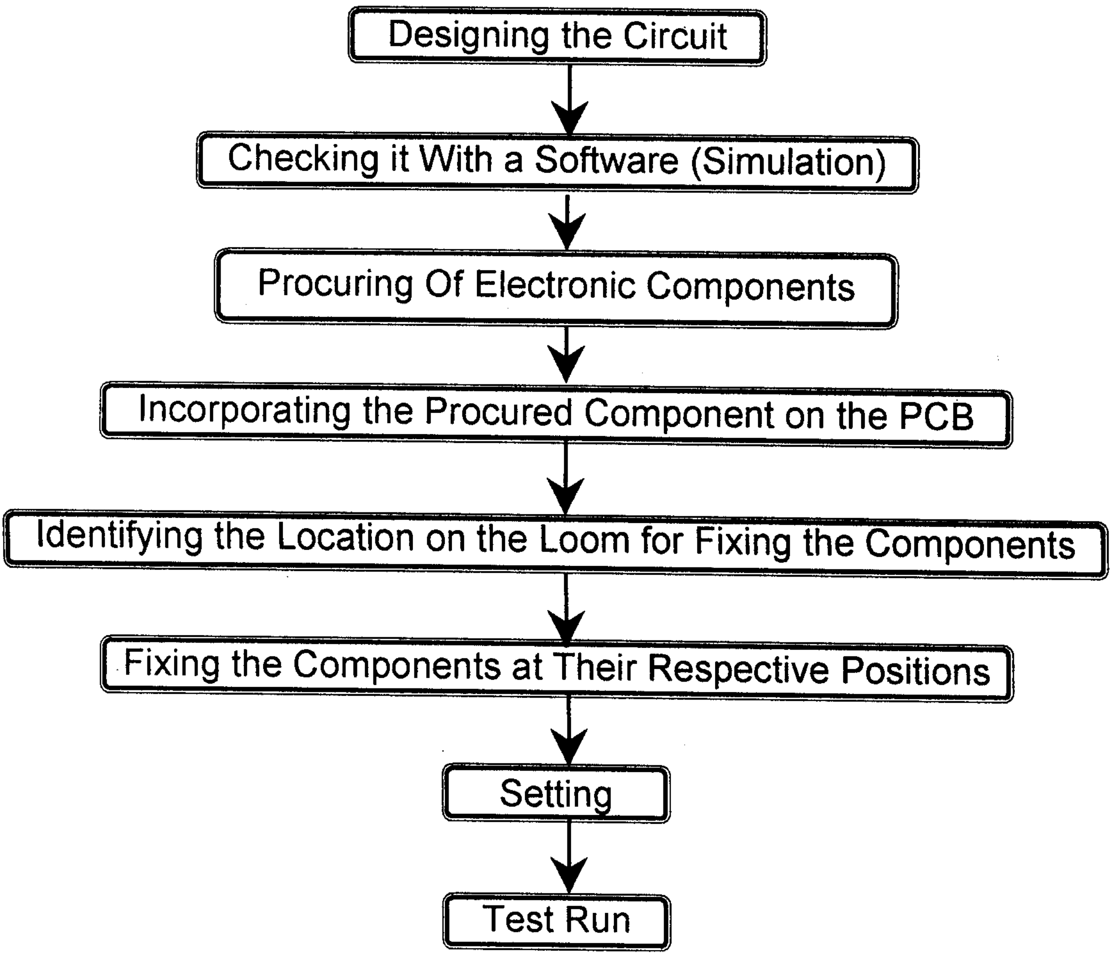
- Complicated circuit design.
- Fixing a metal piece on the shuttle is quite difficult and imbalances shuttle during flight.
- Components used are very expensive and initial investment is also very high.
- Fabrication and maintenance is very difficult.

3.0 OBJECTIVES

- To develop a electronic warp protector motion suitable for conventional looms which is at present having the mechanical warp protector mechanism.
- To instantaneously stop the loom in the event of a slight delay in arrival of the shuttle in to the shuttle box.
- To eliminate the loose reed mechanism which is in existence and thus to enhance the cover of the fabric and to prevent starting marks.
- To completely eliminate damages to the shuttle, reed and warp sheet and thus reducing the machine down time as well as the value loss of fabrics.
- To increase the efficiency of the loom and the weaver to some extent.
- Serious cut damages can be fully avoided.
- To increase the number of looms allocated per weaver by reducing the operating hours.
- To study the cost effectiveness of such motion so as to use it commercially by the entrepreneurs.

4.0 METHODOLOGY

4.1 OVERVIEW OF THE PROJECT:



4.2 PRINCIPLE OF OPERATION:

The presence and the absence of the shuttle in the shuttle boxes at correct timing of the loom cycle are monitored, by using fork type sensors placed at shuttle boxes and on bottom shaft. These sensors are based on the optical sensing technique.

In the event of any slight delay in the arrival time of the shuttle in the shuttle boxes the fork sensors act swiftly and instantaneously stops the loom.

4.3 CIRCUIT DESIGNING:

Every electronic component works on a 5v supply. If the supply exceeds, all the components will be destroyed.

Stage 1:

We first used a transformer to convert single-phase 230v supply to 12v output. Further we used a regulator to bring down the 12v to the required 5v. So we used a capacitor in addition, which ensures a uniform 5v supply throughout.

Stage 2:

From this 5v supply all the electronic components namely resistors, emitters, receivers, IC and transistors are connected in sequence according to the circuit design. Except the resistor all the other components are grounded.

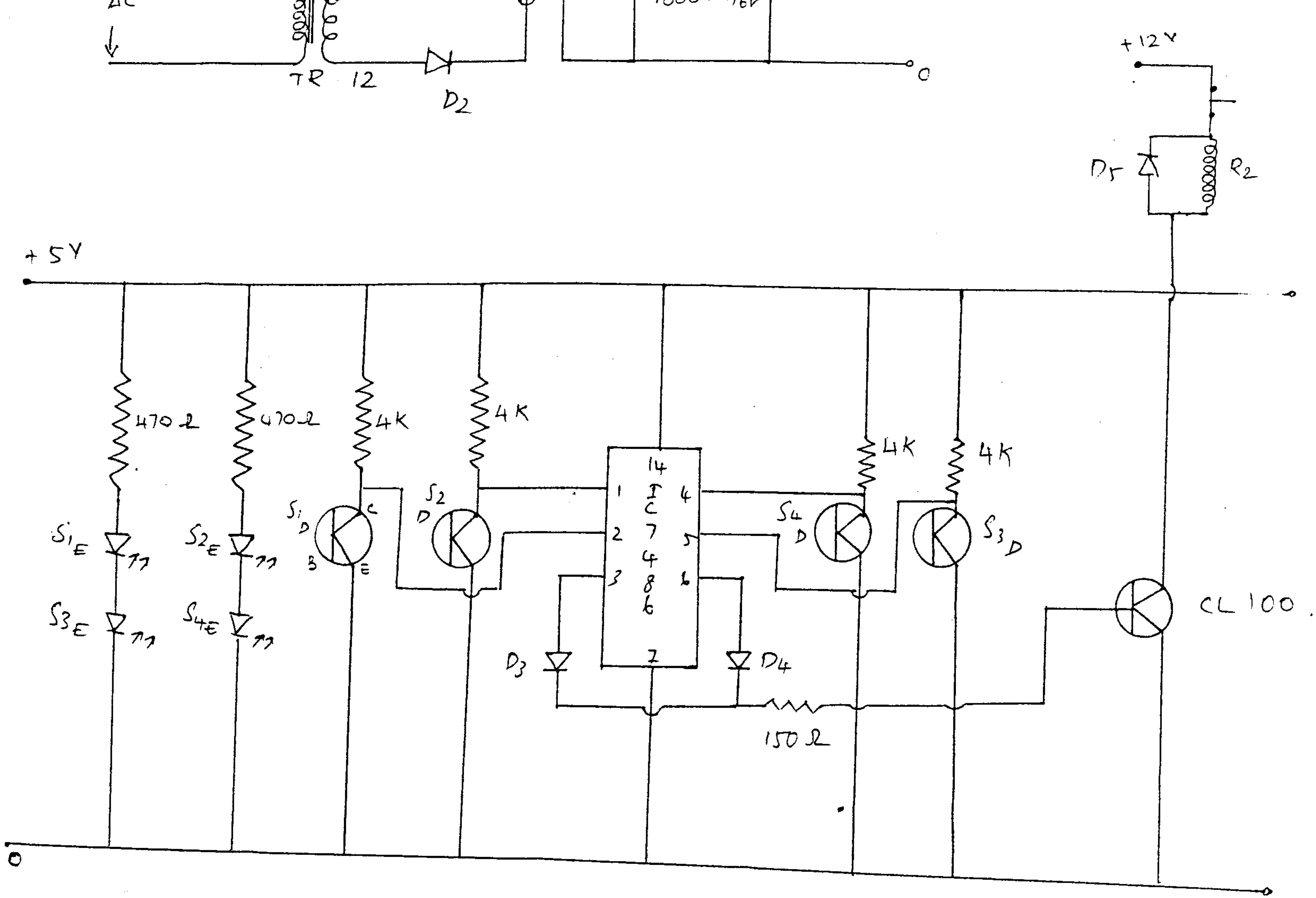
Stage 3:

The output from the IC is connected with the transistor which in turn is connected to the relay , the connection is given to the main box to switch it OFF in the event of a break in the circuit.

4.4 VERIFYING THE CIRCUIT BY SOFTWARE SIMULATION:

The designed circuit is first tested using a simulation software – "WORK BENCH", before implementing it on the PCB. This software incorporates all the electronic components. The circuit is simulated and the output is verified.

Finally the circuit is implemented on the PCB (Printed Circuit Board).



CIRCUIT DIAGRAM

4.5 LIST OF ELECTRONIC COMPONENTS USED:

- IC 7486.
- Regulator 7805, 12v-0-5v.
- Resistors:-
    - 4K7 Ω.
    - 150 Ω.
    - 470 Ω.
- Capacitor 1000μF / 16v.
- Diode IN 4007.
- Transistor CL 100.
- Transformer 230v-0-12v.
- Relay 12v.
- Reset switch (off-on).
- Sensors H21A (Optical Fork type sensor with rigid construction).
- 5" X 6" Printed Circuit Board.

4.6 FUNCTIONS OF ELECTRONIC COMPONENTS:

Electronic component are classified into either being Passive devices or Active devices.

A Passive Device is one that contributes no power gain (amplification) to a circuit or system. It has no control action and does not require any input other than a signal to perform its function. In other words, "A component with no brains!" Examples are Resistors, Capacitors and Inductors

Active Devices are components that are capable of controlling voltages or currents and can create a switching action in the circuit. In other words, "Devices with smarts!" Examples are Diodes, Transistors and Integrated circuits.

4.6.1 ELECTRONIC COMPONENTS - PASSIVE

4.6.1.1 Resistors:

Physical materials resist the flow of electrical current to some extent. Certain materials such as copper offer very low resistance to current flow, and hence they are called as conductors. Other materials such as ceramic which offer extremely high resistance to current flow are called as insulators. In electric and electronic circuits, there is a need for materials with specific values of resistance in range between that of a conductor and an insulator. These materials are called resistors and their value of resistance are expressed in ohms(Ω).

4.6.1.2 Fixed Resistors:

This is the most widely used fixed resistor in discrete circuits. The construction of the carbon composition resistor is shown in fig(). The carbon resistors are made of finely divided carbon mixed with a powdered insulating material such as resin of clay in the proportions needed for the desired resistance value. These are then placed in a casing with lead wires of tinned copper. Resistances of this type are available in the range from few ohms to hundred mega ohms and typical power rating of 1/8 to 2w.

4.6.1.3 CAPACITOR:

Capacitors, or "caps", vary in size and shape - from a small surface mount model up to a huge electric motor cap the size of a paint can. Whatever the size or shape, the purpose is the same - It stores electrical energy in the form of electrostatic charge. We will get into the mechanics and further properties of this later. The size of a capacitor generally determines how much charge it can store. A small surface mount or ceramic cap will only hold a minuscule charge. A cylindrical electrolytic cap will store a much larger charge. Some of the large electrolytic caps can store enough charge to kill a person. Another type, called Tantalum Capacitors, store a larger charge in a smaller package.

4.6.1.4 Resistor Color Codes & Primer:

Resistors are color coded for easy reading. Imagine how many blind technicians there would be otherwise.

To determine the value of a given resistor look for the gold or silver tolerance band and rotate the resistor as in the photo above. (Tolerance band to the right). Look at the 1st color band and determine its color. This maybe difficult on small or oddly colored resistors. Now look at the chart and match the "1st & 2nd color band" color to the "Digit it represents". Write this number down.

Now look at the 2nd color band and match that color to the same chart. Write this number next to the 1st Digit.

The Last color band is the number you will multiply the result by. Match the 3rd color band with the chart under multiplier. This is the number you will multiple the other 2 numbers by. Write it next to the other 2 numbers with a multiplication sign before it. Example: 2 2 x 1,000.

To pull it all together now, simply multiply the first 2 numbers (1st number in the tens column and 2nd in the ones column) by the Multiplier.

4.6.2 Resistor Color Code Chart

1st. & 2nd Color Band	Digit it Represents	-----Multiplier-----
BLACK	0	X1
BROWN	1	X10
RED	2	X100
ORANGE	3	X1,000 or 1K
YELLOW	4	X10,000 or 10K
GREEN	5	X100,000 or 100K
BLUE	6	X1,000,000 or 1M
VIOLET	7	Silver is divide by 100
GREY	8	Gold is divide by 10
WHITE	9	Tolerances Gold= 5% Silver=10% None=20%

4.6.3 ELECTRONIC COMPONENTS - ACTIVE

4.6.3.1 Diodes:

Diodes are basically a one-way valve for electrical current. They let it flow in one direction (from positive to negative) and not in the other direction. Most diodes are similar in appearance to a resistor and will have a painted line on one end showing the direction or flow (white side is negative). If the negative side is on the negative end of the circuit, current will flow. If the negative is on the positive side of the circuit no current will flow. More on diodes in later sections.

4.6.3.2 Transistors:

The transistor is possibly the most important invention of this decade. It performs two basic functions. 1) It acts as a switch turning current on and off. 2) It acts as a amplifier. This makes an output signal that is a magnified version of the input signal. More on transistors in later sections. Transistors come in several sizes depending on their application. It can be a big power transistor such as is used in power amplifiers in your stereo, down to a surface mount (SMT) and even down to .5 microns wide (I.E.: Mucho Small!) such as in a microprocessor or Integrated Circuit.

4.6.3.3 ICs -Integrated Circuits:

Integrated Circuits, or ICs, are complex circuits inside one simple package. Silicon and metals are used to simulate resistors, capacitors, transistors, etc. It is a space saving miracle. These components come in a wide variety of packages and sizes. You can tell them by their "monolithic shape" that has a ton of "pins" coming out of them. Their applications are as varied as their packages. It can be a simple timer, to a complex logic circuit, or even a micro controller (microprocessor with a few added functions) with erasable memory built inside.

4.6.3.4 Transformer:

A transformer is a static (or stationary) piece of apparatus by means of which electric power in one circuit is transformed by means of which electric power in one circuit is transformed to electric power of the same frequency in another circuit. It can raise or lower the voltage in a circuit but with a corresponding decrease or increase in current. The physical basis of a transformer is mutual induction between two circuits linked by a common magnetic flux. In its simplest form, it consists of two inductive coils which are electrically separate but magnetically linked through a path of low reluctance. The two coils possess high mutual inductance. If one coil is connected to a source of alternating voltage, an alternating flux is set up in the laminated core, most of which is linked with the other coil in which it produces mutually induced e.m.f. If the second coil circuit is closed, a current flows in it and so electric energy is transferred (entirely magnetically) from the first coil to the second coil. The first coil, in which electric energy is fed from the supply mains, is called primary winding and the other, from which energy is drawn out, is called secondary winding. In brief, a transformer is a device that

- Transfers electric power from one circuit to another
- It does so without change of frequency
- It accomplishes this by electromagnetic induction and
- Where the two electric circuits are in mutual inductive influence with each other.

4.7 IDENTIFYING THE LOCATION FOR THE FIXATION OF THE PARTS :

As the design and implementation of the circuit is done the sensors and flags are to be fixed at their respective positions.

As the flags of the shuttle bos is made up of aluminium piece it is made to clamp behind the swell spring, where as a 'L' shaped plate is made of mild steel of 2mm thickness. A slot is cut at one side and the other side holes are drilled at different heights so as to fit the sensors at the required height. The slot side is made fastened with the shuttle box bottom bolt. According to the requirement the plate can be moved inside or outside. In the same manner the 'L' plate is fixed on both the sides of the shuttle boxes. The flag and sensors are fixed in such a way that during the normal condition the flag is just at the entry position of the sensor. When the shuttle enters inside, the swell spring gets displaced outwards so the flag fixed on the swell spring also gets displaced out and blocks the sensor.

In this arrangement the sensor is fixed and the flag is of removable type.

Another two sensors are fixed on the bottom shaft, which are connected in pair with either of the sensors on the shuttle box. The sensors are made to hang from the top and the flag for each one of the sensor is fixed on the bottom shaft itself. The sensor is fixed on to a slotted plate for easy adjustments. It is hung from the machine frame, which is above the bottom shaft.

Two flags of 180° are fixed on the bottom shaft by means of a screw clamp, which will be easy for finer adjustment. The flags on the clamp is also provided with a slot attachment which will be very easy for the initial setting.

The connection is given in a way that two sensors (i.e one in the shuttle box and the other in the bottom shaft) should be blocked or should be open. The sensors at both the sides should be open during the shuttle flight from one box to the other. When there is a delay in the timing of the shuttle reaching the box the signals will not match and by means of an electromagnet the starting handle is knocked off to the OFF position. The electromagnet is magnetised by means of a relay. A reset switch is provided to restart the loom.

4.8 TIMING AND SYNCHRONISING

4.8.1 Loom Timing Diagram:

The positions for the timing of the sley, shedding and picking have been located in over and in underpick tappet looms.

- 0° or 360° :
  1) Healds are level; warp threads are parallel with the floor in overpick looms.
  2) Cone is in contact with the picking disc; or shuttle is at dwell.
  3) Cranks are on the top center; sley is in the mid-position between the back and front centers.
- 90° :
  1) Healds are crossed in overpick loom; healds are level in underpick loom.
  2) Cone remains in contact with the picking disc; shuttle is at dwell in the box.
  3) Crank is at the front center; reed is in contact with the fell of the cloth; beat-up.
  4) Fastest movement of the sley.
- 120° :
  1) Shed is open; dwell period on the shedding tappet and healds commences.

- 120° to 240° :
  1) Shed remains open; dwell period on the shedding tappet and healds is one-third of a pick.
- 150° :
  1) Picking nose is in initial contact with the cone, and the shuttle
  begins to move in the box in overpick loom.
- 180° :
  1) Shed remains full open.
  2) Picking nose tip is in final contact with the cone; shuttle leaves the box in overpick loom.
  3) Shuttle moves in the box in underpick loom.
  4) Crank is at the bottom center; sley is in mid position between the front and back centers.
- 210° :
  1) Shuttle enters the warp in overpick loom.
  2) Shuttle leaves the box in underpick loom.
- 240° :
  1) Shed begins to close.
  2) Changing period of healds begins in the tappet loom.
  3) Shuttle enters the warp in underpick loom.
- 240° to 120° :
  1) Changing period on shedding tappets and healds is two- thirds of a pick in an overpick loom.

- 270° :
    1) Healds are changing places or the shed is closing in the tappet loom.
    2) Shuttle passes across the warp.
    3) Sley is farthest from the fabric. Slowest movement of the sley.
- 300° :
    1) Shuttle enters the shuttle box.
- 330° :
    1) Shuttle is checked by the check strap; and
    2) Shuttle is locked by the swell spring in the box.

After the components are fixed the machine is set ready for keeping its settings. We marked the timing diagram on the flywheel. As we all know for every revolution of bottom shaft two picks are inserted. So two flags of 180° each are placed in opposite direction to each other.

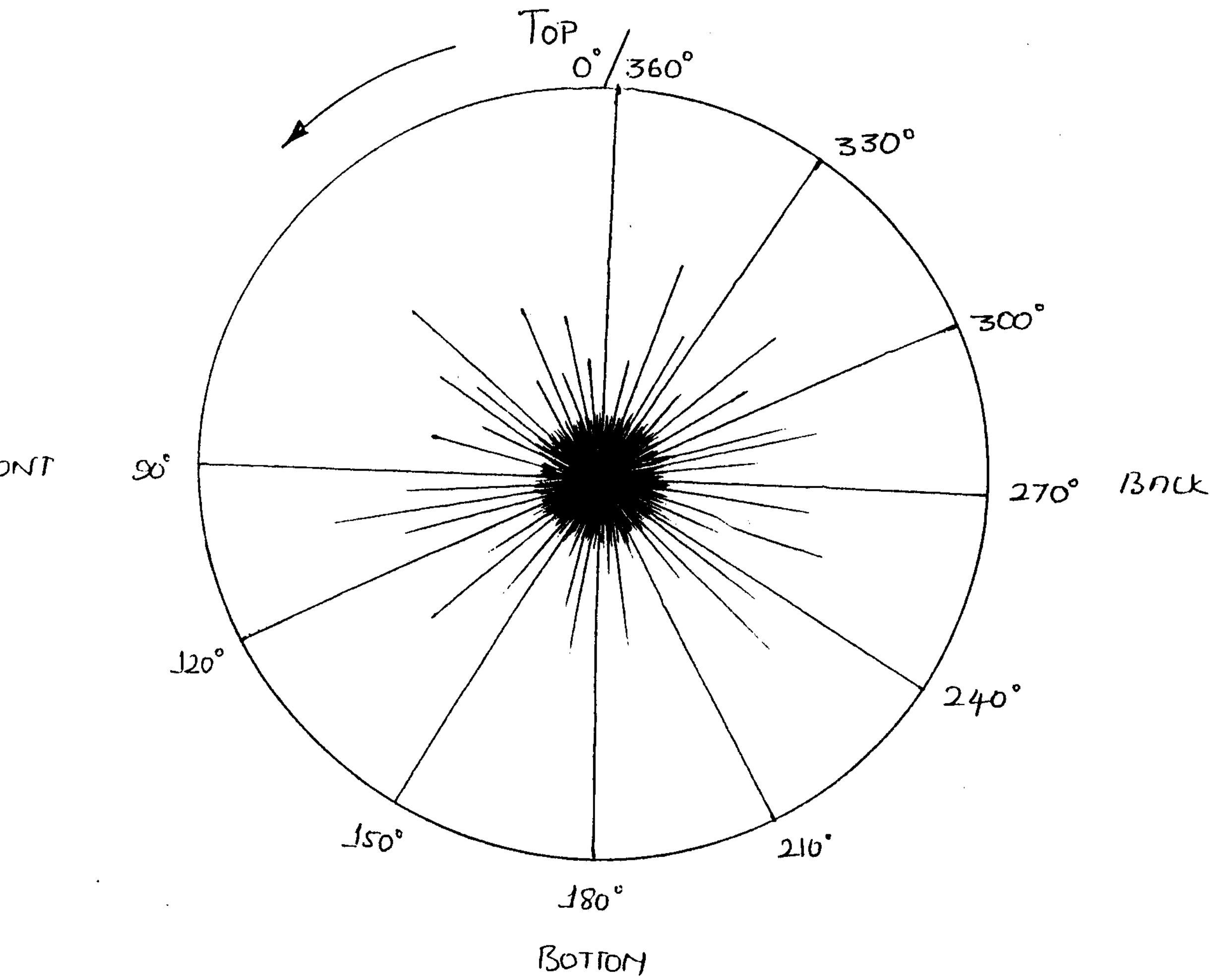
1. While considering the first pick, as the shuttle enters the shuttle box in one side the flag in the shuttle box blocks the sensor. At the same instant the flag in the bottom shaft should block the corresponding sensor.
2. Similarly the same sequence of the setting is done on the other side also.

3. During the flight of the shuttle from one box to the other both the sensors in the shuttle box are not sensed. So at the same instant both the sensors in the bottom shaft should be free from sensing.

4. For the above requirement the excess material in the bottom shaft is cut by trial and error method.

5. The output connection is given to the electromagnetic device which gets magnetized, when the circuit breaks and knocks the starting handle to the off position, instantaneously the brake is applied and the machine is made to stop. At the same instant the indicating lamp is made to glow indicating the loom stoppage.

LOOM TIMING DIAGRAM



4.9 DESIGNING & FABRICATION

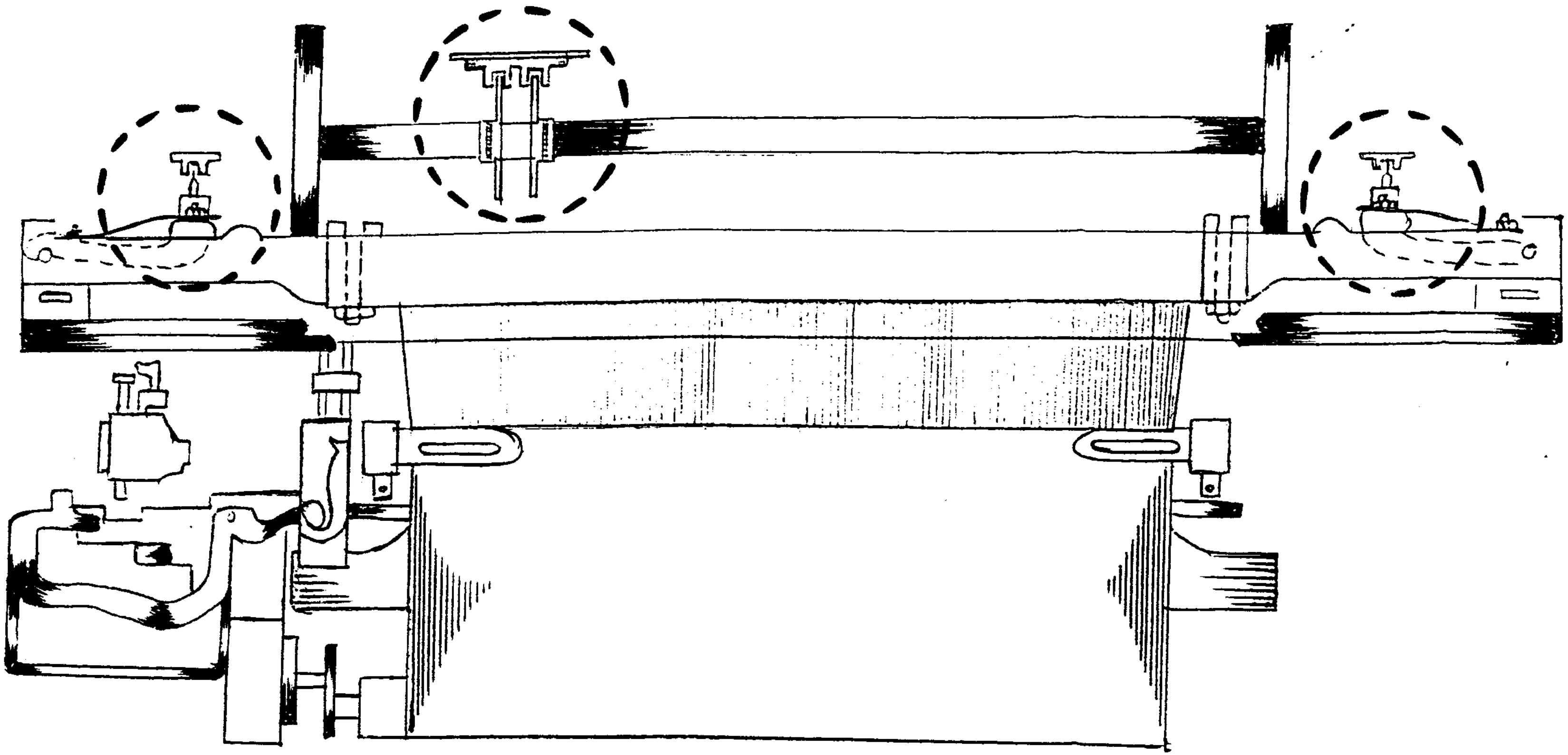
1) The 'L' shaped plate was initially made of 1mm thickness, but due to the vibration it was replaced with 2.2mm thick plate. Even after replacing the vibration prevails so a stay rod is welded across the 'L' plate and the vibration is very much reduced.
2) The flag which was made initially was not of adjustable type. So we faced many difficulties during setting. Later we replaced it with a slot adjustable flag, which made our proceedings easy.
3) In the circuit board, the malfunctioning of the relay caused us many problems. After identifying the problem, the relay was replaced.
4) Due to improper handling a sensor failed and has been replaced by a new one.
5) Initially the system was developed to switch off the motor but for instantaneous stopping of the machine a electromagnetic knock-off mechanism is fabricated.

4.95 WORKING OF ELECTRONIC WARP PROTECTOR MECHANISM

While considering the first pick, as the shuttle enters the shuttle box in one side the flag in the shuttle box blocks the sensor. At the same instant the flag in the bottom shaft should block the corresponding sensor. Similarly the same sequence of the setting is done on the other side also.

During the flight of the shuttle from one box to the other both the sensors in the shuttle box are not sensed. So at the same instant both the sensors in the bottom shaft should be free from sensing.

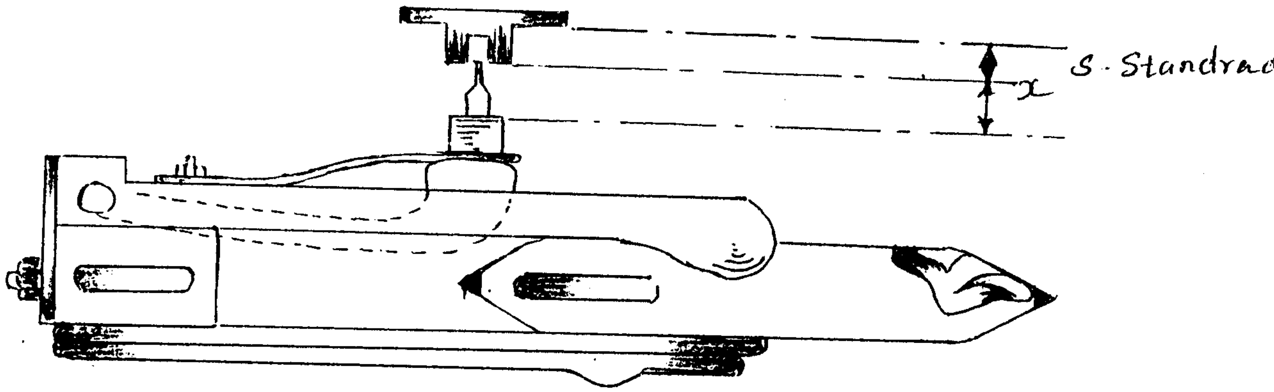
If any difference in the timing occurs in the boxing of shuttle in the shuttle box and a signal is generated. The generated signal is given to the electromagnetic device which gets magnetized, when the circuit breaks and knocks the starting handle to the off position, instantaneously the brake is applied and the machine is made to stop. At the same instant the indicating lamp is made to glow indicating the loom stoppage.



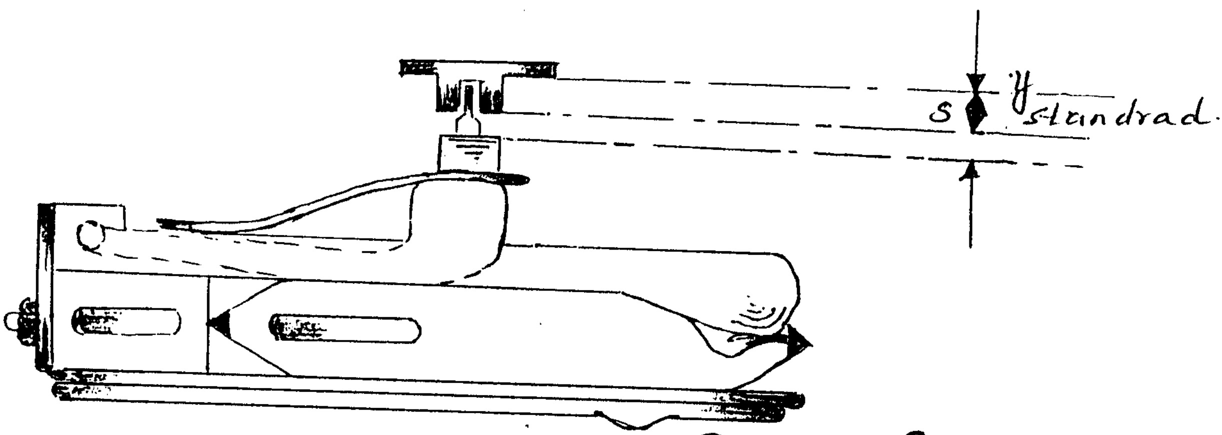
TOP VIEW OF LOOM

TOP VIEW

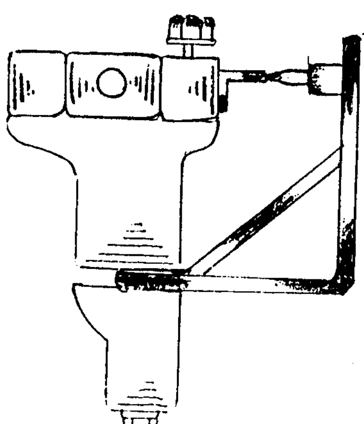
BOXING OF SHUTTLE IN SHUTTLE BOX



Before Sensing.

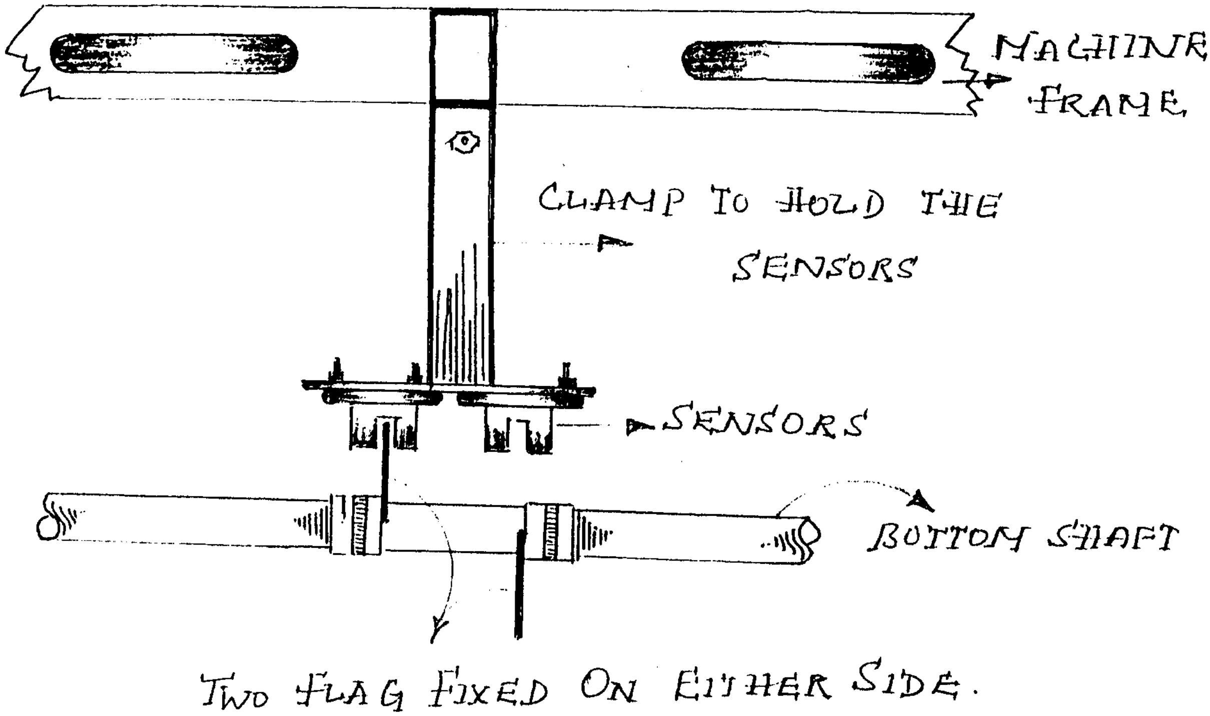


After Sensing.

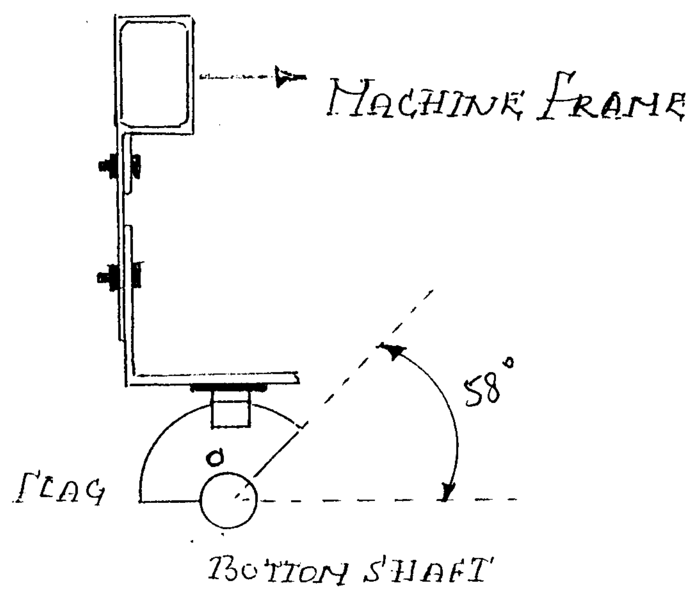


SIDE VIEW

FRONT VIEW



TOP VIEW



5.0 COST ANALYSIS

The cost analysis made for our project shows the amount incurred for the development of this mechanism.

1) Circuit designing and implementing	=Rs. 300.00
2) Mechanical parts	=Rs. 250.00
3) Electromagnetic knock off mechanism	=Rs. 300.00
	Rs. 850.00

Cost of Loose Reed Mechanism	=Rs. 1000.00
Cost of Fast Reed Mechanism	=Rs. 750.00
Cost of Electro Magnetic Mechanism	=Rs. >2500.00

6.0 RESULTS AND DISCUSSIONS

As we carried out the project on the Sakamoto Semi Automatic loom in our lab, on the completion of the project we took a trial run on the same machine. The results were satisfactory.

On the trial run in order to create a situation for shuttle trap, we reduced the picking force below the required level and found the system was responding properly.

As the system was responding properly the following **advantages** can be derived out of it.

- Value loss and fabric damages are reduced.
- Utilization loss is reduced.
- Cost incurred for the damage of reed, shuttle, temple and cloth are minimized.
- Weaver operation is minimized so loom allocation per weaver can be increased to some extent.
- Mending of warp is minimized , as the breakage of ends due to shuttle trap is avoided.

7.0 CONCLUSION

As rightly said in the introduction part this project particularly aimed at the powerloom and automatic loom sector, which are in total majority in India. This project will definitely help the entrepreneurs to earn profit by way of minimizing the value loss of the fabric and spare parts consumption.

Although the mechanism is slightly expensive than fast reed mechanism, owing to its numerous advantages given above we feel the industry will offered to go for it.

In a country like India, which has nearly 18.35 lakh powerlooms, it is not possible to replace them with the latest shuttleless looms within a short period. Hence small developments of this nature on the conventional loom will help the textile industry to sustain in the market inspite of liberalization.

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