Multipurpose Automatic Pressing and Folding machine for Plain Clothes

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***Abstract*— In today's world, neatness is very important for professionalism as well as for many aspects. The pressing of plane cloths make it shine and wrinkleless at various places. But, to press long plane cloths like saree, bed sheets, curtains and many more it takes lots of time as well as manual efforts which lead to high customer price. So, to make it more relevant this project is very helpful with folding mechanism in addition. The commercial complex like big hotels, hospital etc. require large amount of pressing their bed sheets and other cloths. So, this machine will really help them to do it very quickly and with less cost. This machine is user friendly and cost effective product in today's pressing market. This project have great potential to create a new market in pressing line as it modifies many aspects of machine.**

Keywords: pressing machine, Temperature control system, Heater connections, Control panel, less cost, folding mechanism.

I. INTRODUCTION

A simple electrically assisted automatic pressing machine for plain clothes is to be done for laundry and commercial purpose, which will help to reduce manual efforts as well as time of the work with less cost.

Laundry mostly uses a traditional iron consider example of saree pressing time and folding time required to press one saree is more than 25 minutes approx. If proposed machine is utilized by them clothes will be ironed and folded within few minutes. Steam press available uses steam to press plain clothes but these machines cost more than 1.5 lakhs and these systems have more size, more electricity consumption, boiler, no temperature control, require more manual efforts, bulky construction and have no folding system.

In proposed system the operator will just feed the clothes from one side of machine and get ironed and folded clothes on other side within little minutes. This system will be electrically operated and will consist of rollers operated by motor to press and feed clothes. Heating of roller will be done by electrical coils and temperature can be varied as per need.

The temperature control is done by using microcontroller which will maintain exact temperature as per requirement. Manual mode is also provided to adjust temperature for the clothes with more temperature. This project is done with the real market survey from which it is clear that it has real potential in today's market.

II. PRESENT THEORIES AND PRACTICES

1. Aman Kaushik has explained working of automatic ironing machine. Automatic Ironing Machine is a design that uses an innovative framework and motorized mechanisms to effectively iron various clothes by minimizing the difficulties in the task of ironing cloth (by ironing it from both sides i.e. up & down simultaneously). The cloth will be mounted on a stationary frame between the two irons. The movement of these irons is based upon chain & sprocket mechanism governed by two motors. For designer clothes i.e. the upper iron can be completely detached off from the setup and can be used as our usual house-hold iron.

Fig 1.1 Automatic ironing machine based on chain and sprocket mechanism

2. Mohd Hazuan Bin Mohd Zawawi et' al' [2] has explained design of a new electrical iron mainly using Boothroyd Dewhurst DFMA method. It focuses on the existing inner components of the electrical iron and designing a new electrical iron with less possible components because electrical irons largely sold around the world are expensive. This is due to the complexity of the iron itself. There are many unnecessary parts that can be removed by using the Boothroyd Dewhurst DFMA method to reduce cost, assembly time and operations.

3. Steam heated pressing machine has boiler arrangement which creates the pressurized steam at high temperature then this steam is passes through pipes, valves etc towards the roller arrangement. Then by passing plain clothes through roller pressing is done. But this system is quite bulky and without temperature control for different clothes.

Fig 1.2 steam boiler for heating of clothes

4. Gas burner heating type pressing machine consist of gas cylinder and burner which produces heated flame of gas below the roller to which saree is wounded. So by heating process the saree is getting pressed. It has feature of speed control using variable frequency drive but again temperature control is not there.

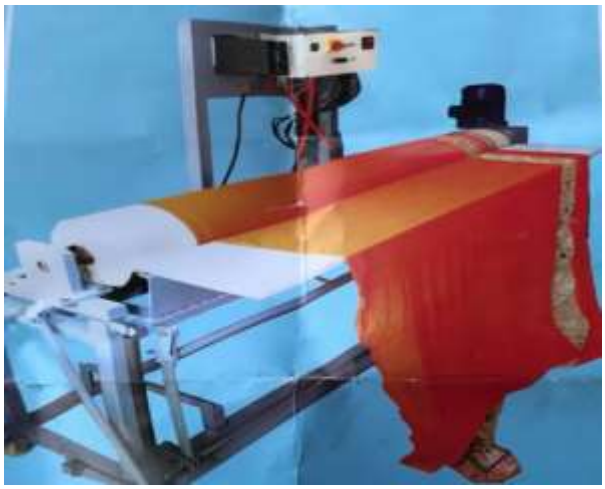


Fig1.3 Gas burner heating type pressing machine

So by checking out all above current market machine there are few common drawback like no precise temperature control, no folding mechanism, systems are bulky and many more. This all drawbacks are removed in this project and try to make it sophisticated and user friendly with minimum cost.

III. METHODOLOGY

The methodology is basically divided into mechanical and electrical working systems.

Electrical working systems -

1. Heater connections

Heaters used are resistive type nichrome plate type heaters. There are total 13 plates are used for heating purpose. The rating of each heater is 1500 watt and all 13 rollers are spread equally below the roller. The roller apply pressure and cloths are getting pressed. The rollers are connected in series parallel combination to control the heating time of heaters. The heaters connection are shown on matlab software as follows-

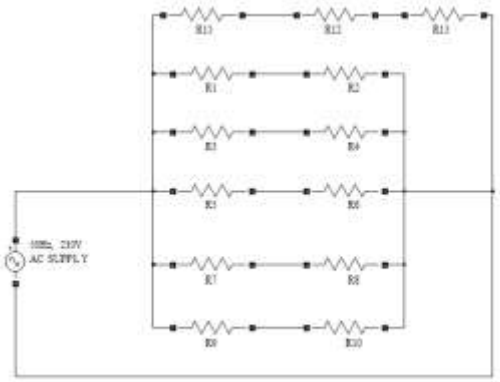


Fig 1.4 Connections of 13 heaters

In series connection equivalent resistance is increases, so it will take more time for heating but in case of parallel connection equivalent resistance is reduces so it will heated quickly. But if all heaters are connected in parallel then it will cause excessive heating out of control so the connections are made in series and parallel combination so it will be precisely controlled.

2. Temperature control system

The temperature is precisely controlled by using micro-controller based system. The controller used is Atmega-320 AVR controller. The basic feature of AVR microcontroller is it will give feedback signal. The total circuit diagram in proteus software is as follows

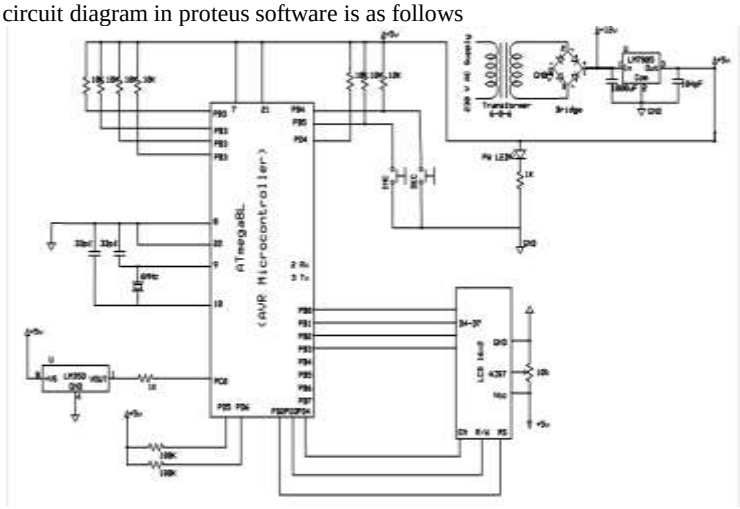


Fig1.5 Automatic temperature controller system

LCD used is 16 bit display and temperature sensor used is LM35 sensor which will be connected at heater side. The LCD display program for temperature sensor is as follows

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(8, 9, 10, 11, 12, 13);
const int in1 = 6;
const int ANA1 = A0;
int sensorValue = 0;  // variable to store the value coming from the sensor
int outputValue = 0;
int abc = 0;
void setup()
{
 pinMode(in1, OUTPUT);
 digitalWrite(in1, LOW);
 lcd.begin(16, 2);
 lcd.setCursor(0, 0);
 lcd.print("Automatic Press ");
 lcd.setCursor(0, 1);
 lcd.print("   Machine      ");
 delay(1000);
 lcd.setCursor(0, 0);
 lcd.print("Temp=     %     ");
 lcd.setCursor(0, 1);
 lcd.print("Type: NaN       ");
}
void loop()
{
 int n, x1, x2, x3, x4;
 sensorValue = analogRead(A0);
 n = sensorValue;

 x1 = n % 10;
 n = n / 10;
 x2 = n % 10;
 n = n / 10;
 x3 = n % 10;
 n = n / 10;
 x4 = n % 10;
```

```
n = n / 10;

x1 = x1 + 0x30;
x2 = x2 + 0x30;
x3 = x3 + 0x30;
x4 = x4 + 0x30;
lcd.setCursor(6, 0);
lcd.write(x4);
lcd.write(x3);
lcd.write(x2);
lcd.write(x1);
```

This is the program for sensing temperature from sensor and display on LCD screen accurately.

3. Motor connections

The motor used for rotation of rollers as well as folding mechanism is single phase induction motor. The rating motor is 0.5 hp and operated on 220 volt AC supply.

The forward and reverse rotation of motor is done by making change in the connection between phase and capacitor a follows

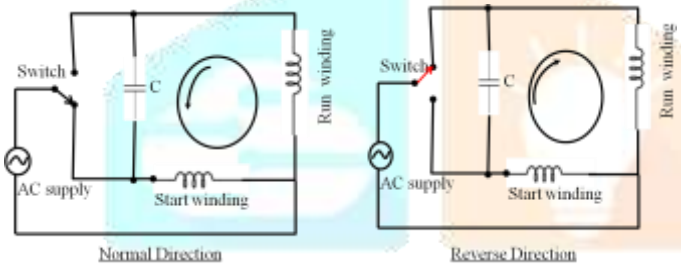


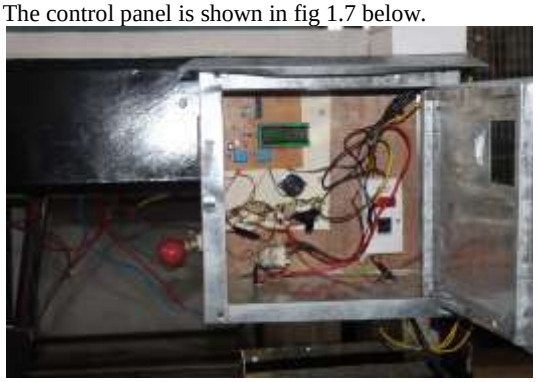
Fig1.6 Forward and reverse connection of motor

4. Control panel

The control panel consists of power switch through which main supply is passed, two transformers and microcontroller based controlled board. The LCD display shows the temperature value of heater. There are two mode selection is given. Mode 1 will maintain the temperature between 55 Celsius to 65 Celsius and mode 2 will maintain the temperature between 65 Celsius to 75 Celsius.

The temperature is controlled by cutting the supply current of heater at maximum temperature. The cutting of supply is done by contactor and signal is given by microcontroller. The indication lamp is provided for indication of supply given to the heating coils.

The control panel is shown in fig 1.7 below.



IV. TOTAL RATING OF MACHINE

The rating of machine depends upon the total/equivalent rating of all heaters and motor.

1. Total rating of all heaters

The rating of each heating coil is 1500 watt
The supply given to heater is 220 volt.
So resistance is v^2/w= (220)^2/1500=35.26 ohm
As two resistance are connected in series so 2R=2*35.26=70.53ohm
Now total wattage of series resistance is (230)^2/70.83=750watt
Now, such five series connections are there thus total rating =750*5=3750 watt
Now, for last three heaters connected in series total wattage=(230)^2/3R=500.09 watt
Total rating of heater is=3750+500= 4250 watt=4.25 kwatt

2. Rating of induction motor

The rating of motor used is 0.5 hp that is 0.373 kwatt
Thus, **total rating of machine** is 4.25+0.373= 4.623 kwatt

V. UNIT CONSUMPTION, TIME AND COST FOR PRESSING

Cloth type	Time (min)	Units (kwh)	Residential Cost (5 Rs/kwh)	Industrial Cost (10Rs/kwh)
saree	4	0.308	1.5 Rs	3.08 Rs
Bed sheets	5	0.4623	2.311 Rs	4.622 Rs
curtains	3	0.2311	1.15 Rs	2.30 Rs

All the time required for particular cloth is calculated by actual practical.

Mechanical Working system

1. Design of machine

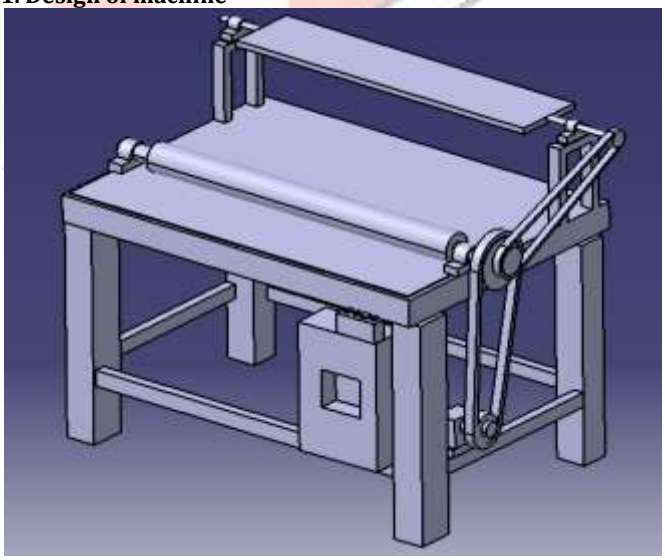


Fig 1.8 Actual design of machine

This design is done in catiya software. Single roller type design made it very simple and robust. This type of design is new in market and causes drastic reduction in the cost of the machine.

2. Design with exact measurement

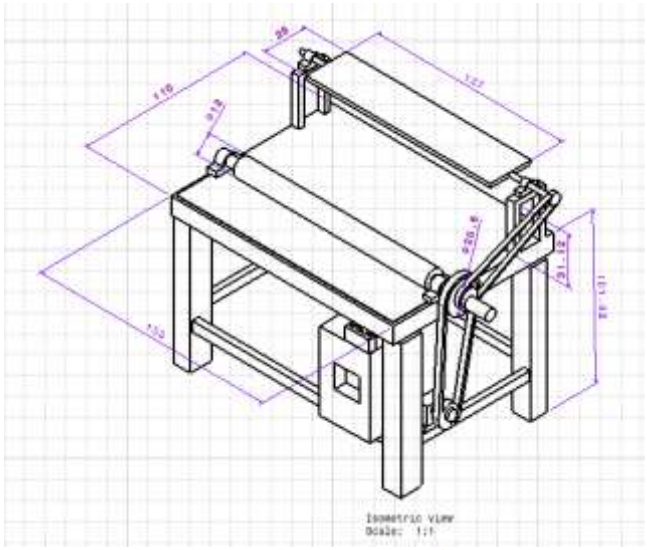


Fig1.9 Design with exact measurement

3. Actual picture of machine

Fig1.10 Actual picture of machine

4. Calculation of speed and roller diameter

Assume:
*As per normal iron
Pressing Normal speed: P_{speed} = 2cm/sec
Normal Press Area: A_{press} = 20cm
Then,
Roller circumference = $2xA_{press}$
= 2x20=**40 cm**
Roller Diameter = 2x40/ (2x3.14)
=12 cm
Time for one rotation (T) =D/P_{speed} = 12/2
= 6 sec

$S = \frac{1x60}{6}$= 10 RPM
So Rotor Speed (S) = **10 RPM** Approximately
Folding Design:
Cloth pressing speed = 2cm/sec
Folding Size = 28 cm
1 rotation= 2 x Folding Size = 56 cm
$T_{one\ fold}$= 56/2 = 28 sec
R_{fold}= R = $\frac{1x60}{28}$ = 2.2 RPM
As per cloth speed, One fold is complete in 28 sec

VI. CONCLUSION

This system has following advantages -

1. Less cost
2. Minimum space required
3. Less human efforts
4. More feasible
5. Less time requirement
6. Less maintenance
7. More safety

If this system is installed it will be beneficial than other systems because it will save up to 40% - 50% initial as well as operational and maintenance costs and no any operational skills required to operate this machine. This machine has proper indications with manual as well as auto mode which will help to maintain exact temperature as per the type of cloths.

VII. REFERENCES

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