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Automatic Transformer Winding Machine using ATMEGA 32

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Abstract: Transformer Winding Machine winds the transformer when number parameters are given to the machine as input. Transformers are used in Voltage Regulator, Voltage Stabilizer, Power Supply, Welding Machine, etc. The different types of transformer are Step up and Step down Transformer, Power Transformer, Distribution Transformer, Instrument transformer comprising current and Potential Transformer, Single phase and Three phase transformer, Auto transformer, etc.

Our machine can manufacture small transformers which are most commonly used for increasing low AC voltages at high current (a step-up transformer) or decreasing high AC voltages at low current (a step-down transformer) in electric power applications, and for coupling the stages of signal processing circuits.

Transformer Winding Machine reduces time and human effort . It replaces manually built transformer. It will increase the transformer winding speed and thus will increase the transformer production. Transformer winding machine can be used in small scale and medium scale industries for transformer production. Also in medium industries loss of electricity they also records of processing winding which result loss of some windings coil because they have no record about how many turns & steps are done. By using this machine it keeps record stores record how many turns & steps done when electricity loss & we can start from where machine is stopped due to loss of electricity

Keywords: Transformer Winding machine, Semi-automatic Transformer Winding Machine, Basic Motor Winding Machine, Winding Machine, Semi-automatic Motor Winding machine

I. INTRODUCTION

Introduction to the Use of Automatic Winding Machine. The winding machine is mainly used for rewinding the bobbin into a cylindrical or conical bobbin after being unwound. The sizing machine is mainly used for fabric sizing.

Electrical coil winding machines are used to wind coils for basic motors, transformers, inductors, and chokes which are in medium range . Coil winding equipment is used in a variety of wire winding, wire welding, and wire bonding applications.

We used the 90w AC motor and for counting the turns we used IR sensor by programming the external interrupt 0. We also make coil shifter using the DC motor with two gears . We made the keypad for giving the inputs to machine for ex. We give the primary voltage and secondary voltage.

It calculate turns itself and then it will wind the bobbin. After completion the total turns it will stop the machine.

We made simple basic OS which is useful to keep record ,calculation & operating purpose. By the local calculation method

II. LITERATURESURVEY

We visited Vinod Electronics for industrial survey, which is a small scale industry which manufactures the transformers and other electronic devices essentials. Which is located in 6/340, Mangalwar Peth, ichalkaranji. The Vinod Electronics started at 1989. It started manufacturing at 1990. There are 12 Number of Employees are working in this industry.

Types of products & services

- A. Voltage Stabilizer
- B. Battery charger
- C. Transformer

Turnover of this industry is 10-12lakh pre year.

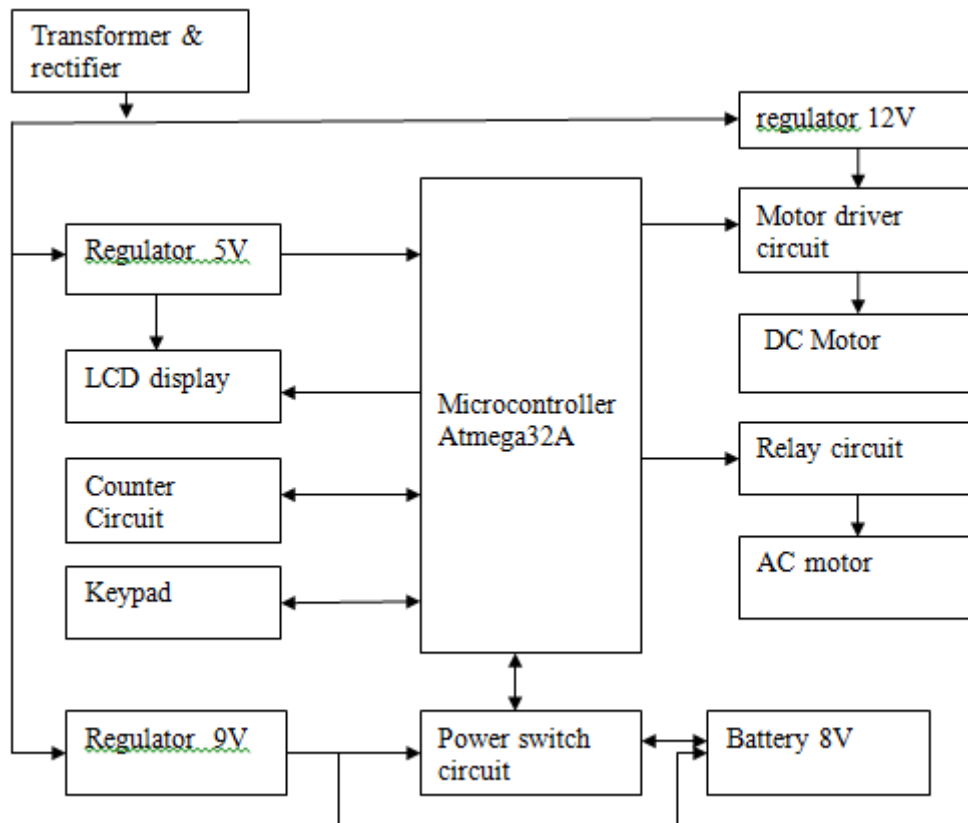
From this industry we got the idea about our mega project. We learnt about different types of transformer ,manufacturing methods of transformer and its applications in different types of electronic devices.

III.METHODOLOGY

This machine will provide the ease and comfort to the manufacturer. Also it provides the user to select the turns of transformer winding instead of manually operated winding machine. which needs manual rotation. In general it will benefit the manufacturer to increase the production with precision , less time and efforts.

This machine is affordable to Small, Medium, Large scale industry manufacturers of transformers which will help the manufacturers to maximize the production and quality of transformer. The machine is designed in a such a way that we can manufacture small and medium transformer of different applications and also motor winding is possible. .

IV.BLOCKDIAGRAM



V. WORKING

- 1) *Power Supply:* The machine working on Atmega32A microcontroller which require 5V power supply. We used 12-0-12,3A transformer and 6A4 diode for bridge rectifier. Rectifier converts the AC into DC voltage. From that we used 5V for microcontroller and 12V for DC motor, & 9V for power switching circuit.



Fig.1 power supply

2) *LCD Display:* After starting the machine in LCD display there are multiple layers are displayed . They are,

- a) Direct value,
- b) Calculate value,
- c) Configure value,
- d) Saved programme.

In first layer there are two layers step by step and manual layers. In step by step layer we can give the values of primary and secondary steps of transformer winding . In manual layer we can give number of turns directly.

In second layer we can give the following data for transformer manufacturing.

V_i (input voltage)=

V_o (output voltage)=

I_i (input current)=

I_o (output current)=

Length =

In third layer we can give following data for transformer manufacturing.

F (Frequency)=

B_m (Flux Density)=

A(Area)=

In fourth layer we can store all data which is entered by us in three layers

Prog0

Prog1

Prog2



Fig.2 lcd display

3) *Counter circuit:* We used the counter circuit for counting the rotation of the AC motor .This is helpful for to display the values of counted, count remaining and speed of motor in RPM. This circuit works on IC555. The counting concept is mainly based on IR sensor. When transmitted rays from transmitter to receiver ,then resistance of receiver is reduces. & this reduce of resistance across receiver voltage also change this changing voltage is given to the trigger circuit and this triggered o/p is given to the interrupt INT0 of atmega 32. We placed a metal plate at gear side to the rotating shaft where transformer bobbin can be placed for winding , that metal plate is drilled 8 wholes & ir Tx & Rx are placed both side of plate resp where wholes can be matches of circular area of plate. When motor starts the rotating shaft rotates then this plate rotate that time when whole are passes by thus passed wholes triggers the signal of ir & trigger circuit which is given to the interrupt of atmega32 when falling edge get sensed by atmega32. Then in interrupt count value increase in respect to div of 8 for a count of winding shaft.& thus count is used for detecting the speed of shaft at 300ms interval.

4) *Keypad* : We used the keypad for giving inputs for machine as per our requirement. In our Keypad 16 keys are available. we get binary inputs from the four pins of microcontroller . We used new technic for making key matrix in this key matrix in 4pin we can use 15 key's & in 8 pin we can use 255 key's.

Key	Binary input	function
0	0000	NUM 0
1	0001	NUM 1
2	0010	NUM 2
3	0011	NUM 3
4	0100	NUM 4
5	0101	NUM 5
6	0110	NUM 6
7	0111	NUM 7
8	1000	NUM 8
9	1001	NUM 9
10	1010	DOT
11	1011	DEL
12	1100	OK
13	1101	DOWN
14	1110	CLR
15	1111	BACK

For e.g

After switch ON the machine we selected the first layer by clicking on OK button on the keypad. Then we can select manual option from the two options as per above explanation of direct value layer. In manual layer we give direct number of turns like 200. Then clicking on OK button we can Start the machine.

In run condition we can see counted value, count remaining value and speed of AC motor on LCD display. This function is done by the counter circuit. After completion of the 200 turns microcontroller stopes the AC motor by switching the relay.

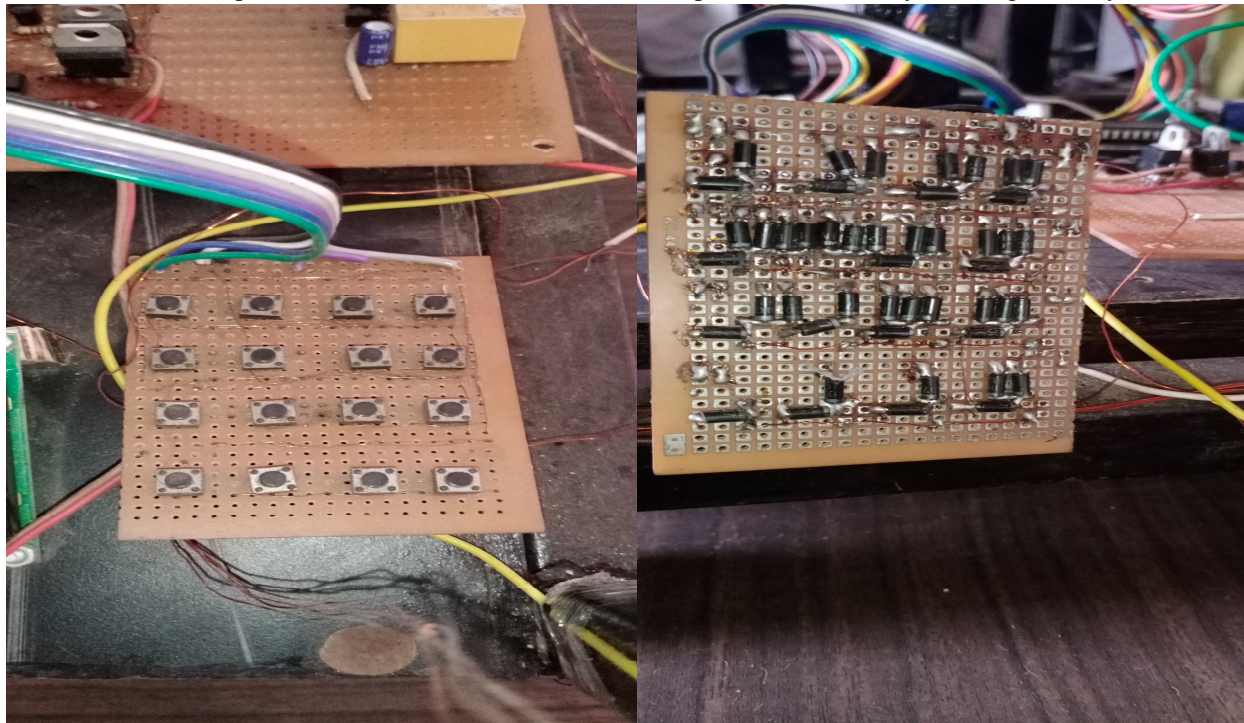


Fig.3 keypad

5) *Power Switching Circuit:* In various industries we require a save processing work when electricity is gone. But in some industries can offered the UPS for this & processing work is saved manually. But in many industries they cannot offered the UPS. In that case purpose we designed a power switching circuit which can help to processor when electricity is gone then save current running process automatically. Input of 9V is given to this circuit & one directional circuit is used to connect the battery to the next output circuit which avoid reverse voltage. When switch ON then TIP122 transistor on by the input 9v electricity & this circuit starts driving voltage to the next circuit. When electricity is gone then by processor TIP 122 transistor is take in ON state until processor is done his saving processing work .when electricity is gone then is call the interrupt 1 for saving his work.

6) *DC motor Driving Circuit :* We used 4 : TIP122 medium power transistor for direction switching, two transistor is connected in series, at middle of thus transistor motor is connected

i.e T1 : collector to Vcc ; emitter to motor of first terminal ;

T2 : collector to second terminal of motor ; emitter to GND;

& another transistor are connected in series opposite connectivity i.e

T3 : collector to first terminal of motor ; emitter to GND;

T4 : collector to Vcc ; emitter to motor of second terminal ;

& Base of T1 & T2 are connected to emitter of opto-coupler by 5.6K resistor individually & collector of opto is connected to 12Vcc same connectivity of base of T3 & T4 to second opto

first opto of first terminal is connected to atmega 32 A2 pin & second opto of first terminal is connected to atmega 32 A3 pin via transistor driving circuit.& both of opto second terminal is connected to gnd.

When A2 = 1 : T1 on T2 on : first terminal of motor current is supplied by the T1 & electrons supplied by the T2 to second terminal of motor : which result forward direction of motor;

When A3 = 1 : T3 on T4 on : first terminal of motor electron is supplied by the T3 & current supplied by the T4 to second terminal of motor : which result reverse direction of motor.

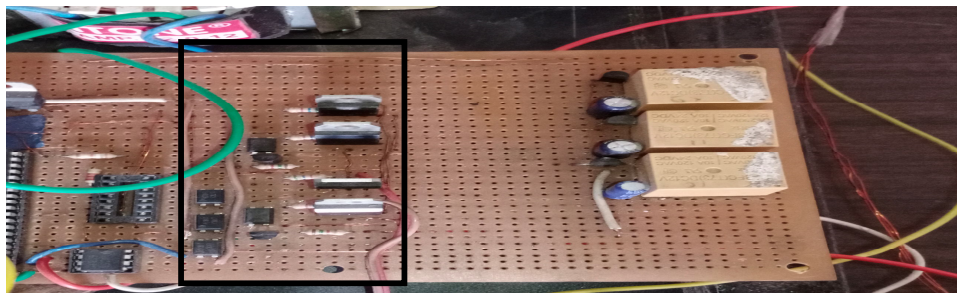


Fig.4 DC motor driving circuit

7) *Distance Detector:* We used sharp ir Tx & Rx transmitter is connected with 100R resistor to 5Vcc.& second terminal to gnd. & receiver is connected to 5Vcc by 37K resistor & cathode of Ir to GND. & junction of resistor & Ir receiver anode terminal is connected to atmega 32 A0 pin which is used for take analogy input.ir transmitter is placed at rotary & receiver at stationery rigid body. This value is is converted into distance in mm. When distance value is gone above the given distance to the processor then processor commands to driver circuit to drive motor in reverse direction & when rotary rich at préciséd 0 value the processor commands to driver circuit motor drive in forward direction.

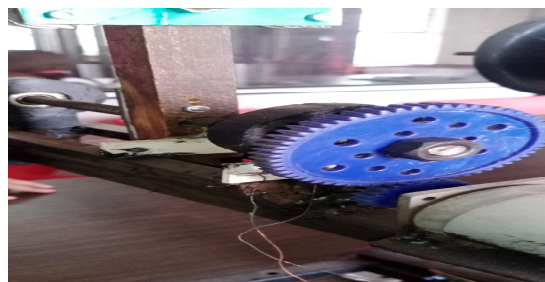


Fig.5 distance detector

VI. HARDWARE USED

- 1) *Metal Gears*: 30 & 60 teeth : 1 & 1;
- 2) *Plastic Gears*: 30 & 60teeth : 1 & 1;
- 3) *Processor*: atmega 32 : 2Kb RAM , 32 kb ROM , 4.5_5.5 V , 1Kb EEPROM : 1 ;
- 4) *Timer IC*: NE555 : 2 ;
- 5) *Copper Connecting Wire*: Transparent insulated : as per requirement;
- 6) *Transistor* : TIP 122 : collector dissipation 65_2W : 5 ;
- 7) *LCD*: 16 * 4 : green back light : 1 ;
- 8) *AC Motor*: 90W :1300RPM : 1;
- 9) *DC Motor*: 5_24V : 1;
- 10) *Battery*: 4V :1 AH : 2;
- 11) *Crystal*: 16Mhz ;
- 12) *Capacitor* : 22pf =2 : 1mf =1;

VII. RESULTS AND APPLICATIONS

- A. Reduces human efforts
- B. Reduces manufacturing time
- C. Increases production rate
- D. Precision.
- E. Reduces calculation time
- F. It keep record when electricity gone
- G. We can save 3 program & can be increased program saving functions depends on EEPROM
- H. Use for medium scale variable transformer making industries

VIII. CONCLUSION

Transformer Winding Machine will reduce time and human effort . It will replace manually built transformer. It will increase the transformer winding speed and thus will increase the transformer production.

Transformer winding machine can be used in small scale and medium scale industries for Transformer production.

It has automatically processing saving technic which avoid loss of record when electricity is gone.& avoid cost on UPS

IX. FUTURE SCOPE

We can make a gauge detector which can be used to detect the gauge of coil & display their property Automatic insulation to bobbin

REFERENCES

- [1] <http://engineerexperiences.com/design-calculations.html> : transformer calculation formulae ;
- [2] https://www.powerstream.com/Wire_Size.htm : AWG wire gauge selection table ;
- [3] <http://nepsi.com/resources/calculators/motor-torque.htm> : mechanical calculation ;
- [4] <https://html.alldatasheet.com/html-pdf/171430/ATMEL/ATMEGA32/151/1/ATMEGA32.html>
- [5] <https://html.alldatasheet.com/html-pdf/447652/TGS/TIP122/53/1/TIP122.html>
- [6] <https://x-engineer.org/graduate-engineering/mechatronics/mechanisms/how-to-calculate-a-gear-ratio/>



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