

Automatic Winding Machine

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Abstract - Electrical and Electronics Industry is one among the fastest growing industries. The need of automation in industry is very much essential to have efficient work done. In modern day electrical and electronics shops winding a motor is a little hectic job, because the conventional method used can be inaccurate. Therefore, Automatic Winding machine can be helpful in these shops so that the job can be easily done through the automated setup. It is a Microcontroller based electro - mechanical project. Automatic Winding Machine can be used to wind small motor and transformers. With this machine, winding the core of any electrical machine can be done precisely. This machine does not require skilled person to operate it. Hence it can also be used by an inexperienced person. This Project can be implemented in small as well large scale by making modification to the design.

Key Words: Windings, Motor, Transformers, Microcontroller, Arduino, Core, Timer, Precision

1. INTRODUCTION

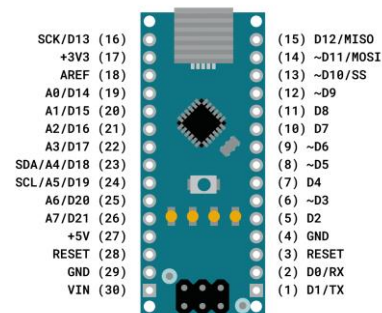
Machines are manmade tools which reduces the effort of humans. The tools have helped humans in many ways. Using any sort of tools or machines the work can be done in faster and efficient way. In electrical machines like motors and transformers the windings play an important role, in terms of performance and efficiency. Hence the winding should be done precisely, otherwise a small count mistake or improper winding can damage whole machine. The Automatic winding machine is such kind of tool which is highly helpful in small scale industries and electrical shops. This machine is used to wind motor and transformers. The automatic winding machine is an Arduino based project. The machine also consists of a counter, which keeps the count of number of windings to be done on the core of the electrical machine.

2. COMPONENTS REQUIRED

- **Arduino nano:**

Arduino is open-source development board based on ATmega328P microcontroller of 16MHz frequency. This board can be programmed using Arduino IDE software. It has an operating voltage of 7-12V (Input), output voltage of 5V. This has 14 digital I/O pins and 6 analog pins for

the interface. Arduino nano has 2kb of SRAM and 32kb of flash memory.



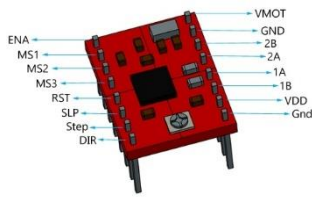
- **NEMA 17 stepper motor:**

Stepper motor is a brushless dc motor that divides full rotation into number of equal steps. It has four wire bipolar configuration, with 4.8kg-cm holding torque in bipolar mode. It has rated voltage of 12V dc and has rated speed of 4688 rpm. The step per revolution is 200 with a step angle of 1.8 degrees. The input pulse decides the rotation angle of the motor



- **A4988 stepper motor driver:**

The A4988 motor driver is a micro stepping motor driver which contains a built-in translator which provides smooth operation to the motor. The driver can be operated between 8-32V.



- **0.96" OLED display.**

Organic light emitting diode (OLED) is also known as organic electro luminescent diode, it is a light emitting diode in which the emissive electroluminescent layer is film of organic compound that emits light in response to an electric current.



- **10/26 mm bearing.**

In 10/26 mm bearing 10 represents internal diameter in mm, and 26 represents outer diameter in mm.

- **Mechanical supporting structures.**

These structures can custom made in order to suit the machine for different applications.

- **Push buttons and switch.**

- **Empty core.**

- **Copper wire roll.**

- **Jumper wires.**

- **Breadboard.**

- **5V power source.**

3. WORKING

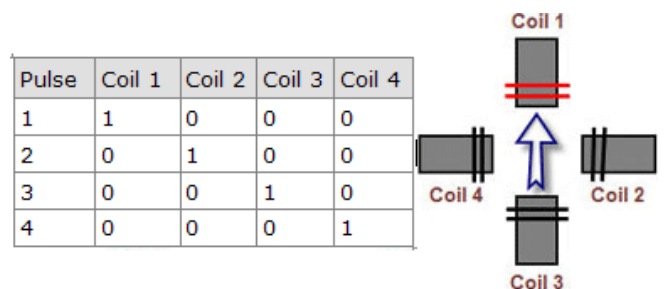
As the name suggests automatic winding machine, is used to wind the windings on the core of transformer or motor. The power supply can be given through adapter or battery. An on/off switch is used to make the circuit excited. There are two push buttons on the control panel to feed the required number of counts of windings. the buttons are indicated as up and down to increase or decrease the number of counts. The maximum number of counts can reach up to 106. The count is displayed on the OLED screen on the control panel, the counts displayed will be the number of rotations made by stepper motor 1. The operation of the machine starts once the start button is

toggled. There are two stepper motors in the circuit, namely winding motor (motor 1) and index motor (motor 2).

After toggling the start button the winding motor inculcated with the winding mechanism starts rotating and hence it draws the copper wire from the roll and starts to wind on the core. The shaft of motor is connected to winding structure through a belt. As the motor shaft rotates, the belt drives the winding structure, and it winds the core. This operation stops when the given number counts are completed.

After one set of winding, the index motor rotates, and the new core replaces the existing one. These operations are controlled by Arduino. The power supply of 5v dc is given to the microcontroller, this further delivers the power to motor drivers. The motor drivers amplify the current suitable for the motor and drives it accordingly. The motors are fed using motor controllers in order protect them from current damages. The motor drivers are also used to control the speed. The operation will be active until the button is toggled to stop.

4. FIGURES AND TABLES



Fig(1.0)

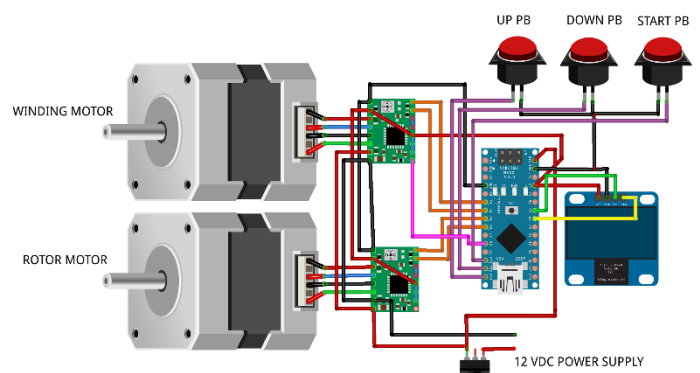


Fig (2.0)

5. ABBREVIATION

- i. SRAM – Static Random access memory
- ii. I/O – Input/output
- iii. NEMA - National Electrical Manufacturers Association

- iv. OLED - Organic light emitting diode
- v. IDE – Integrated Development Environment
- vi. PCB – Printed Circuit Board

6. ADVANTAGES

- Cost effective.
- Depending in the input program, we can wrap a variety of windings in the same machine.
- The fully automated machine can reduce manual work.
- Very minimal instruction is required to operate the machine.
- The machine greatly improves the efficiency of work and reduces the cost of enterprise.
- The counter avoids mistake in counting and reduces human error.
- Quality of production can be improved.

7. FUTURE SCOPE

- Multiple machines can be winded at a same time.
- PCB can be used to eliminate the breadboard setup.
- Sensors can be integrated for high precision and speed.
- Remote operation of the machine in absence of operator.
- Modification of mechanical body to fit wide range of cores.

8. CONCLUSION

Automatic winding Machine would be a best choice for small scale electrical shops for winding motor and transformer cores, based on size. This machine can be designed and operated with low cost and does not require any skilled operator. This machine helps to save lots of time and energy.

The design can be easily modified according to the use.

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BIOGRAPHIES



Prof. Nagarathna K Associate professor, department of EEE, Global academy of technology, .She has 15 years of teaching experience and 3 years of Industry experience. She is pursuing Ph.D in Control Systems from Visvesvaraya Technological University. She has published 7 journal papers.



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