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Automatic coil winding machine

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ABSTRACT

The automatic coil winding machine system is designed to enhance the motor's coil winding. The goal of this project is To replace manual coil winding machines with automatic ones. It will solve the issue of the time required to make coils. With this System, winding a coil will be faster. This system will take less time for winding coil. This technology can be applied to a variety of Applications, such as winding coils for transformers, inductors, motors, chokes and others. By utilizing this system, the industry person Can reduce the time needed for coil creation by employing this technology. This technique can also be applied to lower manufacturing Costs and boost productivity. The components of an automatic coil winding machine include a digital display for the number of turns, ON and OFF controls, and a spot for the user to submit an order. The goal of the project is to reduce the labor and time involved in Making coils.

Keywords: Arduino Uno, DC motor, Shaft, Pulley, Servo motor, Winding coil, automation.

I. INTRODUCTION

Background information Typically, a winding machine winds a material such as metal wire, thread, or paper, onto a core, spool, or bobbin. There are several different types of winding machines, from simple manual feed machines to complex computer-numeric-control (CNC) machines. Some of the more common uses for winding machines are coil winding, Rope winding, and continuous filament winding. Many industries use these devices, including textile, electronics, and wire industries. A manual winding machine usually has a core on a spindle and the user feeds wire, rope, or other material onto the core. The user controls the spindle speed and feeds the material through user hand, guiding it to control the tension and load pattern. These simple machines may be of a bench-top size or large stand-alone winder.

A coil winding machine is a machine for winding coil on to a spool, bobbin and many more. This coil winding machine is one of types of winding machine that available in industries today. The coil winders can be classified according to their speed levels and capacity. From multi speeded machines to medium, large and extra-large machines, these Machines come in various types and categories, performing a range function. The common applications for a coil winding machine are to wind coils for transformer, inductors, motor and chokes. Coil winding machine design is dictated by a coil's complexity, material tension limitations, machine versatilities, and automation / operator Intervention, production volume and budgetary considerations [3]. Complete types of winding machine ideal for educational institutes, small and medium enterprise.

II. METHODOLOGY

In this, the ardiuno programming is used for automation purpose.

Servo motors are used for rotation of the shaft on which the spool of the transformer is mounted.

The whole assembly will contain two shafts to hold the coil bundle and spool on which the spool will be mounted.tension will be maintained between two shafts in order to ensure uniform winding.

In developing a project, methodologies is one of the most important element to be consider to make sure that the development of the project is smooth and get the expected result. A good methodologist can be described the structure or the flow of the project where by it can be the guideline in managing it. It is also to avoid the project to alter course from the objectives that have been started or in order words the project follow the guideline based on the objectives.

- Hardware use
- Arduino Nano
- LCD
- DC Geared Motor
- Counter Sensor
- Servo Motor

III. MODELING AND ANALYSIS

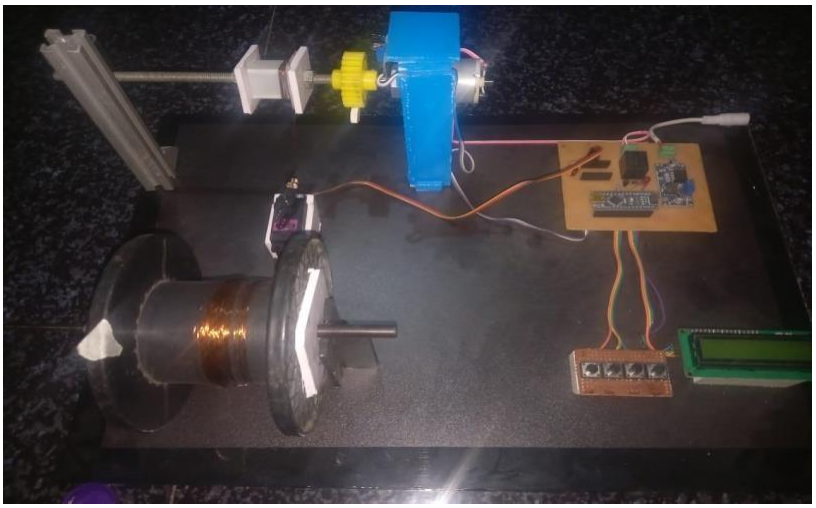

Figure 1: Automatic coil winding machine

IV. RESULTS AND DISCUSSION

The development and testing of the Arduino-based transformer coil winding machine yielded promising results. The machine was designed to automate the process of winding copper wire onto transformer cores, ensuring precision, uniformity, and efficiency. After successful assembly and programming, a series of tests were conducted to evaluate the machine's performance, accuracy, and usability.

The core components included an Arduino Uno microcontroller, a Servo motor for controlling the rotational movement of the spool, a lead screw mechanism for wire traverse, a display interface (LCD),

and input controls such as a rotary encoder or keypad. The code was programmed to take user inputs for the number of turns, direction of winding, and coil layer count. These parameters were crucial in adapting the machine for different transformer specifications.

During testing, the machine was able to wind coils with high accuracy. The programmed turn counter worked reliably, halting the motor automatically after reaching the desired number of turns. The precision of wire placement was enhanced by the synchronized movement of the wire guide, controlled by a secondary motor or stepper actuator. This ensured uniform spacing and minimized overlapping of windings. The real-time display of progress on the LCD screen improved user feedback and usability.

However, some limitations were observed. For very fine wires or complex multi-layer windings, minor adjustments were needed in the guide mechanism to prevent tangling or uneven layering. Moreover, the initial version lacked a tension control system, which affected the coil's compactness in a few test cases. Future improvements may include the integration of a tension feedback system, automated layer shifting, and memory functions to store multiple winding profiles.

V. CONCLUSION

the Arduino-based transformer coil winding machine demonstrated its capability as a low-cost, efficient, and customizable solution for small to medium-scale transformer production. It successfully automated the winding process with satisfactory accuracy and consistency. The system can be further enhanced with additional sensors, improved mechanical components, and refined software algorithms to support more complex winding requirements. This project not only serves as a valuable tool for electronics enthusiasts and small manufacturers but also lays the foundation for future innovations in automated coil winding technology.

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