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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.

Index Terms **- Coil winding, Arduino Uno, DC motor, Shaft, Pulley, Automation**

I. INTRODUCTION

In today's generation, the coil winding machine plays an important role in the industrial world. As it minimizes the efforts and time with manual efforts. One of the winding machine kinds now used in industries is this coil winding machine. Coil winders can be categorized based on their capacities and speeds. These machines range from multi-speeders to medium, large, and extra-large machines. Machines exist in many forms and categories and can be used for a variety of tasks. A coil winding machine is frequently used to wound coils for transformers, inductors, motors, and chokes.

Coil winding can be done by manual or by automatic. Manual coil winding machines require an operator to manually feed wire onto the coil and control the tension of the wire during winding. They are suitable for low-volume production or for winding coils that have complex shapes or sizes that are difficult to wind with automatic machines. But automatic coil winding machines are fully automated and can be programmed to wind coils of different sizes and shapes. They use computer-controlled systems to wind wire onto the coil, control the tension of the wire, and cut the wire when the winding is complete. Automatic coil winding machines offers more benefits compared to manual machines. Automatic coil winding machines are faster and more efficient than manual machines, and they are ideal for high-volume production. Automatic winding machines can wind coils with a high degree of precision, ensuring that each coil meets the required specifications and tolerances. Also, automation can lead to reduced costs, as it eliminates the need for manual labour and reduces waste and rework. Computers, hydraulics, pneumatics, robotics, etc. are examples of low-cost automation methods that can be used to automate processes. In large-scale production, automation is crucial.

There are many automated coil winding machines on the market to address the shortcomings of a manual winding machine. The machines that are currently available are large, intricate, and expensive. And hence, these automated machine drawbacks are overcome in this project. As a result, this project will involve the construction of a coil winding machine that is controlled by an Arduino programme and a DC motor. This device is small-scale in design, affordable, and simple to use.

II. LITERATURE REVIEW

A coil winding machine is frequently used to wind coils for transformers, inductors, motors, and chokes. Each previous work and research had the same goal: to develop a feasible small-scale coil winding machine for educational purposes. They used different elements, parts, and electronics for making a simple winding machine, as discussed in the paper.

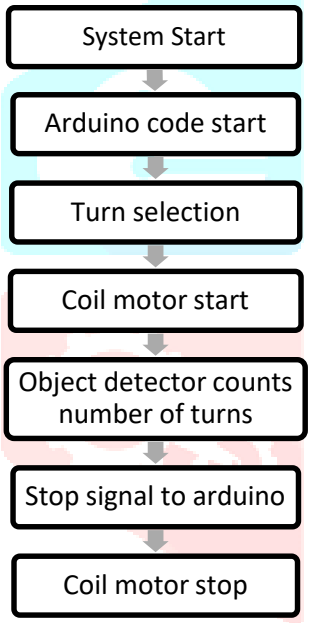
M. Alaguraja, M. Sakthivel, R. C. Udhayakumar, M. Varatharaj, K. Selvakannan used the PWM speed control method for the proper tension on the coil. The coordination of all parts of the machine is done by the Arduino ATmega2560. The system had to meet the demand for high-speed production with the fewest mechanism requirements. The system proved to work effectively, avoiding unnecessary wastage of materials required. The coil winding machine also provided high accuracy and precision in the proportion of transformer coil winding. R. Korbu, A. Gatare, D. Nirwane, A. Khot made a system which has the ability to overcome the time delays

in the coil-making system. L298N, a dual Hbridge motor driver that enables simultaneous speed and direction control of two DC motors, is used to control the DC motors. An Arduino Mega 2560 was used to control the whole system. This system focuses mainly on reducing the number of workers and providing less time for a microcontroller-based application. M. Dumre, S. Hirekhan, S. Pullawar, V. Kachhawah has used two stepper motors. One is used for rotational motion, and another is used for linear motion. These two stepping motors work synchronously, so that during one rotation of the shaft, the slider moves forward along the diameter of the coil. Arduino's program has been used to set the program. According to the program, this two-stepper motor rotates, and after one revolution of the shaft, the slider advances linearly. The program helped synchronize two shafts and a slider to obtain accurate rotation. Bluetooth model HC-05 is used for communication purposes between an Arduino and an Android phone. P. Vaskar, S. Zambare, S.Waje, R. Vhora has used Arduino programming for automation purposes. The rotation of threaded shafts on which bobbins and an armature are mounted is done by stepper motors. Three shafts are used to mount the armature and bobbin on the wire drum in the entire system. The bobbin keeps the tension in place. Through a bobbin from a wire drum, the wire is wound on the armature. The coil feed is monitored by an Arduino board.

III. METHODOLOGY

The coil winding machine uses a 775 DC motor to drive the winding mechanism, which consists of an 8mm shaft, a small pulley, and a gear remover. The gear remover is used to change the direction of the motor's rotation, allowing the machine to wind the coil in either direction. The speed of the motor is controlled using a motor speed controller, which adjusts the voltage supplied to the motor. This control allows the user to adjust the winding speed and ensure that the coil is wound accurately.

An IR sensor has been used to detect the end of the coil, enabling the machine to stop automatically. The IR sensor is mounted close to the coil former and detects the presence of the wire. When the wire runs out, the sensor sends a signal to the Arduino, which stops the motor and the winding process.



Flow Chart - 01

The user inputs the desired number of windings and the wire gauge of the coil into the machine using a tactile button and an LCD Yellow 2x16 display. The Arduino reads this information and uses it to control the winding process. The wire is fed through the 8mm pulley and secured using zip ties. The wire is then wound around the coil former, which is mounted on the 8mm shaft. The user manually starts the winding process by pressing the tactile button.

The Arduino controls the winding process, counting the number of windings and ensuring that the wire is wound accurately and consistently. The LM7805CV regulator is used to provide a stable 5v supply to the Arduino. Once the desired number of windings is reached, the Arduino stops the winding process and signals the user with the LCD display. The user can then remove the coil from the machine and use it as needed.

IV. RESULTS AND DISCUSSION

This machine is observed to be capable of winding 100 turns in 45 seconds with an accuracy of +/- 1 turn. It can wind coils with a diameter range of 1mm to 5mm. The machine can also be programmed to wind coils with different wire gauges and insulation materials. In an automatic coil winding project, the winding machine can be programmed to wind coils in various shapes and sizes. As for now, this machine can wind coils in regular shapes, in cylindrical and circular shapes. With its high speed, precision, and flexibility, the automatic coil winding machine can produce high-quality coils in large quantities, meeting the demands of various industries such as automotive, electronics, and aerospace.

Actual Model-

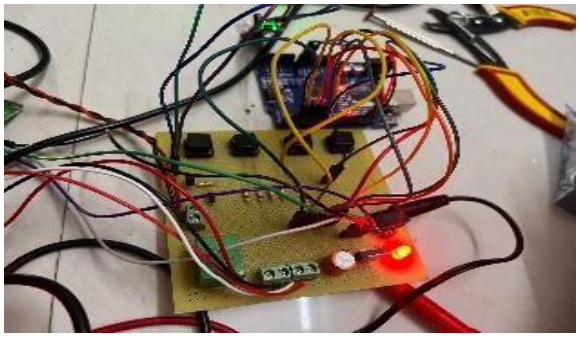


Fig. 1

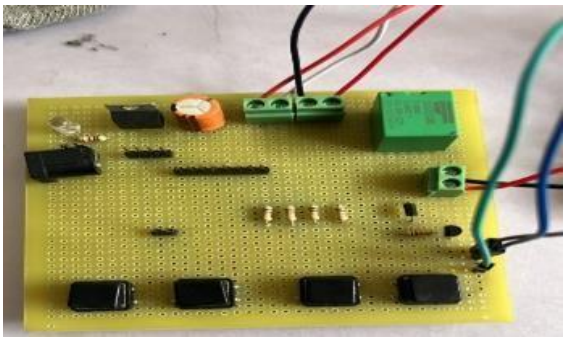


Fig. 2

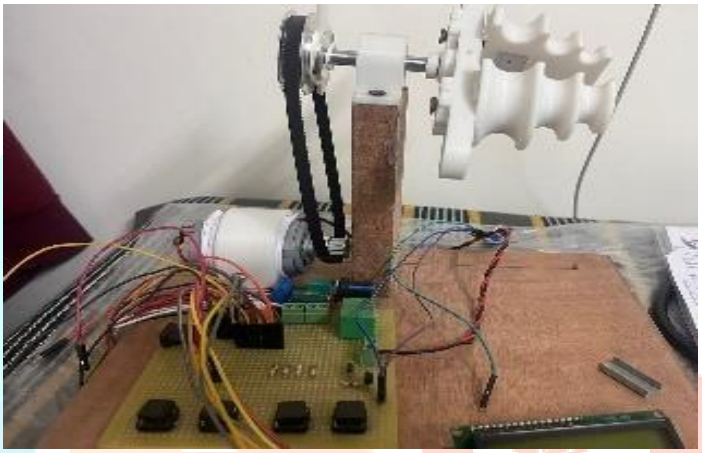


Fig. 3 - Assembled Model

V. ADVANTAGES

This machine can wind coils much faster than a human operator, which means it can produce a larger volume of coils in less time. This machine can wind coils with greater precision than a human operator, ensuring that the coils are wound to the correct size and shape, i.e., it gives more accuracy. It works with less cost efficiency as it requires less maintenance. It is easily manageable with less human efforts and with a productive time period. Easy to assemble and disassemble. Good result can be obtained with less period of time.

VI. CONCLUSION

It took a lot of time to wound coils manually in the past. It was unable to create uniform spacing between two consecutive windings due to the extremely low winding precision. The automatic winding equipment now in use in the sector is complicated, expensive, and large. The main goal of the project was to get around these problems by creating a portable, inexpensive automatic coil winding machine. In future, the production of coils can be done much faster and with advancements in technology, automatic coil winding machines are likely to become even more efficient. With some modifications, this project might be made into a product. It would be less expensive to produce if done on a large scale.

VII. ACKNOWLEDGMENT

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