

A Paper on Pedal Operated Winding Machine

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Abstract. The paper presents the detailed study & analysis of the method for the development of Pedal operated transformer winding machines. The main objective of this project is to develop a pedal operated winding machine winding which can be used for various winding operations that will greatly reduce cost behind the automatically operated machines,. This method can also be used to reduce the manufacturing cost. Firstly, the manual methods of winding were in practice and this method proved to be very good for winding . Hence, it was necessary to make some revolutionary changes in the field of winding. The components produced by this method have good strength to weight ratio and is also cost effective. The paper includes brief study of literature related to the transformer, stepper & induction motor starter winding machine And how to combine both. Further it deals with methodology for the design which is required for implementation. The components produced by this method have good strength to weight ratio and is also cost effective

Keywords — transformer winding, winding mechanism, stepper & induction motor starter.

I.INTRODUCTION

The paper deals with the pedal operated winding machine which replace the manual work at better productivity .There are a few distinct sorts of twisting machine from basic manual encourage machine to complex PC numeric control (CNC) machines. A portion of the more typical uses for winding machines are curl winding, rope winding, and persistent fiber winding A coil winding machine is one of the sorts of winding machine that accessible in enterprises today. The coil winding machine can be ordered by their speed levels and limit. The basic use of curl winding machine is to twist coil for a transformer pointer engines and stifles.

Numerous ventures utilize these gadgets, including material, hardware, and wire enterprises. A manual winding machine for the most part has a centre on an axle and the client encourages wire, rope, or other material onto the centre. The client controls the axle speed and feeds the material through client hand, managing it to control the pressure and load design. These basic machines might be of a bench top size or vast remaining solitary winder. Coil winding machine configuration is managed by a coil's many-sided quality, material pressure impediments, machine versatility, and robotization/administrator mediation, generation volume and budgetary contemplations. In any case, our machine is utilized for the transformer and starter of engine winding.

II.SCOPE OF PROJECT

Project scope is the piece of undertaking arranging that includes deciding and archiving a rundown of particular

project objectives, expectations, assignments, expenses and due dates. In this project, the extent of the project is including an outline and creation a little scale curl twisting machine at a lower cost.

In this project, the coil winding machine size will be just in work area measure. All the programming and coding project will utilize program to control two stepper engine movement. A portion of the coils winding machine parts are accessible at the workforce research facility, for example, stepper engine, aluminium plate, and lead screw.

Certain segment, for example, round bobbin, direct pulley and engine coupling is created utilizing quick prototyping machine.

III.EXISTING METHOD

We would like to classify them as manual & semi-automatic. The subtle elements are introduced here alongside relative graph.

- **Complete Manual Method:** In this kind of transformer winding assembling strategy the entire windings are finished by the gifted laborer In this method the shaft on which bobbin is mounted is pivoted physically with paddle gathering as appeared in fig.1 Rotating paddle and after that giving level movement by another hand makes the procedure boisterous
- **Semi Automatic Transformer Winding Machine:** The impelled version of the transformer winding machine is

made as the paddling physically was dull work. So new machine was produced around 1965 in France and this machine was broadly acknowledged everywhere throughout the world and with a few changes is utilized today too. In spite of the fact that this machine was acknowledged overall still it needs the talented specialist to work it as it is simply kill the obstacle of paddling.

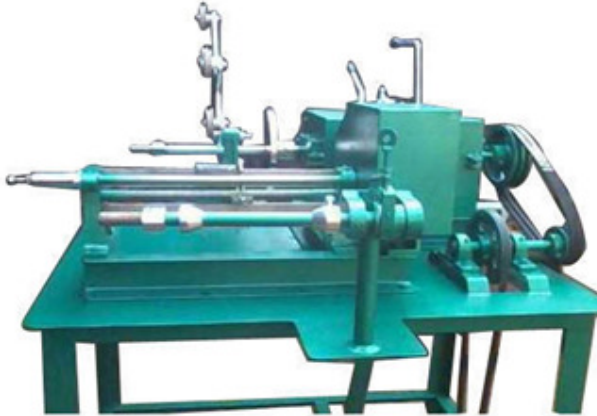


Fig.2 Semi-Automatic Transformer winding machine.

- As shown in fig.2 the winding process is still depends on the skilled labour as he has to take care of 4 different things simultaneously such as controlling speed of induction motor. Also he has to take care of number of turns completed and how many turns are remained. Also he has to take care of number of turns per layer should not exceeded the predefined value for that particular guage of wire and as this varies as per guage of wire ultimately this makes the whole process tedious.



Fig.3 Advanced Semi-Automatic Coil winding machine

- **Advanced Semi-automatic Transformer winding machine :**

This is additionally created procedure for self-loader transformer completing machine as its gives level forward and in reverse development thus. In any case, the principle disadvantage of this machine is that it must be utilized for assembling LV transformers and there additionally for particular scope of bobbin size.

IV. Method of Winding Coil

The coordination of rotational and translational movements is requiring while exchanging wire to bobbin. There are numerous strategies to winds a coil these days. Past investigation appears there are two of the most widely recognized strategies for winding coil are pedal worked winding and fly winding.

In the pedal worked winding procedure, the coil is twisted by pivoting its centre or bobbin. In the fly winding procedure, the bobbin is settled and the wire is wrapped around it. pedal worked winding are most effortless contrast with fly winding procedure since it can control the wire position consistently and smooth contrast with fly winding.

Fly winding are have a tendency to get contorted due to conflicting curving and wrong wire removal. The centripetal power in axle winding machine wire pressure is required to rotate the wire in round way. It prompts a looser coil and decreases the loop fixing powers. On the off chance that there is less diminishment, shaft winding are attractive as a result of the capacity to control the wire position.

V. Importance of Tension in Coil Winding Machine

Tension is the force required to pull the wire against the accumulation of all resistance, forces and loads imposed on the wire as it moves, including the tension device [5]. Consistent tension is important to achieving the aim of coil electrical characteristics also stable performance from coil to coil. Pretension is when the force applies to the wire path before and after tension device. Pretension is caused by the friction of the wire moving over pulleys, supply spool flange and many more. There are two types of tension state which is static and dynamic state. In dynamic state, the tension started when the wire meets the bobbin or the previous winding of the coil. Tightness and compactness of the coil are controlled by the tension.

Consistent tension is required during coil winding. Among the winding tension factors including bobbin size, bobbin shape, number of turn, winding speeds, acceleration and deceleration rates. No matter how sophisticated the motor controls has, the material easily to get wander during winding and causing irregular spaced turns when insufficient tension occur. The diameter of the wire will reduce hence reducing the strength of the wire and make the wire tends to breakage if

there is too much tension. Other than that, excessive tension can cause to change the wire characteristics and damage the bobbin's surface during winding process. Major characteristic of coil is resistance. Coil that randomly winds in the same number of turn will produce different wire lengths. . If a coil is wound with good tension it is compact and it has less wire on it then a coil wound with incorrect low tension that results in a coil with longer total length of wire [5].The longer the coil wire has, the higher the resistance of the coil.

VI. CONSTRUCTION

Primary component of task are driving system, winding instrument and mention below

- **Coil Winders**

Coil winders are generally used for smaller jobs. They can be hand worked or have a winding drive that is controlled by a foot pedal. These loop winding machines are utilized as a part of the creation of solenoid curls, multi-segment loops, and other such complex curls. In spite of the fact that they are little, they can reach up to rates of 9000 RPM

- **Winding Mechanism:**

Winding mechanism we formally introduce for proper wound and at suitable clearance .also to maintain accuracy.

- **Power Mechanism :**

The main source of power is pedal .the operator produces power by pedal and transfer through chain.

- **Meter :**

To getting no of turns we employed meter .which input is shaft rotation.

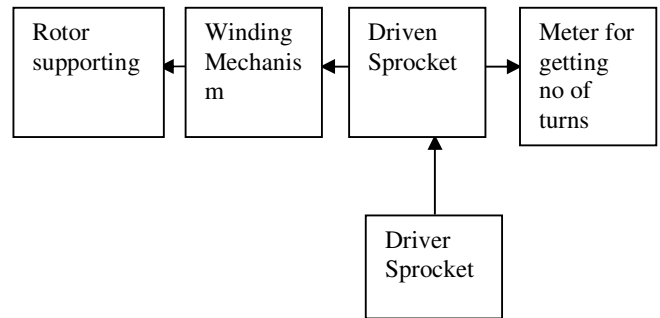


Fig.4 The machine working on meter



Fig.5 Constructed pedal operated winding machine

VII. BLOCK DIAGRAM



VIII. WORKING

- When operator move the pedal power through the chain is transmitted to the shaft, sprocket mounted on the shaft rotate the bearing wheel, which contact with ring.



Fig.6 Pedal operated winding machine.

- Due to the friction between the ring and the bearing wheel start rotating.



Fig.7 Coil winding.

- This ring is rotated around the object to wound due to this equal tension is obtain in all side.
- The speed of ring is depend on the operator
- Winders have a centre roll on which the material is wound up often there are metal bars that travel through the centre of the roll, and are shaped according to their intended purpose.
- The operation of coil winding machine is performed by pedal.
- Meter counting the number of turns of shaft and displays on the board
- Bench adjustment is provided for other type of wound.



Fig.8 Coil Winding

- Tension of the coil is maintained with the help of spring.

IX. SCOPE AND OBJECTIVES

As we are proposing method of pedal operated winding, so the primary goals and objectives are as follows.

1. To reduce the cost of product.
2. To prepare machine that will assure the efficient winding.
3. To avoid delays in delivery by following up with the existing manufacturing method i.e. manual winding method.
4. To complete short work and reduction in cost.

X. CONCLUSION

This paper present the detailed study of manual operated winding machine will be able to eliminate the drawback of high cost , high maintenance. The main objective of this machine is to minimize the cost of conventional winding machine and replace the manual labour and optimize the process. The inference is that, this automated system has increased the production and also provided solution for lack of human labour for such hectic jobs is compensated. A better user interface has been provided with a number of turns meter. This project automatic coil winding machine, can operate several accurate than manual process.

However this machine usually has material tension limitations, operator intervention and low productivity and as motors are the basic need for the stator winding becomes the growing and essential process in automation solution.

Implement the idea of automation in coil winding machine at minimum manufacturing cost also in increases productivity of automated machine.

This work will provide low operational cost, low power consumption, accuracy and flexibility to the system.

REFERENCES

1. Automatic Coil Winding Machine by *Sundar Ganesh CCS**, *Minu S**, *Niveta R**, *Nivethitha AC**, *Padmini R**, *Gokul Krishna K**, *Joe Breslin J**
2. Design of Automatic Transformer Winding Machine by Nishad S.Joshi, Chetan B. Bulbule, Sagar D.Domale, Prof. Jayashree Deka.
3. Automation in Manufacturing of Winding by Ms. Priya Ikhankar1 Ms. Rakhi Golhar Ms. Ankita Kamdi Ms. Trupti Banarase Mr. Sanjeet S. Kashyap
4. boosting Power Density of Electric Machines by Combining Two Different Winding Types by RolandKasper*NormanBorchardt
5. boosting Power Density of Electric Machines by Combining Two Different Winding Types by RolandKasper*NormanBorchardt
6. Analysis of filament winding processes and potential equipment technologies by N. Minscha,* , F.H. Herrmanna , T. Gerekeb, A. Nockeb, C. Cherifb
7. Analysis of tension analysis ofwinding processes and N. Minscha,* , F.H. Herrmanna , T. Gerekeb, A. Nockeb,C.Cherifb
8. V.V.Athani,“StepperMotorsFundamentals,Application and Design”, ch. 4, pp. 31-65, NewAge International (P) Limited, New Delhi,2000
9. V.V.Athani, and J.C. Mundha, “High Performance Controller for High Torque PM Stepping Motor”, IEEETrans. on Industrial Electronic. Vol. IECI-25, No. 4,pp.343-346, 1978
10. Reston Condit, Dr. Douglas W. Jones, SteppingMotors Fundamentals” (AN907), pp. 10-14, Microchip, 2004
11. [4] M.H. Rasid, “Power Electronics, Circuits, Devices and Applications”, ch. 9, pp. 406-430, Prentice-Hall, India,2007
12. http://www.ijetae.com/files/Volume3Issue9/IJETAE_0913_88.