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AUTOMATED SPRING COILING MACHINE

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ABSTRACT: This paper shows that the, The Machine is basically used to manufacture all different sizes of springs. If this work had to be done manually on lathe machine, it requires a skilled operator and consumes ample amount of time. The labor efforts required are also more. This machine is portable and easy to use for any operator or less skilled operator. It also simplifies the work to manufacture variable springs with variable pitch and sizes which fulfills the requirement of many machines. A spring is defined as an elastic body, whose function is to distort when loaded and to recover its original shape when the load is removed. Springs are usually made out of spring steels. Small springs can be wound from pre-hardened stock, while larger one are made from annealed steel and hardened after fabrication. Depending on design and required operating environment, any material can be used to construct a spring, so long as the material has the required combination of rigidity and elasticity technically, a wooden bow is a form of spring.

KEYWORDS: PLC, Metal wire, Sensors, Dc motor, Pitch Motor

INTRODUCTION

A spring is an elastic object used to store mechanical energy. A spring is defined as an elastic body, whose function is to distort when loaded and to recover its original shape when the load is removed. Springs are usually made out of spring steels. Small springs can be wound from pre-hardened stock, while larger one are made from annealed steel and hardened after fabrication. Some non-ferrous metals are also used including phosphor bronze and titanium for parts requiring corrosion resistance and beryllium cooper for springs carrying electric current (because of its low electrical resistance). When a spring is compressed or stretched, the force it exerts is proportional to its change in length.

The rate or spring constant of a spring is the change in force it exerts, divided by the change in deflection of the spring. That is, it is the gradient of the force vs. deflection curve. An extension or compression spring has units of force divided by distance, for example N/m. Torsion spring, have units of torque divided by angle such as N-m/rad. The inverse of spring rate is compliance that is if a spring has a rate of 10 N/mm; it has a compliance of 0.1 mm/N. The stiffness or rate of springs in parallel is additive, as in the compliance of springs in series. Depending on design and required operating environment, any material can be used to construct a spring, so long as the material has the required combination of rigidity and elasticity technically, a wooden bow is a form of spring As the springs are very important in absorbing the shocks and storage of the energy for quick return motion like the motion of brakes and clutches, measuring loads. their demand in day to day also increases.

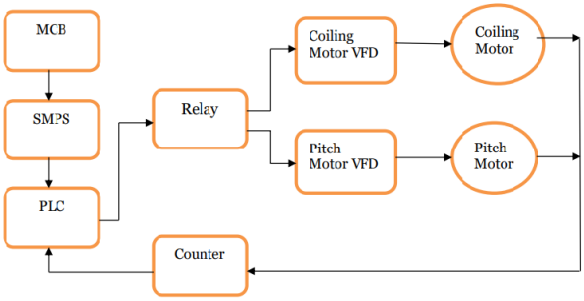
The major traditional spring making on a lathe machine is of a bigger process and more time consuming. Production of spring on automatic multi-dimensional spring rolling machines reduces the production time and increases the number of springs. In the present day, every material not only works with the manual but also automatically. Here we find simple and useful working equipment named as Automatic multi-dimensional spring rolling machine, it helps to make springs automatically. The motor helps to rotate the shaft and while rotating the shaft a wire can be inserted on top edge position of the shaft with the help of fixed support and it rotates with the shaft and spring can be formed. It provides flexibility when we observe any sudden shocks and due to external pressure on spring leads to some failure. So here we analyze the materials which can bear more loads, tests can be done and we provide basic information regarding that usage. At the end of the day-spring works under the strain energy.

SYSTEM DEVELOPMENT NEED

The project was basically done for the company named Winner Electronics situated in Satpur industrial estate, Nasik. The company is engaged in developing machine and operating panels. The Machine is basically used to manufacture all different sizes of springs. If this work had to be done manually on lathe machine, it requires a skilled operator and consumes ample amount of time. The labour efforts required are also more. This machine is portable and easy to use for any operator or less skilled operator. It also simplifies the work to manufacture variable springs with variable pitch and sizes which fulfils the requirement of many machines. Thus, the key reasons for the undertaking of project can be summarized as follows:

- To increase the Production Rate
- To use mechatronics arrangements.
- Reduce time.
- To reduce floor area.

I. Block Diagram & Concept Description



Block diagram of Automated Spring Coiling Machine

230v power provides to a Switched Mode Power Supply (SMPS) it convert the given input power into a desired (24v) and provide to PLC (Programmable Logic Circuit) through a MCB . MCB gives proper isolation and prevents overloading condition of PLC.PLC stands for Programmable Logic Controllers. They are basically used to control automated systems in industries. They are one of the most advanced and simplest forms of control systems which are now replacing hard-wired logic relays at a large scale. The PLC ladder logic program is built and feed in the storage of the Central Processing Unit. To give programming instruction to the controller, you feed these commands one by one in the CPU memory from the programming component. Every input and output component will be assigned a special location address which will allow plc to know about where it is physically connected. Coiling motor is used to coil the metal wire is going to move forward and backward in circular motion according to the metal wire needs. The springs comes out from the machine. Pitch motor is used to provide the space between the two wounding of the spring. That's how the project is going to work automatically without using manual power.

II. Selection Criteria:

A) Proximity Sensor

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation , infrared, for instance, and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor targets demand different sensors. For example, a capacitive photoelectric sensor might be suitable for a plastic target; an inductive proximity sensor always requires a metal target. Sensor used in the machine is to obtain intermediate motion.

Sr. No.	Parameters	Properties
01	Make	Electronic Switches (I) Pvt. Ltd.
02	Model	IP 18205 AF
03	Output State	N.C.
04	Housing Diameter	18 mm
05	Range ferrous	8 mm
06	Output	Solid State

B) Motor

The Motor is attached to the wheel which drives the wheel. The selected motor should provide High Torque and low speed. The available motor is Worm Gear Motor which has output speed calculated as:

$$G = \left(\frac{n_1}{n_2}\right)$$

$$35 = \left(\frac{1440}{n_2}\right)$$

$$n_2 = 41\ rpm$$

The required speed of 20 rpm is met by using the A.C Drive Control Panel to obtain variable speed as per application.

Sr. No.	Parameter	Properties
01	Make	Bonfiglioli Riduttori
02	Model No.	BN71A4
03	Electric Supply	3Ø
04	Power	0.25 Kw
05	Frequency	50 Hz
06	Gear Ratio	35
07	Speed (rpm)	1440

C) **Selection of Coupling**

A coupling is a device used to connect two shafts together at their ends for the purpose of transmitting power. Flexible couplings are used to transmit torque from one shaft to another when the two shafts are slightly misaligned. It can accommodate varying degrees of misalignment up to 3˚ and some parallel misalignment. Coupling used for our operation is 'L070 flexible jaw coupling'. It is a special purpose coupling of flexible coupling.
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III. COMPONENTS USED

A) PLC Assembly

a. Relay Card

b. SMPS

c. Chock For SEVFD

d. Main Switch

e. MCB for VFD

f. PanelEnclosure

B) Electrical Part

a. Coiling motor VFD

b. Pitch (Trolley) motor VFD

C) Mechanical Part

a. Coiling motor with gear box

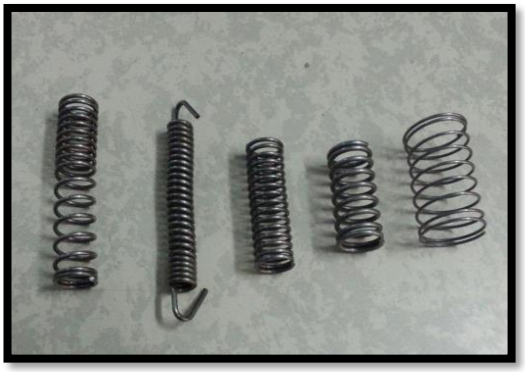
b. Trolly motor with gear box

c. Mechanical frame

IV. Application

i. Variable Pitch and Variable size can be obtained.

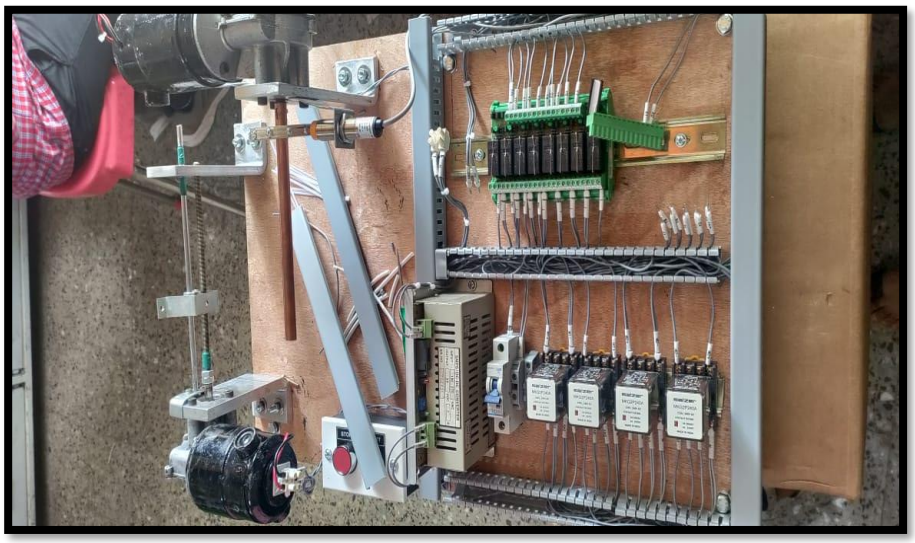
ii. Spring of any wire cross section can be manufactured.



CONCLUSION AND FUTURE WORK

The single-stage supply is given to the sewing motor, it will run The pulley is coupled to the goad outfit pulley with the assistance of the belt. The goad outfit plan is to keep running as per the speed of the engine. Before switch on the acceptance engine, the spring wire is bolted to the secure nut in the spring moving shaft. The spring wire is supply by a spring wire tare. The tare is settled to the casing stand by two ends heading, with the goal that it will run openly as per the speed of the spring moving shaft. The spring moving shaft is turned when the single-stage enlistment engine exchanged ON. The spring wire is coming in the moving shaft because of the turn of the spring moving shaft. The length of the moving spring is chosen by the administrator. The required length of the spring is rolled; the single-stage acceptance engine is turned OFF. By Designing and manufacturing of variable pitch spring coiler machine we have studied about different components of machines and proper designing method. We also had Reverse engineering in the process of discovering the principles of a component and system through design of its structure.

Final View



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2. "Design data book" PSG, Kalaikathir Achchagam, 1978 Edition.
3. "Machine Design", R.S. Khurmi& J.K. Gupta, S Chand& Company Ltd., Fourteen Edition

CATALOGUES

1.Bonfiglioli Riduttori Motor – Standard Catalogues.
2. Electronic Switches (I) – Standard Catalogues.
3. Sunfar Electronic Technologies