

Control System Upgradation with Encoder in Vibbreurs Application Machine

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ABSTRACT: Vibbreurs [VIB] application machine is a riveting machine which is used in watch manufacturing. Pinions and wheels are assembled by this machine. This process is based on advanced PLC controller model SIEMENS-S7 1200. Pinions are made by WAHL92+20 machine in Auto turning division. Wheels are made by press machine in press shop module. Wheels and Pinions are assembled in Gears sub assembly. PLC controllers are mainly used to control the arms, vibrator bowl feeder, riveting rod and anvil which contains in this machine. By using basic encoder, for setting the accurate arm position and to change the arm position based on user requirement. HMI is used to display the arm positions in degree.

KEYWORDS: PLC, Encoder, Inductive proximity sensor, Laser sensor, Reed switch, Power circuit, Control circuit, DC motor, HMI device.

I. INTRODUCTION

A Watch, Mandatory for every human to enjoy the luxurious and auspicious life. To build a watch, it comes across several stages and operations to view the final product. The certain operation on building a watch are Press Shop, Ebauche, Auto Turning, Gear hobbing, Burnishing, Gear Assembly. The watch has two sides in the main plate, the Bridge side, and Dial side. This machine is used to assemble the parts of the date and day indicator. Star, Wheel, and Lever are the three components needed to correct the date and day corrector. The day indicator is placed below the date plate. There are two series of day indicator i.e. 7022 and 7122. The difference lies in the diameter of the disc. The setting lever is placed directly on the main plate and it is used while the watch is being set. It also houses the setting lever jumper for day and date jumping.

II. BACKGROUND

Earlier telemechanic PLC controllers are huge programsize, spare parts are rare, inbuilt programming that we could not change as per the requirements and the absolutemodel which is difficult to learn. In contrast, the microcontroller systems that have is called an open architecture, the most PLCs manufacturers offer only closed architectures for their products. PLC devices are proprietary, which means that parts and software from one manufacturer cannot be used easily in combination with parts of another manufacturer, which limits the design and cost options.

III. PROPOSED SYSTEM

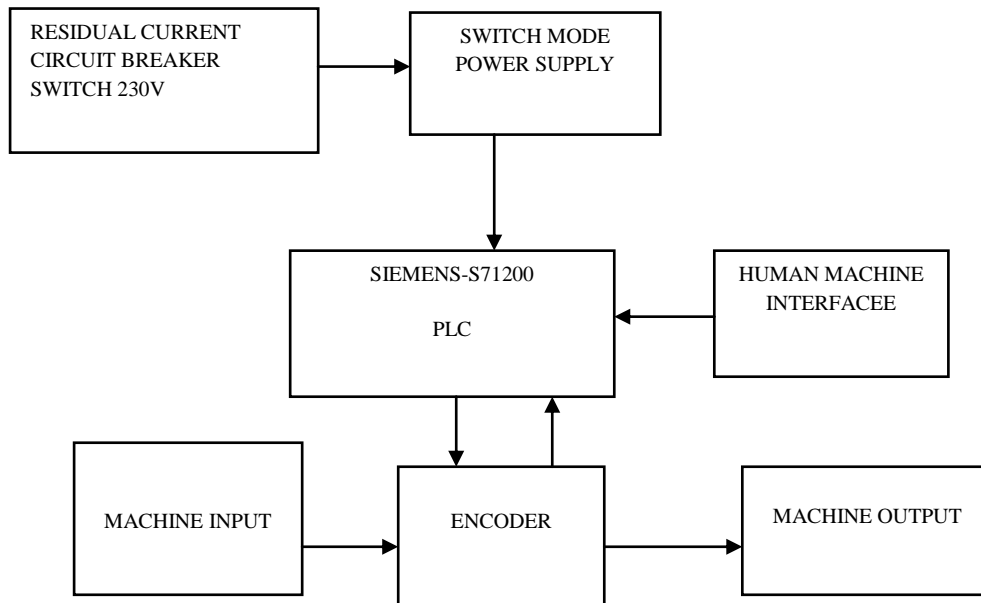


Fig.1. Block diagram

Power supply 230V and it is converted into 24V & 5A through SMPS. RCCB is a wiring device that breaks a circuit when the electric current is out of flow. These are designed to prevent current leakage and it protects the circuit from over current or short circuit conditions. SMPS supplies power supply to all the inputs and outputs. Machine inputs are Arms and Motors positions are based on Encoder. If Encoder rotates, motor also rotates and its position is displayed in HMI machine. The outputs are displayed in HMI machine. We can also find errors in machine through this HMI machine.

IV. SYSTEM DESIGN

Fig 2 follows circuit diagram for inputs Arm motors, in which R stands for Phase and N stands for Neutral. Power supply 230V is converted into 24V & 5A with the help of SMPS. RCCB is a wiring device that breaks a circuit when the electric current is out of flow. These are designed to prevent current leakage and it protects the circuit from over current or short circuit conditions. Then the current equally flows through Motors. For Arm 1 motor and Arm 2 motor MPCB switch is placed in which it protects motor from short circuit, overload, and disconnect functions. For Arm 3 motor VFD is placed in which it is adjustable and it is used to control motor speed.

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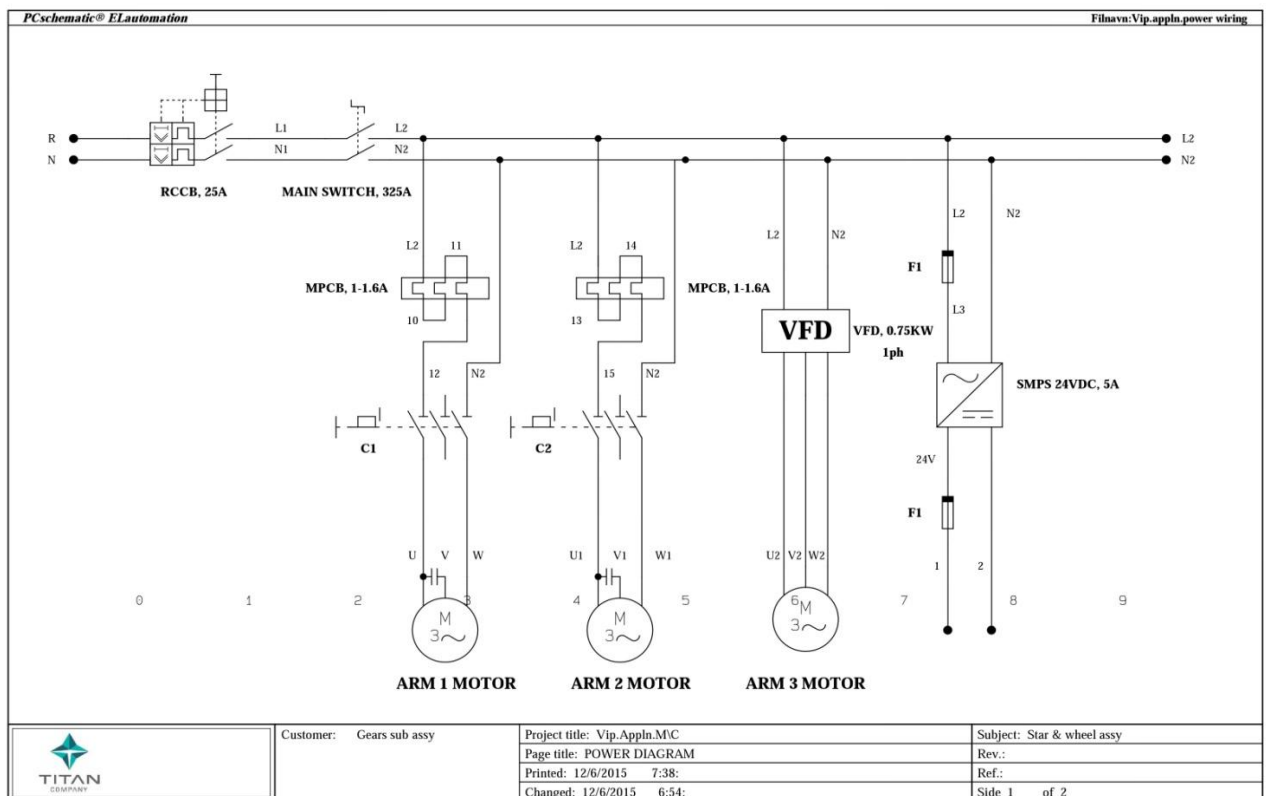


Fig. 2. Circuit Diagram

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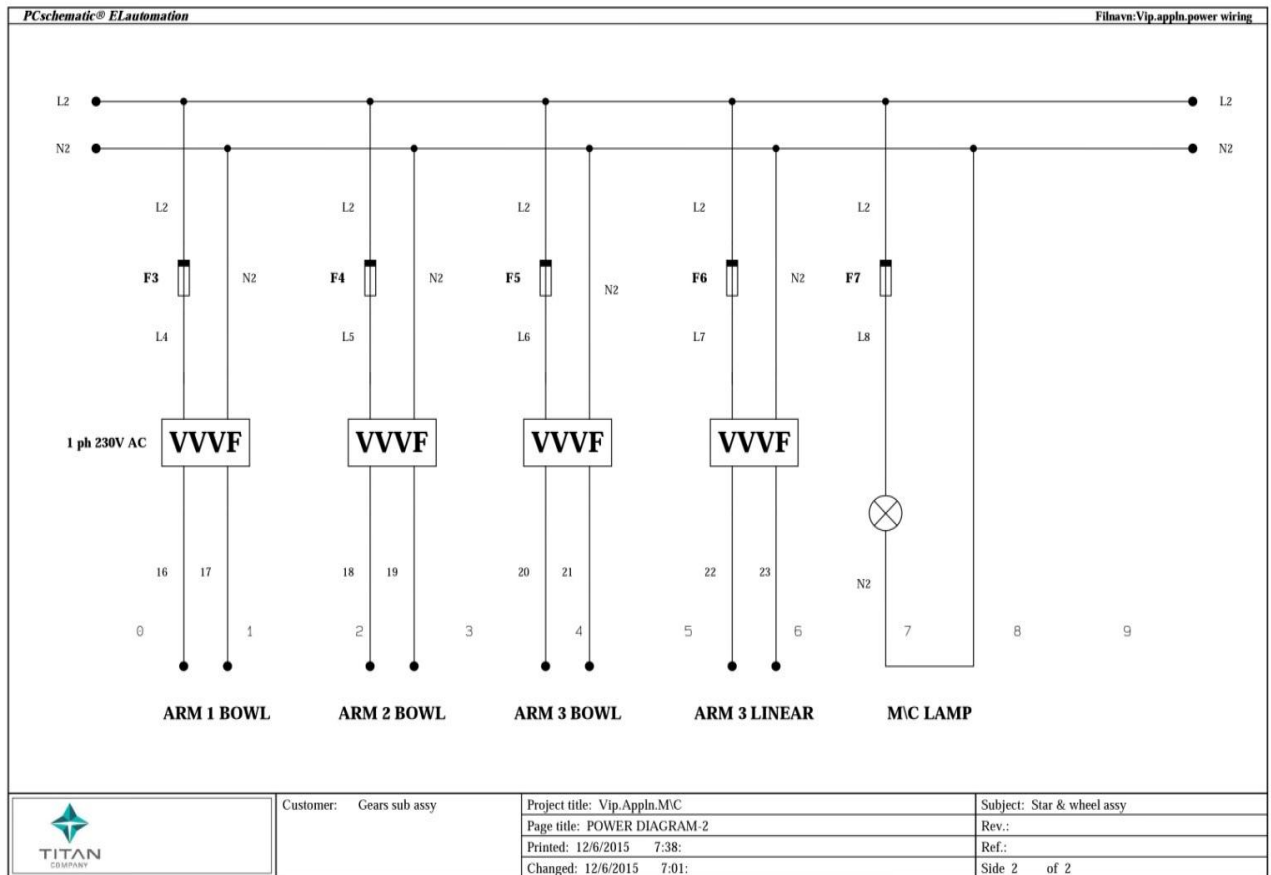


Fig. 3. Circuit Diagram

Fig 3 follows circuit diagram for input Arm bowls, in which components are placed in the bowls. Power supply is equally divided into Arm 1 bowl, Arm 2 bowl and Arm 3 bowl. The VVVF is placed over the Arm bowls in which it is used to varying the required frequency and voltage. The M\C lamp is used to cast light on the space surrounding the machines. Connections are made and it is programmed in PLC to get output.

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B.Flow Chart

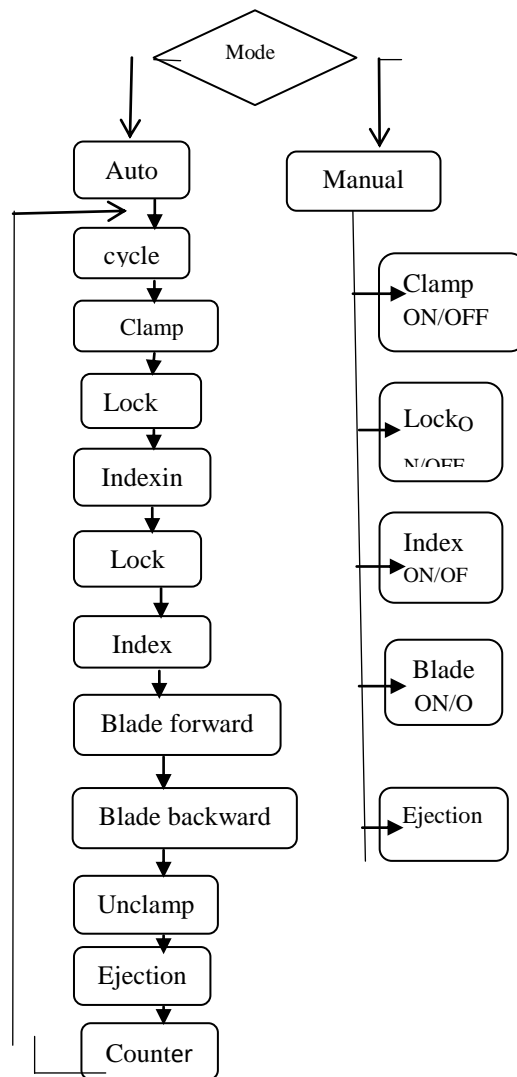


Fig. 4. System Flow

AUTOMATIC MODE

- STEP1: Start the program
- STEP2: Select the mode
- STEP3: Press foot switch or pedal
- STEP4: Clamp a coil core
- STEP5: Release the lock
- STEP6: Tapping the coil core

STEP7: Lock the indexing pulley
STEP8: Return to home position
STEP9: Blade move to forward direction
STEP10: And again, its move to the backward direction
STEP11: Unclamp a coil core
STEP12: Then eject a coil core
STEP13: Count a tapped coil core
STEP14: End a program

MANUAL MODE

STEP1: Start the program
STEP2: select the mode
STEP3: ON/OFF the clamp push button
STEP4: ON/OFF the lock push button
STEP5: ON/OFF the index push button
STEP6: ON/OFF the blade push button
STEP7: ON/OFF the unlock push button
STEP8: ON/OFF the unclamp push button
STEP9: Then eject a coil core
STEP10: Count a tapped coil core

IV. EXPEREMENTAL RESULT

Once a program has been written, it needs to be tested and debugged. One way this can be done is to simulate the field inputs with an input simulator, such as the one made for the S7-1200 PLC. The program is first downloaded from the programming device to the CPU. The selector switch is placed in the RUN position. The simulator switches are operated and the resulting indication is observed on the output status indicator lamps.



Fig. 5. Top View of Vibbreurs application Machine

VIB APPLICATION MACHINE APPLICATIONS:

- ❖ Gears sub assembly
- ❖ Watch making and related areas.
- ❖ Micromechanics Appliances
- ❖ Automation systems
- ❖ Riveting process ...etc

V. CONCLUSION

In this project, we done the conversion of PLCs and encoder. By this conversion easy to maintain the accuracy of the arm position and HMI helps to display the accurate position in degree. Encoder by replacing the cam shaft for to set the accurate arm position and to change the arm position based on user requirement. Drawbacks of the existing system is reduced.

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