Programmable Automation Control System for Direction Control of DC Motor and Single Phase Induction Motor with Braking

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Abstract- This paper discuss about the basic conceptual need of inventions in automation and its industrial applications. Automation is increasing rapidly and proving its role beneficially by replacing complicated hard-wired control and relay logics. Now a day, automation is implemented in every electromechanical firm throughout the world. Here we are demonstrating one of the applications of automation system by controlling the direction of DC motor and single phase induction motor with braking.

Abbreviations - PAC (Programmable Automation Controllers), D.C. (Direct Current) motor, Single Phase Induction Motor, FBD (Functional Block Diagram), LD (Ladder Diagram).

I. INTRODUCTION

In today's fast-moving, highly competitive industrial world, a company must be flexible, cost effective and efficient if it wishes to survive. This is achieved with a technology dealing with the application of mechatronics and computers for production of goods and services. In the process and manufacturing industries, this has resulted in a great demand for industrial control systems/ automation in order to streamline operations in terms of speed, reliability and product output. Automation plays an increasingly important role in the world economy and in daily experience. Automation is the use of control systems and information technologies to reduce the need for human work and eliminated the human errors.

The term automation, inspired by the earlier word automatic, was not widely used before 1947, when General Motors established the automation department. It was during this time that industry was rapidly adopting feedback controllers, which were introduced in the 1930s. The biggest benefit of automation is that it is labor saving; however, it is also used to improve quality, save energy and materials and improve quality, accuracy and precision.

II. CIRCUIT ELEMENTS

The following parts are included in our application:-

- Contactors - Contactors are advanced form of switches which are easy to use and logically operated with the help of plc. It consists of two parts- stationary and movable. Whole circuit is connected to the stationary part and provided with a coil having a moving part. When the coil is energized the movable contacts are closed against the

stationary contacts, and the circuit gets completed.

- Single Phase Induction Motor - We are using a single phase induction motor of rating 750 W, 220/230 V, 7.6 A, 1.0 HP.

DC Motor- The D.C. motor is of rating 748 W, 220/230 V, 1.0 H.P.

The Photograph of proposed system is demonstrated in fig2.

Fig2. Photograph of proposed circuit

VIII. HARDWARE CIRCUITRY

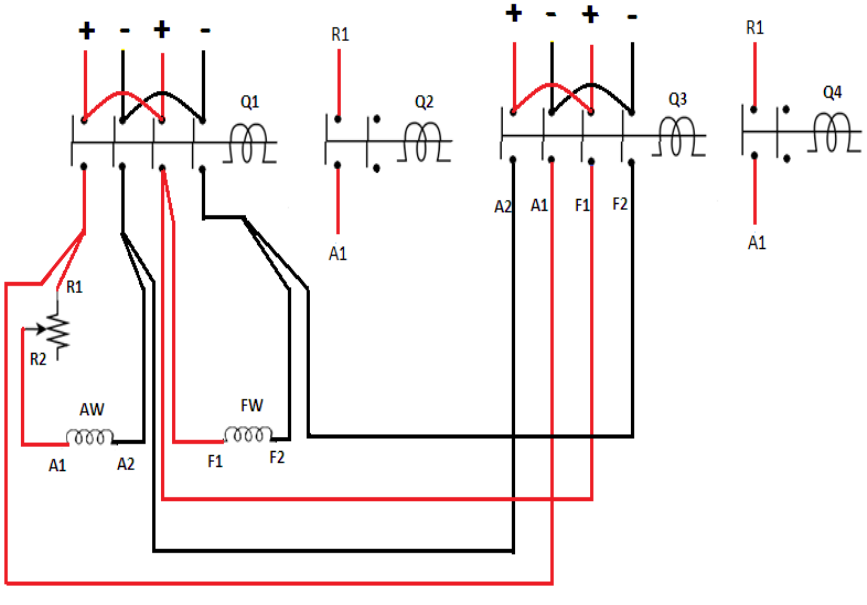


Fig.3(a). Direction control circuit for DC motor

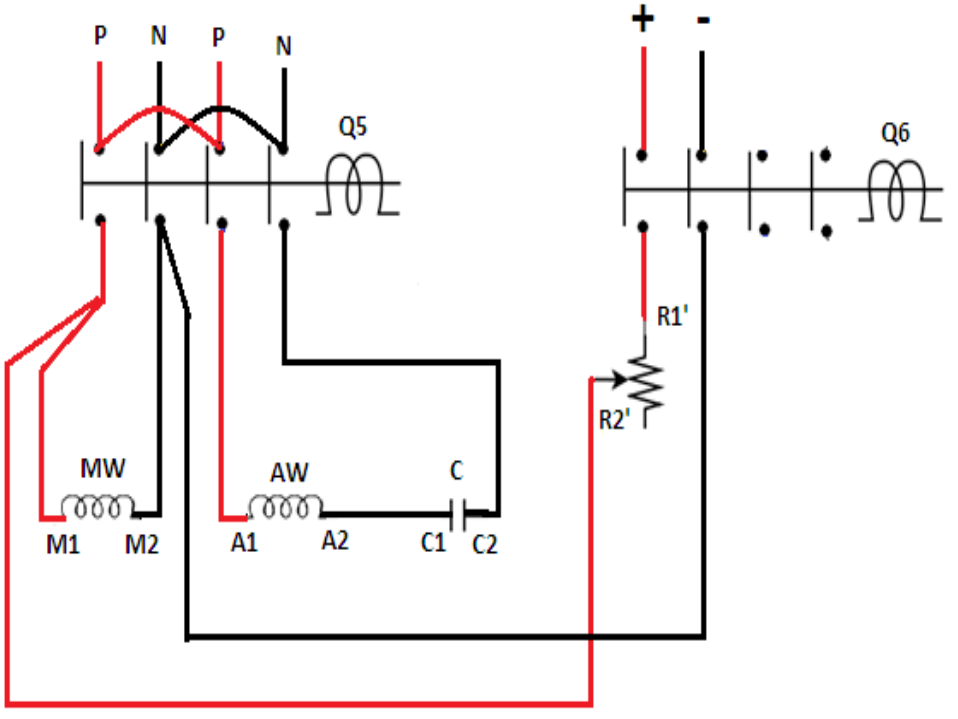
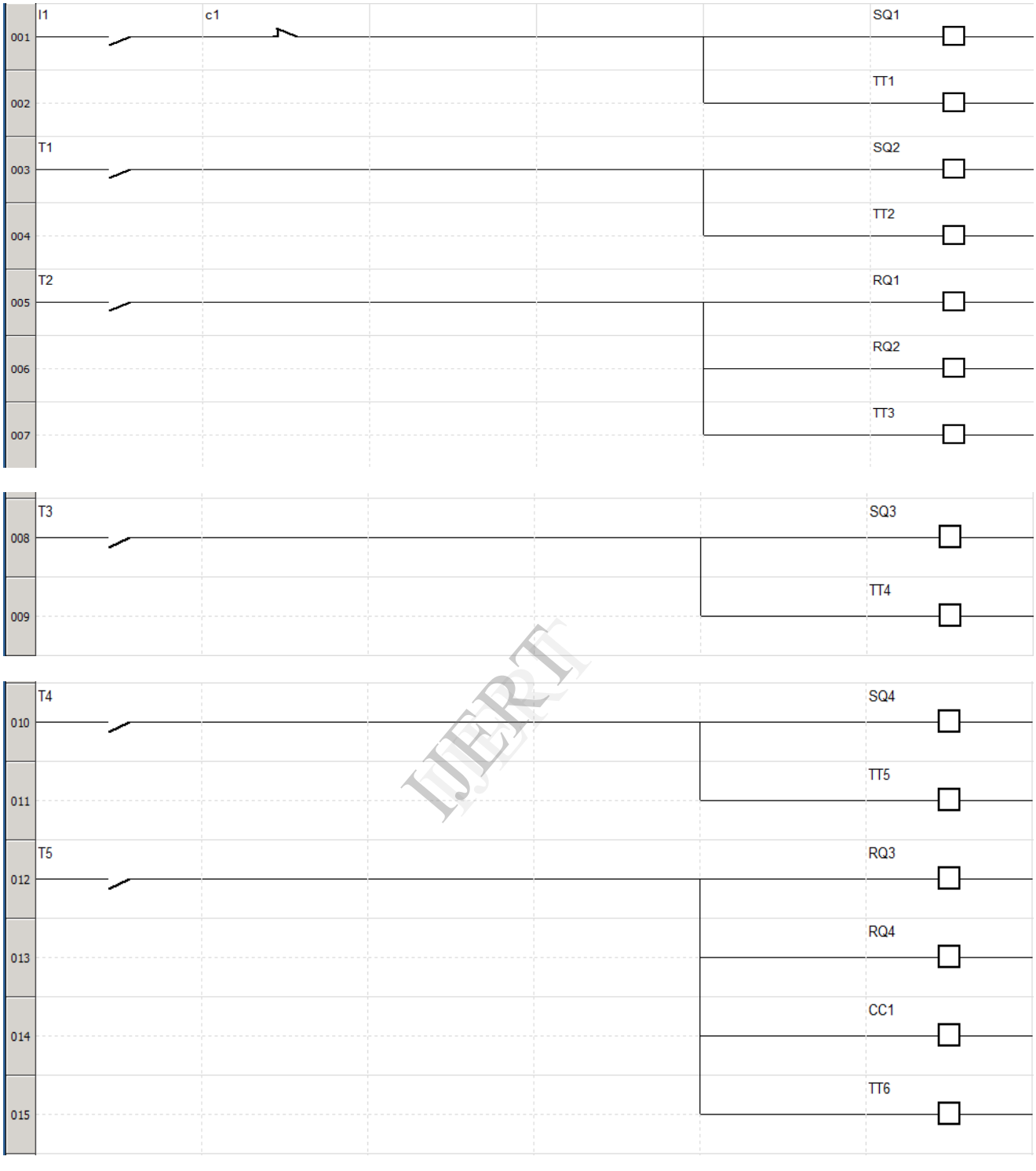
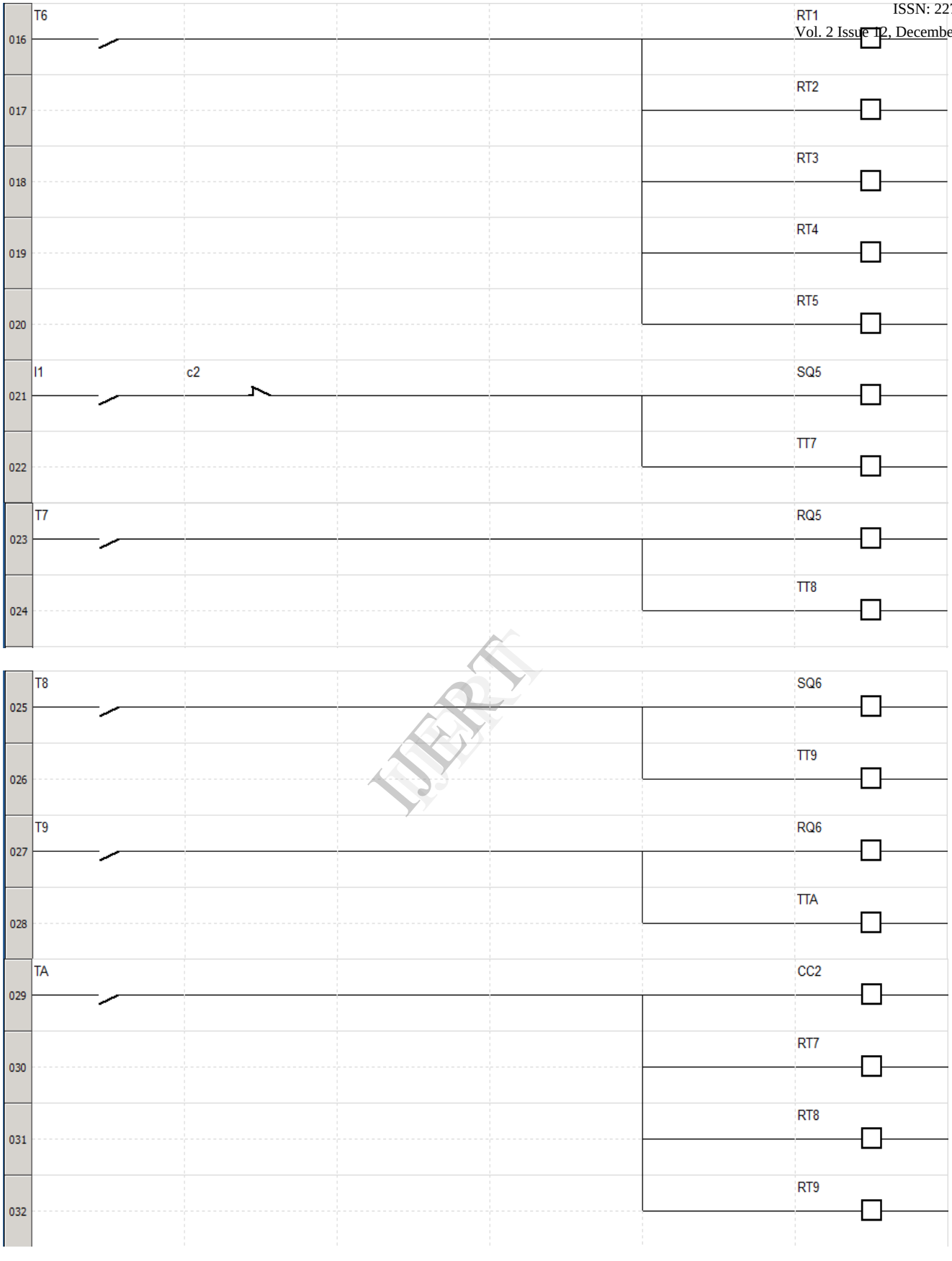


Fig.3(b). Direction control and braking arrangement circuit for Induction motor

P – Phase terminal of AC supply, N- Neutral terminal of AC supply
(+) – Positive terminal of DC supply, (-) – Negative terminal of DC supply
M1, M2 - Terminals of main winding of induction motor,
F1, F2 – Terminals of field winding of dc motor
C1 – Terminal of capacitor, Q1, Q2, Q3 – Contactor coil.
R1, R2 – Terminals of variable resistance.

VIII. REFERED PROGRAM




016
T6
RT1
017
RT2
018
RT3
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RT5
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TT9
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T9
RQ6
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TTA
029
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CC2
030
RT7
031
RT8
032
RT9

VIII. AUTOMATION IMPLIMENTED AREAS

The automation system designed can be used in various industries i.e. process industry, pharmaceutical industry. It is used for mixing two different types of raw materials. DC machine is used as stirrer (mixer), induction motor is used to control the supply of raw product.

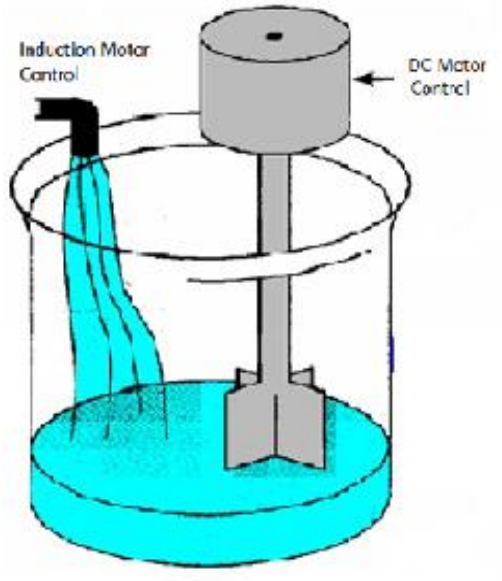

Fig4. Process industry

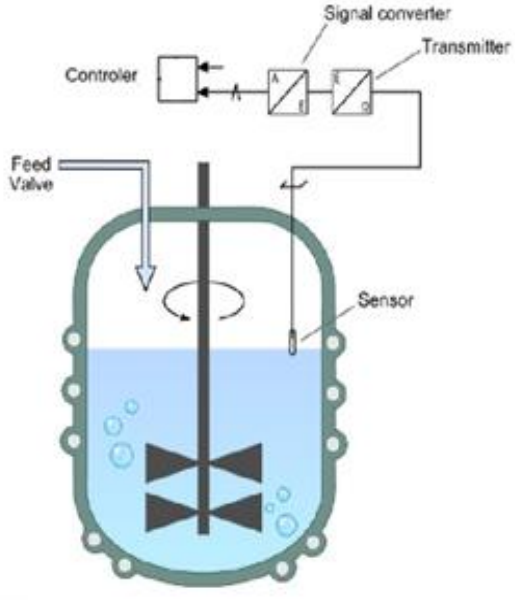

Fig5. Pharmaceutical industry

IX. CONCLUSION

Successful experimental results were obtained from the above prescribed system indicating that the automation system is better as compared to hard wired system. The setup of direction control of dc motor and single phase induction motor for forward and reverse rotation with braking has been implemented and achieved. The motor is rotating for prescribed time set in the timers for forward direction and reverse direction. The motion can also be controlled by controlling the time of the timers as per requirement. This feature makes the system more efficient for flexible implementation. Thus, the PLC proves itself to be a versatile control tool in automation system.

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