

12

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Project Report

TIMER SWITCH

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TIMER SWITCH

Introduction

For the student studying under the course of Power Electronics and Control Engineering such as Electrical Machine and Control, Programmable Logic Controller especially timer control area, understanding the time control application is very important.

Timer control applications are used in the most industrial and house-hold appliances such as motor drives, fan control, and etc.

This project is intended to turn off the appliance according to preset time interval.

After familiarizing the students with the techniques of timer control and, the training project lays special emphasis on creating other motor circuit and developing circuits.

Objectives of this project

The objectives of this project are

1. To understand the characteristic of semiconductor device
2. To understand the theory and performance of transformer and its tapping
3. To study the circuit construction of simple DC power supply
4. To understand the usefulness of timer ICs and
5. To study the characteristics of relays and its contacts.

Component lists of the circuit

The requirement and component of the circuit is listed in the following.

Semiconductors

| | |
|----|--------|
| D1 | 1N4007 |
| D2 | 1N4007 |

| | |
|----|-----------------------|
| D3 | 1N4001 |
| D4 | 1N4007 |
| IC | 555 Timer (with base) |

Resistor

| | |
|----|---|
| R1 | 10 M Ω (variable resistor) Pre-set |
| R2 | 100 k Ω (trigger input resistor) |

Capacitor

| | |
|----|---|
| C1 | 1000 μ F, 15V (filter) |
| C2 | 500 μ F, 15 V (discharge capacitor) |
| C3 | 10 nF, 25 V (control voltage capacitor) |

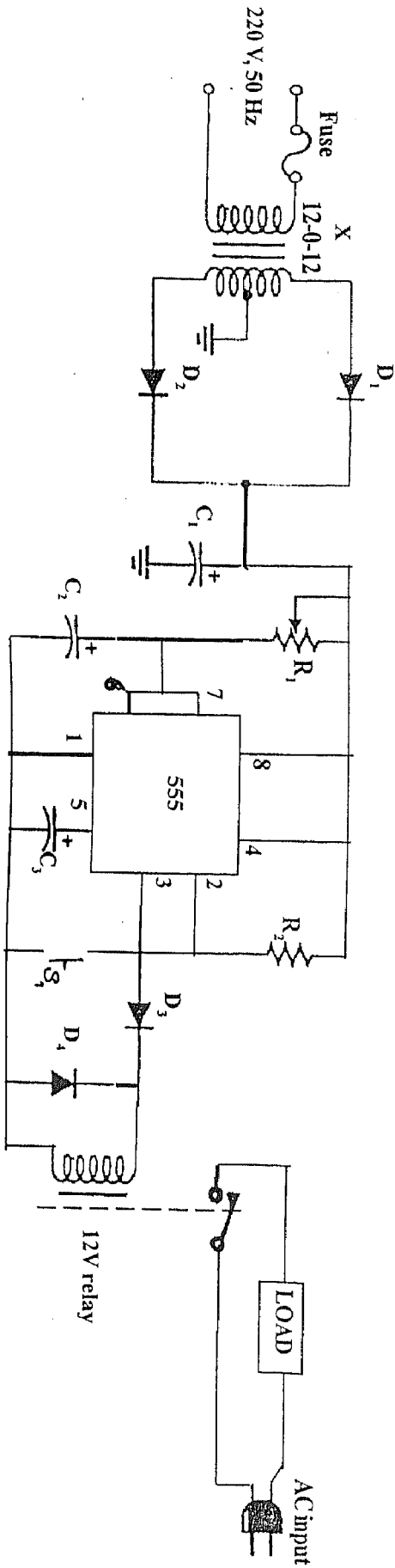
Miscellaneous

| | |
|-----------------|---|
| X1 | 12-0-12 volts, 250 mA transformer |
| S1 | trigger switch (push button) or Bell switch |
| Relay | 12 V, 200 mA |
| Pilot light | Neon lamp |
| socket | 2 pin socket outlet (for load supply) |
| printed circuit | Universal card |

555 Timer Specifications

| | |
|-----------------------|------------------|
| Supply voltage, Vcc | +4.5 V to 15 V |
| Supply current | 3 mA to 6 mA |
| (Vcc = 5 V) | |
| Supply current | 10 mA to 15 mA |
| (Vcc = 15 V) | |
| Output current | 200mA (max) |
| Power dissipation | 600 mW |
| Operating temperature | 0 to 70 degree C |

Circuit Diagram of the Timer Switch



Operation of Timer Switch

This timer switch is monostable multi vibrator. It is used to delay off and delay on time of appliances operation.

In the delay off timer switch, if relay coil is removed from A to B, the timer switch operates as time delay on function.

In reference, the delay off time t_1 and delay on time t_2 are calculated as follow:

$$\begin{aligned} t_1 &= 0.693 (R_1 + R_2) C \\ &= 0.693 (10k+100k) (500\mu) \\ &= 38.115 \text{ s} \end{aligned}$$

$$\begin{aligned} t_1 &= 0.693 R_2 C \\ &= 0.693 (100k) (500\mu) \\ &= 34.65 \text{ s} \end{aligned}$$

To operate the timer switch, press S1 push button switch, the relay coil is excited (energized) and relay contact closes the load circuit. The appliance is connected to supply voltage. After a preset time delay, the relay contact opens and opening the load circuit, the appliance will be turn off.

Conclusion and Discussion

This timer switch can be used in the motor control area. We can use this timer switch in the Star-Delta motor starter as the switching circuit.

If we want more delay on time or more delay off time, we can get these times by varying the two resistance values (R_1 & R_2) or discharge capacitor value.