Automate the Home

Speed Regulator for Motors Used for Domestic Use

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INTRODUCTION:

A wide variety of motors are in use for household applications. These motors are coming under the category of FHP (fractional horse power). Various types of FHPs that are in use and their applications are as shown:

SL. No.	TYPE	APPLICATION
1	Induction Motors	Fans, Pumps, food processors
2	AC/DC Series motors	Kitchen mixers, vacuum cleaners, grinders, sewing machines
3	Hysteresis motors	Fans, turn tables, etc.

All of the above types of motors need speed regulation according to the requirements and must be protected against overloading. The motors must be protected from overheating and over run. The circuit suggested aims to increase or decrease the speed of the motor by pushing appropriate buttons. It also monitors the temperature or any shutdown condition sensed by the external hardware to switch off the motor. The maximum continuous running time is also programmable. Since the controller controls the speed by using integral cycle controlling and zero cross switching there is less EMI due to switching and at the same time suitable for a variety of motors powering from AC.

Facilities that can be incorporated are:

1. A variety of AC motors and AC/DC motors.
2. Integral cycle controller for reduction in RFI/EMI.
3. Maximum running time protection.
4. Variable speed by operation of push buttons.
5. Motor protection against overheat.
6. Higher efficiency even at low speed.
7. Controller takes less power, and low cost.

APPLICATION OPERATION:

The PICmicro™ controller senses zero crossing point in the input supply by GP3. Here a simple circuit can be employed. This pin gets triggered for the +ve and –ve half cycles of supply. On receiving the trigger, the controller calculates the exact point of applying gating pulse to the SCR which is acting as a switch. Once triggered, the following full half cycle conduction occurs and the motors get power for that half cycle. The controller selects a period of say 100 cycles (this value must be properly selected depending on the mass and the type load and the type of motor, larger values for heavy motor) of AC and passes a fixed number of cycles to the motor. The rest are not allowed. This operation continues. The number of cycles of conduction is determined by the speed values stored in the SPEED register. The speed value can be increased by pressing the INC button or can be increased by pressing the DEC button. If more cycles are allowed, the average speed is increased and vice versa. Release of any of the above buttons causes running at the present speed.

Protection

The motor protection needs an external circuit to monitor the faulty condition. It may vary from a simple thermal trip to sophisticated temperature and current monitors. In any case a logic input to the controller is sufficient to trip the motor. Once tripped, the motor cannot be started again immediately. Restarting occurs after a predetermined cooling period.

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CIRCUIT DIAGRAM OF MOTOR SPEED REGULATOR