Design of Starter for DC Shunt Motor using Autotransformer

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Abstract

The main disadvantage of DC Motor is to catch fire quickly while starting period, To overcome this problem we have to use dimmer as starting component. So the advance technology is to reduce current. The cost of component is less. Power loss is also less as compare to another starter. Due to less power it`s getting more efficient. The Three point starter suffers from a large variation of speed by adjustment of the field rheostat. To increase the speed of the motor, the field resistance should be increased. Therefore, the current through the shunt field is reduced. The field current may become very low, because the addition of high resistance to obtain a high speed. The Three point starter connects the resistance in series which reduce the high starting current , due to changes of point from resistance 1,2,4 to end we don`t get the accurate speed. This main problem we facing during operation so, To eliminate this problem we completely eliminated the use of 3 point starter using advance technology will get accurate speed and will show the speed on digital speed display. The idea is to introduce changes in starter resistances of DC shunt motor in small about basic concept, manufacturing, performance and related practical oriented outcomes. DC motor having more part for transformation of energy. The important work for motor is to convert from electricity to useful work. This paper gives design of starter using autotransformer for DC shunt motor.

Keywords: *Relay, contactor, rectifier, MCB, Three-Phase Autotransformer.*

1. Introduction

Mechanical work is done through DC motor which gets started by electricity. Nowadays, to know about the regulation of dc shunt motor, it's necessary for engineers, industries as well as technical persons employed over there. This motor consists of armature as well as field coil. Both coil i.e. winding are shunted to each other and they are connected across supply. These coils are surrounded by magnetic poles. It's because of that the rotor rotates by magnetic properties of repulsion and attraction. The production of torque is as per suggested by FLH rule. The motor having better regulation, for variable current. Dc shunt e motors are usually employed for the purpose of speed variation

The advance starter for DC shunt motor is for limiting the significant starting current of motor. During this we have a tendency to don't seem to be victimization any kind of starter [i.e Three point starter, Four point starter, etc.] to start out the DC shunt motor. We tend to are using dimmer and rectifier and digital panel for displaying the speed. In this the three phase supply is given to the variable resistor that varies the voltage by which the current flow in line with the voltage. The bridge rectifier is employed to convert the ac voltage to dc voltage. From this we tend to limit the beginning current of the dc shunt motor and control the speed of the motor. There is a need of more extra turns of

smaller gauge wire to made shunt field windings of a DC shunt motor; rather than a series-wound DC motor. Because of this high range of turns a robust flux is permitted to be generated, whereas the smaller gauge wires limit the current flowing through the shunt coil by offering a high resistance. Therefore, the beginning torque needed to start a DC shunt motor is low, which means that the load on shaft should be tiny at start-up. In an exceedingly DC shunt motor, torque is proportional to armature current. In a series-wound DC motor, torque is proportional to the square of armature current. This torque-current relationship which is exponential permits motors to handle high startup loads by supplying high beginning torque.

2. Methodology

The self excited DC motors is shunt falling in category of DC motor, as the name suggest here the which carries flux is inserted across the winding which perform energy conversion task. As we know that in across voltage remains same therefore each winding will carry different current withsame voltage, as below shown figure.

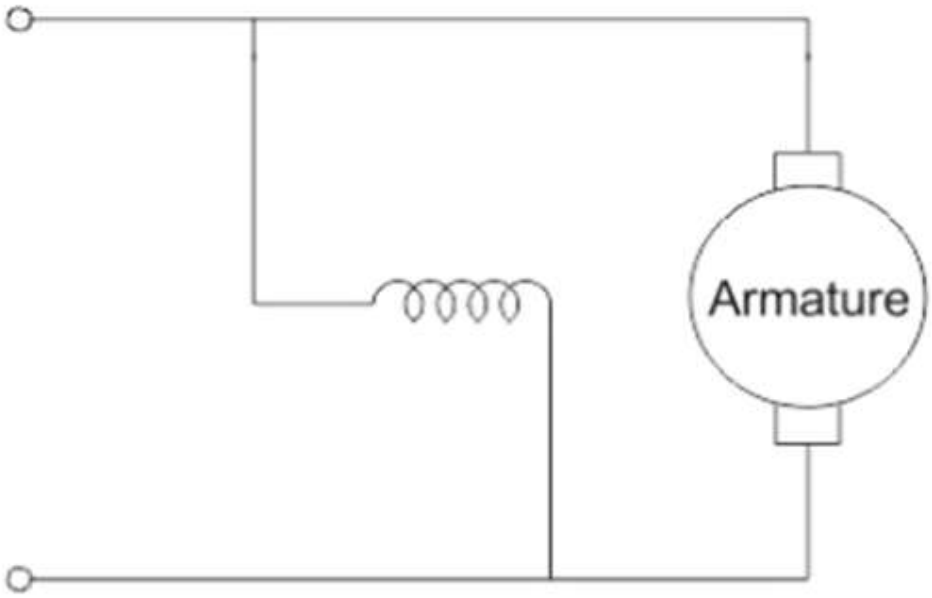

Figure 1. DC shunt excited motor

Here in this motor total voltage supplied is taken as V. Total current taken as I_T. This total current get divided, as both winding are connected across. Let I_1 is armature coil current which having resistance of R_1 and I_2 is field coil current which having resistance of R_2. Voltage remains identical across each winding.

From this we are able to write

$I_T = I_1 + I_2$

Here:
I_T is supply current
I_1 is armature winding current
I_2 is shunt field winding Current

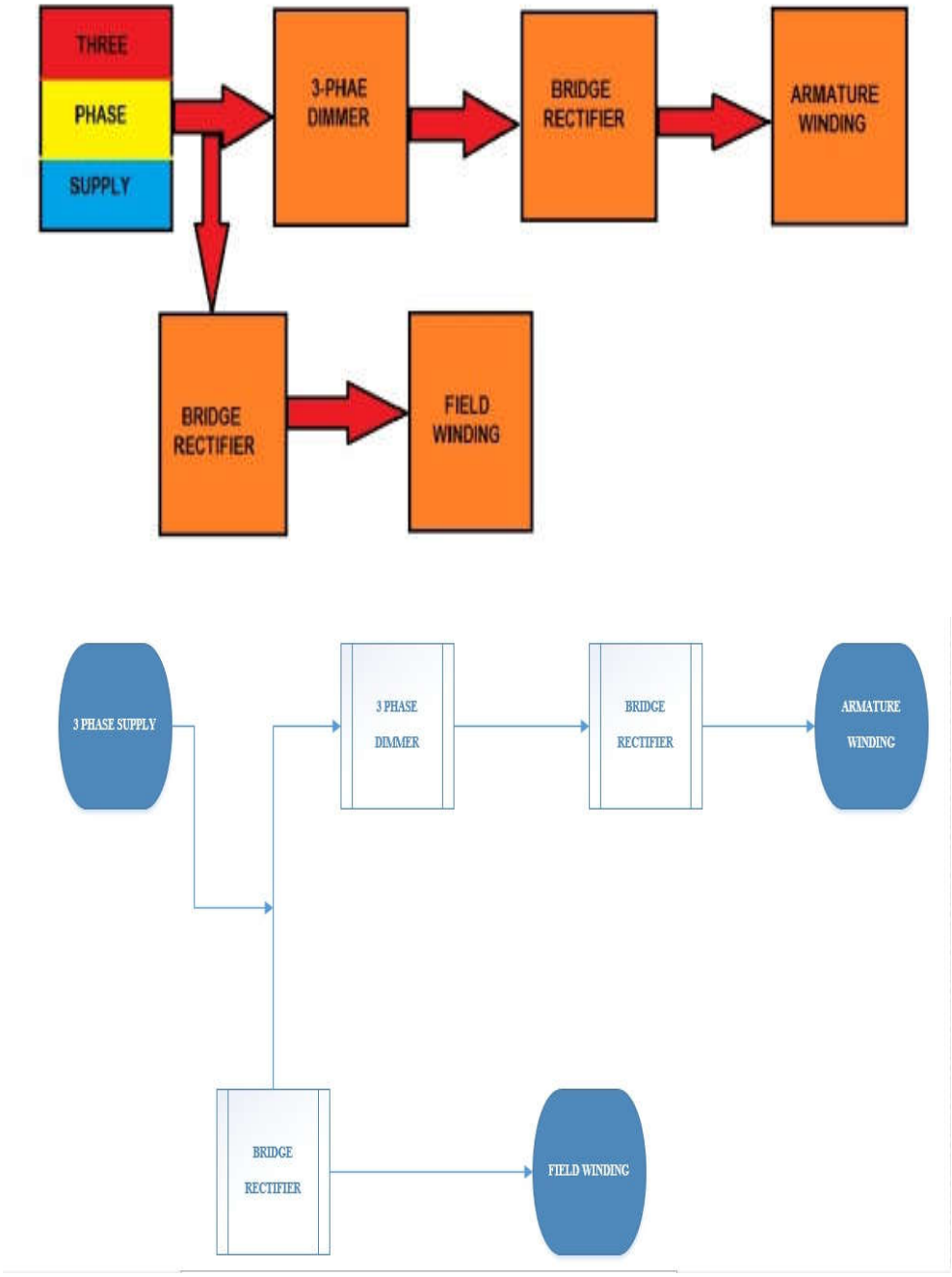

Figure 2. Block Diagram of Control Panel

2.1 Construction:

Three phase supply is connected to variable resistor by means that of switches (3p,16A) and contactors(12A). The output of variable resistor is connected to the bridge rectifier .This regenerate dc supply is fed to the armature winding of DC SHUNT MOTOR. The one phase and also the neutral is connected in parallel to the bride rectifier by means that of MCB (2p,6A).The other end of the bridge rectifier is connected to the field winding of DC SHUNT motor. It is connected to the field winding with the assistance of ammeter and 8pin relay that have two modifications over.

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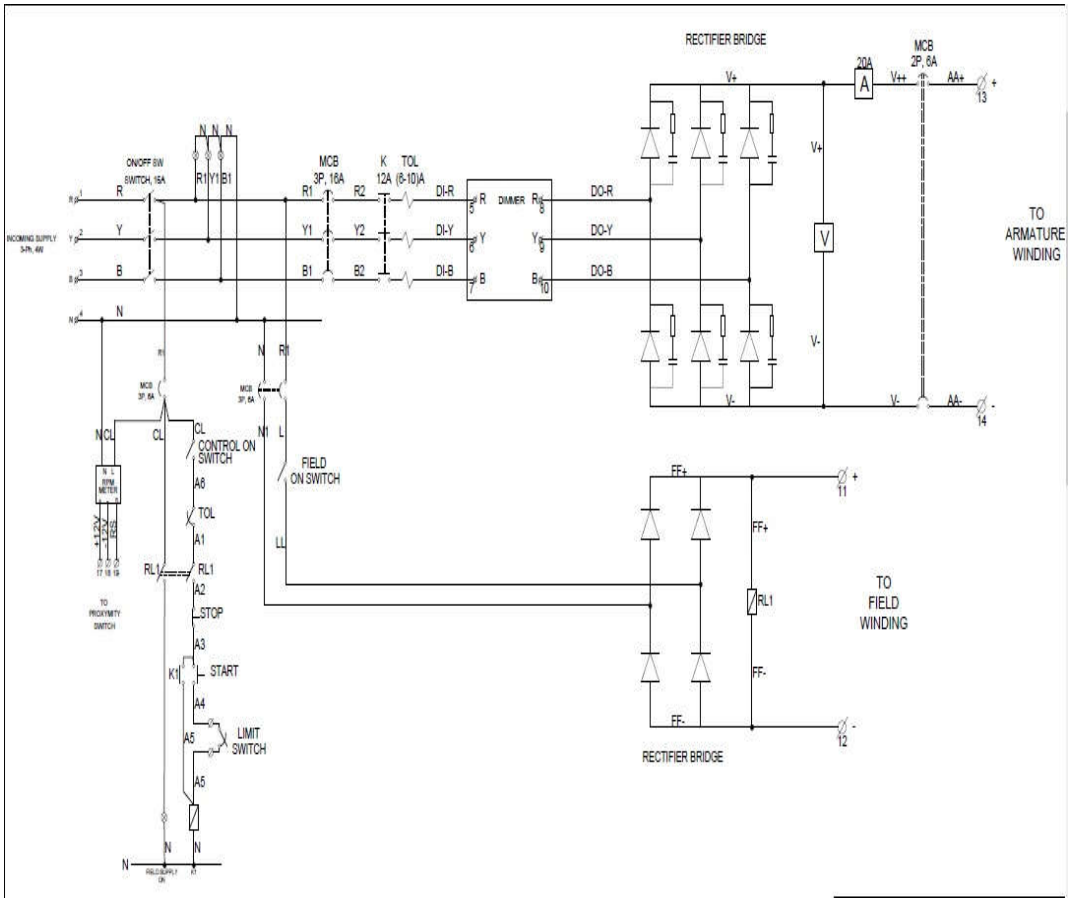

Figure 3. Circuit Diagram of Control panel

2.2 Working:

We feed the three phase supply to the system , the barrier of three phase supply system is that the 16Amp on/off switch. once the switch is activates the RYB light-emitting diode lamps can glow that indicate the three phase supply is feed into the system. once control on button is switched to ON the 3P, 16A MCB get ON. Then we tend to turn on field and armature button by means that of start push, the contactor coil will energies. Then 12Amp 3Phase contactor get ON, the 3P contactor is asynchronous with the thermal overload relay, for protection purpose. field winding get directly 220V DC supply by means that of single phase bridge rectifier. The three phase supply is given to the dimmer to vary the beginning current of armature winding. This variable voltage is regenerate to DC

by means that of 3phase bridge rectifier. The DC voltage and current is shown in voltmeter and ammeter. The revolutions per minute Digital Indicator and n-p-n proximity switch is use to measure the speed of DC shunt motor. To prevent the motor Stop push are use.

The control panel is that the best choice respect to three point/four point starter and conventional starter. We limit the big starting current of DC shunt motor by using dimmer. By the assistance of dimmer we are able to additionally control the speed of motor. we are able to show correct values of Voltage, Current and Speed additionally.

3. Result Analysis And Discussion

In experiment initial of all, MAIN ON is switched on it can starts the supply then on the control ON switch. Here is that the two switches one for field and other for coil. It flows supply into the panel. Therefore we tend to variable the other observation by the assistance of dimmer. The observation is as follows:

Table 1. Voltage and Current Observation

Voltage (V)	Speed (RPM)
50.0	189.0
75.0	288.0
100.0	391.0
150.0	593.0
200.0	800.0

Speed formula for DC Shunt motor is

$$E = \frac{P \varnothing z N}{60A}$$

Here, N = speed of rotation in rpm.

P = number of poles.

A = number of parallel paths.

Z = total no. conductors in armature

Limitation.

When the Panel door is open then the operating of control panel remains running in condition. In dimmer, limits of variable voltage aren't to be bigger than 0-220V DC and L-L is 160V AC. When the motor is in running condition the Proximity Switch is mounted at one place, close to the shaft.

4. Conclusion:

Thus from this starter we tend to limit the starting current of DC shunt motor. And that we display the correct speed of the motor in digital mode.