

General Motor Knowledge

Part 1

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This section is a new and hopefully permanent part of "Morrill Moments". In it we hope to explain, in terms as general as possible, how our motors work. There are several complicated theories and physical laws and a lot of high power mathematical formulas that could go into an explanation such as this. But we do not have to prove to you that motors work really do work, we all know that they do. A simple understanding of the internal workings of a motor is all that is really necessary. Along the way, we may have to just accept some facts as true, but we could not change them even if we did understand them. All of us may not understand everything there is to know about how television works, but all of us can tune in our favorite program and know how to adjust the antenna to get the best picture.

Electrical current flowing through a wire will produce a magnetic field around that wire. If you hold that wire in the palm of your right hand with your thumb pointing in the direction that the current is flowing, then your fingers, as they curl naturally over the wire, point the direction of the magnetic field that is created around that wire. Now take this wire, with the current flowing through it and the magnetic field circling all around it, and wind it into the form of a coil. Hold the wire in your right hand, with your thumb pointing the direction. Follow the wire around the coil. Notice how all of the lines of magnetic flux (your fingers) are concentrated in the inside of the coil and how all of this concentrated magnetic flux is pointing in the same direction.

Now take a material that is greatly affected by the close presence of a magnet, like a piece of steel, and place it inside the coil. This will further concentrate and direct the magnetic flux. It is easier for the flux to travel in the steel than through the air. This might be likened to us traveling on an interstate highway rather than back roads, it is easier and much faster. But, once we get on, we may find that we are pushed along faster and faster by the other motorists and it is sometimes difficult to get off where we want to go and it can get very confusing around large cities with cars going every which way. So, let us take our piece of steel, and instead of one solid piece, make it several thin layers of steel. This will divide our steel highway into lanes with walls that keep the magnetic flux traveling smoothly and all in the same direction. The direction we want the magnetic flux to travel.

Step back and take a look at this piece of steel, with several thin layers of steel laminated together into one piece and the many turns of electrical current carrying wire circling it. Hold it in your hand, your right hand. Hold it so that your fingers curl around the steel in the same direction as the wire was wound around the steel. If the fingers of your right hand point in the direction that the current carrying wires are wound into a coil, your thumb will point the direction of the magnetic field.

Does some of this sound familiar? It should. You have just wound a stator. It is this concentrated and directed magnetic field that attracts the rotor. The rotor will try to align itself with the magnetic field. Stay tuned, same time next month when we will make this magnetic field change in magnitude and then direction and appear to travel around our stator. We will have our rotor spinning around in circles just trying to keep up!