ASK R-E

WRITE TO:

LETTERS
Radio-Electronics
500-B Bi-County Blvd.
Farmingdale, NY 11735

MORE ON MOTORS

In selecting questions for this column, we try to choose those that will interest the greatest number of readers and provide what we feel is the most practical answer when there may be two or more possible solutions to a problem. At times we consult professionals and experts before preparing a reply; but, unfortunately, the expertise of experts and professionals is often governed by their experience and familiarity with the question, and recently we got some "not-so-expert" opinions. So...we apologize for the less-than-expert replies to a couple of inquiries and will now try and set the record straight.

In an early inquiry on reversing electric motors, we pointed out that there are many types of motors and suggested that the reader take the motor to a motor repair shop and have a technician install a reversing switch. In a follow-up on the question (See "Ask R-E" in the April 1987 issue), we mentioned the possibility of reversing a motor by shifting the pole and field coil assemblies to the opposite sides of the brush-holder center-line.

Reader Edward T. Smith, of Brogue, PA adds that a simpler and more practical solution is to switch the leads connected to the brush holders. Interchanging those leads reverses the current through the armature, so the torque and the direction of rotation are also reversed.

Now for what we hope will be the final word on the subject of reversing motors:

Single-phase, split-phase motors have a main winding fed directly from the AC powerline and an auxiliary winding that is fed a current that is out of phase with that in the main winding. The two windings may be electrically equal. In this case, the phase shift is generally produced by an inductor or a capacitor in series with the auxiliary winding. The usual single-phase, split-phase motor can be reversed by reversing the connections to either the auxiliary winding or the main stator winding.

In the single-phase capacitor motor (Fig. 1-*a*), the main and auxiliary windings are electrically similar. One winding is fed directly from the AC powerline and the other is fed through the capacitor. The position of the switch selects between the forward and reverse directions of rotation by switching the series capacitor from one winding to the other.

In some split-phase motors, the "start" winding has many turns of fine gauge wire; the "run" winding has fewer turns of a much heavier gauge wire. The phase difference in the magnetic fields causes the armature to rotate. The motor easily is reversed by reversing the connections to one of the windings.

In the capacitor-start motor (Fig. 1-*b*), the main or "run" winding is directly across the AC powerline and the auxiliary or "start" winding is fed through a capacitor and centrifugal switch that opens when the motor comes up to speed. For forward rotation, the start winding, switch, and the capacitor are in a series string from the midpoint of the main winding to one side of the powerline. For reverse operation, the switch returns the start-winding assembly to the other side of the powerline.

The shaded-pole induction motor (Fig. 1-*c*) is usually a low-torque low-speed type used for

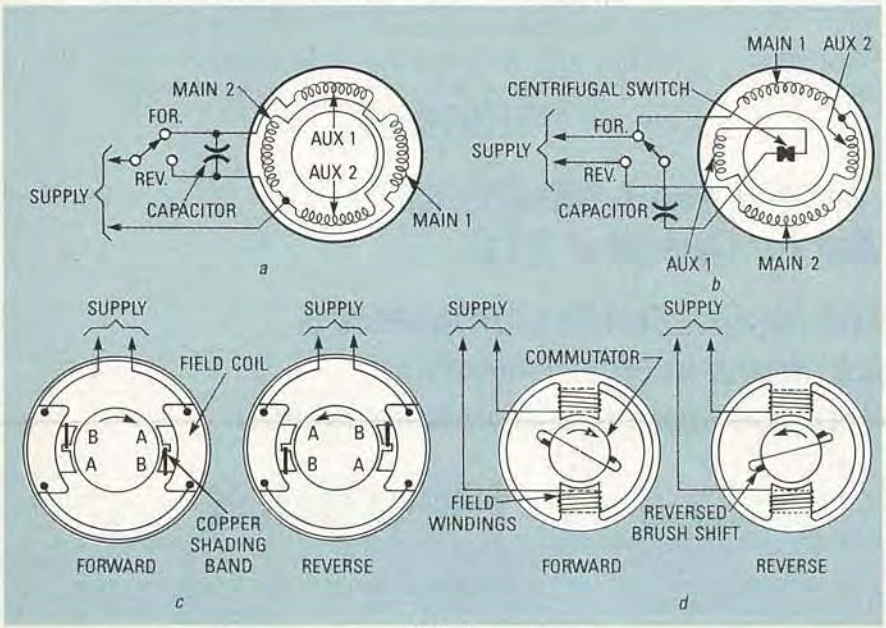

FIG. 1

pumps and fans. Power generally ranges from around 1/3 to 1/30 horsepower. It has copper bands short-circuiting or "shading" a portion of each pole face. The magnetic flux "peaks" first in the unshaded portion, then it peaks in the shaded portion; the electrical effect being a rotation from the unshaded to the shaded pole piece. The motion of the rotor follows the rotating field.

Reversing a shaded-pole motor is generally a mechanical operation. Rotate the wound stator-coil assembly 180° in the case or turn it end-for-end with respect to the rotor. Special types of shaded-pole motors have been designed so as to be electrically reversible; they can usually be identified by instructions on a plate affixed to the motor's case.

The basic repulsion-induction motor (Fig. 1-*d*) has a slotted armature with windings connected to a commutator. The brushes are connected together and the armature is excited by pulsating currents in the stator winding. That type of motor is reversed by rotating the set of brushes through a small angle around the armature centerline. The brush positions for forward and reverse directions of rotation may be marked on the motor's frame; another technique might be to limit the brush positions using stops.