TECH TIPS Cont'd. . . . .

this arrangement, the flux in each pole of the stator reverses for each 60 degrees of magnet rotation, so that a complete cycle of two reversals occurs for each 120 degrees of magnet rotation. The voltage induced in the stator coils therefore occurs as an A. C. waveform with frequency thrice that of the rotational frequency of the magnet.

The stator coils are connected together in two sets of four coils each. As the alternator waveform is to be rectified (in the regulator), the coil sets are arranged so that one set produces current while the other set does not, in order to produce an output waveform without large 60-degree current gaps.

An arrangement of four diodes is used to rectify appropriate current paths, but the arrangement is not the same as that used in the standard four-diode rectifier bridge.

During alternator operation, the electrons are forced through the stator coils, through the stator-ground connector, and into the engine casting for distribution into the various load components (lights, horn, ignition, and battery).

If the six-pole rotor magnet is to be considered the heart of the system, then the Ducati static regulator is to be considered the brain of the system, for this is the site which most Ducati owners associate with headaches. In general terms, the regulator acts by tailoring the power output of the alternator to the amount of current being drawn thorugh the separate (1) battery-charging circuit, and (2) dissipative-load circuit containing lights, horn, and ignition.

The regulator is called a "static" regulator because it contains no "moving" contacts. The reference is not to electrostatic regulation.

The regulator is also called a "saturable-core inductor", or equivalently, a "standard-core reactor", both of which are decriptive of the way in which the power output of the alternator is tailored.

In terms of basic alternating-current terminology, an inductor is one of two "reactive load" components (capacitor and inductors". As a reactive load component, the inductor has the effect of reducing the value of the alternating current which flows in a circuit for a given value of applied voltage. In this respect, the reactance of an inductor is analogous to the resistance of a resistor. This reactive manner is the manner in which the inductors are used in the regulator. Although it is common to associate inductors with transformers, the regulator uses inductors as reactive load components, and not as transformers.

Here the inductors are called "saturable-core" inductors because the magnetic flux densities in the cores or the inductors provide a means of regulating their inductive reactance, and because the cores of the inductors can be saturated with magnetic flux in order to reduce to a minimum their inductive reactance. More specifically, a flux-generating coil in the battery-charging circuit generates magnetic flux to desaturate the cores of the reactive load coils and thereby increases to a maximum their inductive reactance. Thus as the battery-charging current increases, the inductive reactance increases, and the alternator output decreases in order to prevent overcharging of the battery.

Similarly, a flux-generating coil in the dissipative load circuit (light, horn, and ignition) generates magnetic flux to saturate the cores of the reactive load coils and thereby decrease to a minimum their inductive reactance. Thus as the headlight current increases, the inductive reactance, decreases, and the alternator output increases in order to prevent undercharging of the battery.

Of course there are the reciprocal flux-generating effects of the reactive load coils and the reactive load effects of the flux-generating coils yet to be mentioned, but these effects are presumably not central tot eh useful operation of the regulator.

Another part of the system is the battery-dicharge warning light circuit. As best I can determine, the circuit conducts current during all stages of battery charge and discharge, and only illuminates the light when the value of the current reaches a sufficiently large value.

If former cogitation on the reader's part seemed to fall short of his present understanding of the system, the failure can be attributed to a saturable reactor that looks similar to a transformer, a diode arrangement which is not a standard bridge, and a battery-discharge warning light circuit that passes current even when the battery is charging.

Though the complexity of the system might seem a detraction to the motorcycle, the Ducati Elettrotechnica designers still show their true colors when positioning the stator windings on the lower four of six available stator poles. The tiny weight of the coils lies close to the ground for that infinitesimal contribution to fine road handling.

Credit is gratefully extended to Clymer Publications for use of technical drawings. The drawings were modified by the arthur for this article.

Credit is gratefully extended to Ervin S Priem, Associate Professor of the Department of Electrical Engineering at the University of Florida, for illumination of the staturable reacotor concept.

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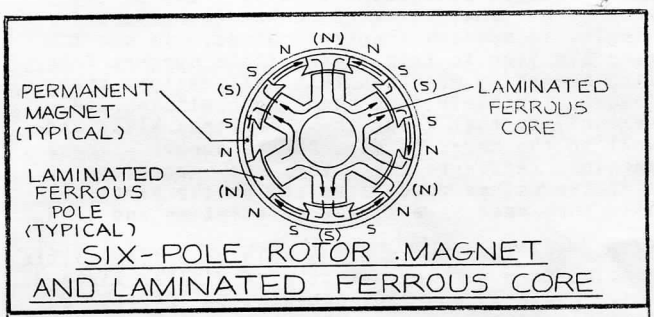
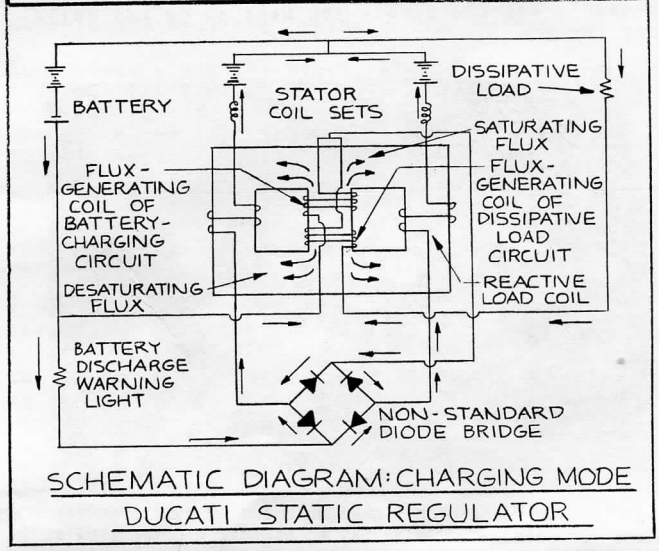


SIX-POLE ROTOR .MAGNET AND LAMINATED FERROUS CORE



SCHEMATIC DIAGRAM: CHARGING MODE
DUCATI STATIC REGULATOR