17 ACR ALTERNATOR

DESCRIPTION

The Model 17 ACR alternator is a unit incorporating an integral regulator. The construction is shown in the exploded illustration (Fig. 1). The laminated stator carries a 3-phase star-connected output winding. A 12-pole rotor carries the exciter field winding, the rotor shaft running in ball bearings located in die cast end brackets.

Alternator output is rectified by means of six *silicon diodes; these are housed in a rectifier pack* and connected as 3-phase full-wave circuit.

The rectifier pack is mounted on the outer face of the end bracket and also contains three field diodes. At normal operating speeds a small portion of the stator winding current flows through these diodes to provide rectified self-exciting field current. This circuit is taken to the two brushes which feed the current to the exciter field winding via face-type slip rings. The slip rings are carried on a small diameter moulded drum mounted on the rotor shaft outboard of the slip ring end bearing.

A micro-circuit voltage regulator is located on the slip ring end casing.

The 14TR regulator is a three lead unit—the yellow lead going to the brush connection; the metal link to the field connection and the black lead to earth.

An anti-surge device (fitted to later models) is located on the slip ring end bracket and connected by a yellow lead to the "IND" terminal and protects the regulator from any upsurge in voltage.

Electrical connections to the harness are brought out to Lucar connector blades, grouped on the rectifier pack, which accept a non-reversible moulded socket.

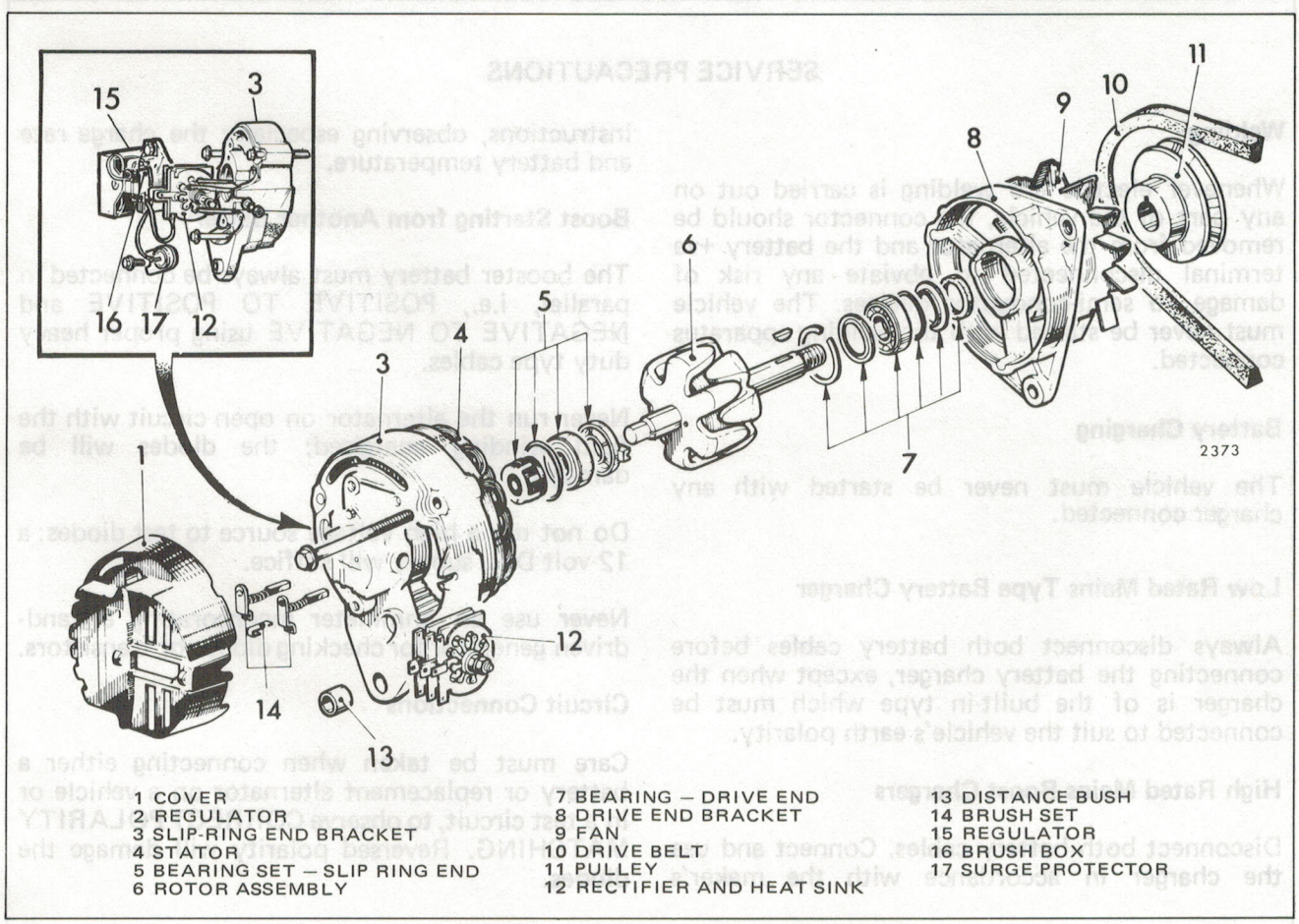

Fig. 1 *17 ACR alternator (inset – 14TR regulator)*

ENGINE ELECTRICAL—Charging System

17 ACR Alternator Description

OPERATION

When the ignition switch (or the equivalent control switch for diesel engines) is switched 'ON', a small current flows from the battery and through the rotor field winding, the circuit being complete via the warning light, alternator terminal(s) 'IND' and the carbon brushes contacting the rotor slip-rings, the alternator regulator and earth. At this stage, the warning light is illuminated and the rotor is partially magnetised.

When the engine is started and the partially magnetised rotor rotates within the stator windings, 3-phase alternating current (a.c.) and rapidly rising voltage is generated.

A small portion of generated alternating current (a.c.) is rectified to direct current (d.c.) by the three field diodes incorporated in the rectifier pack. Output current from the field diodes supplements the initial current flowing through the rotor field winding from the battery, causing an increase in the magnetic influence of the rotor and resulting in self-excitation of the alternator. As rotor speed and generated current and voltage increases, the rotor field increases correspondingly until the alternator becomes fully excited.

During the rise in generated output voltage (reflected at terminal 'IND') the rising voltage influences the warning light so that it functions as a 'Charge-Indicator Warning Light', as follows: When the generated voltage applied to one side of the warning light (via the 'IND' terminal) rises above the battery voltage applied to the other side of the warning light, the warning light is extinguished and this normally indicates that the alternator is developing its main battery-charging current.

The main battery-charging current is rectified from a.c. to d.c. by the other six diodes in the rectifier pack (main output diodes) which function in a full-wave bridge rectifier circuit.

Alternator output is controlled by a voltage-sensing regulator unit, attached to the brushbox.

SERVICE PRECAUTIONS

Welding

Whenever electric arc welding is carried out on any part of the vehicle, the connector should be removed from the alternator and the battery +ve terminal disconnected to obviate any risk of damage to semi-conductor devices. The vehicle must never be started with the welding apparatus connected.

Battery Charging

The vehicle must never be started with any charger connected.

Low Rated Mains Type Battery Charger

Always disconnect both battery cables before connecting the battery charger, except when the charger is of the built-in type which must be connected to suit the vehicle's earth polarity.

High Rated Mains Boost Chargers

Disconnect both battery cables. Connect and use the charger in accordance with the maker's instructions, observing especially the charge rate and battery temperature.

Boost Starting from Another Battery

The booster battery must always be connected in parallel, i.e., POSITIVE TO POSITIVE and NEGATIVE TO NEGATIVE using proper heavy duty type cables.

Never run the alternator on open circuit with the field winding energised; the diodes will be damaged.

Do not use a high voltage source to test diodes; a 12-volt D.C. supply will suffice.

Never use an ohmmeter incorporating a hand-driven generator for checking diodes or transistors.

Circuit Connections

Care must be taken when connecting either a battery or replacement alternator on a vehicle or in a test circuit, to observe CORRECT POLARITY MATCHING. Reversed polarity will damage the diodes.