General Description of the Lucas Range of Alternators and their Functions in Service

ALTERNATOR MODELS

Old Range (RM13 – 14 – 15 – 5AF)

Motor cycle alternators comprise a six-pole permanent magnet rotor and a six-limbed laminated iron stator. The rotor is driven by an extension of the engine crankshaft while the stator is located in the crankcase or chain case. The rotor has an hexagonal steel centre, each face of which carries a high-energy magnet keyed to a laminated pole tip, as shown in Fig. 1. The six pole tips are riveted to brass end plates. This assembly is cast in aluminium and then machined to give a smooth external finish. Five-inch diameter stators, of differing thicknesses, have been used for all models except RM14, for which thick, intermediate and thin hexagonal stator packs of $5\frac{7}{16}''$ A/F ($5\frac{7}{8}''$ spigot dia.) were used.

Two rotor lengths are used. Alternator, model RM13/15 utilises the RM13 stator pack with the longer rotor as fitted in model RM15, in order to obtain output characteristics intermediate between these two.

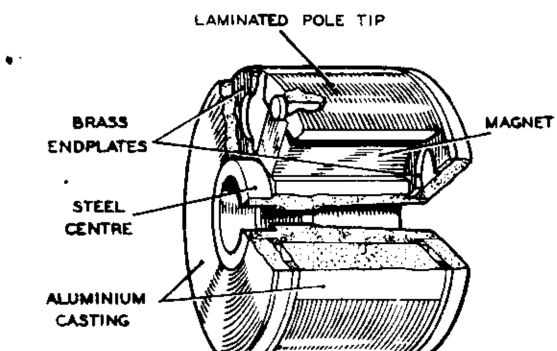

Fig. 1 View of rotor, sectioned

The same rotor and stator sizes are used in model 5AF (Fig. 2) scooter alternator but, in this case, the rotor is cast integral with the engine flywheel and cooling fins. This flywheel, when fitted to 6-volt units, carries an inertia ring while, in 12-volt units, a ring gear is fitted for engagement with the starting motor, model M3.

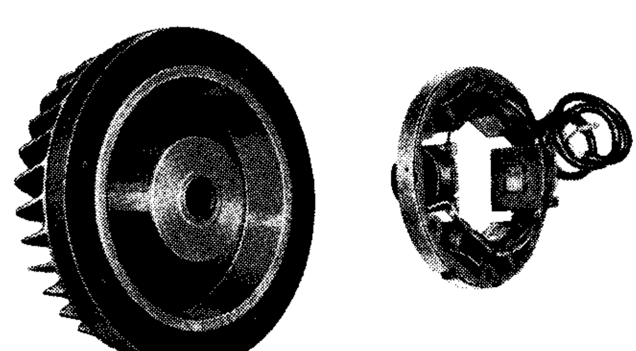

Fig. 2 Alternator model 5AF, stator and flywheel assembly

Models RM14 and RM15 (Figs. 3 and 4) are fitted to large capacity machines having high top gear ratios while the remainder are fitted to small capacity machines having low top gear ratios.

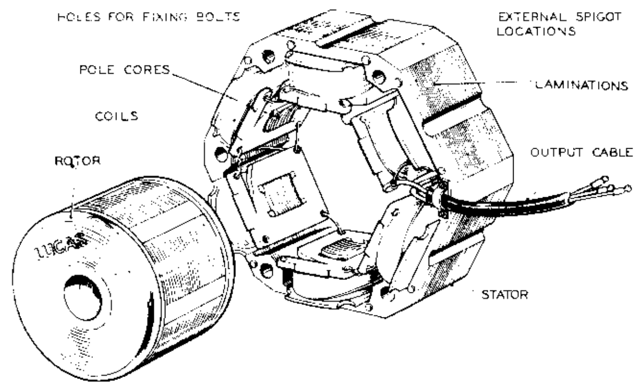

Fig. 3 Alternator model RM14, with rotor withdrawn

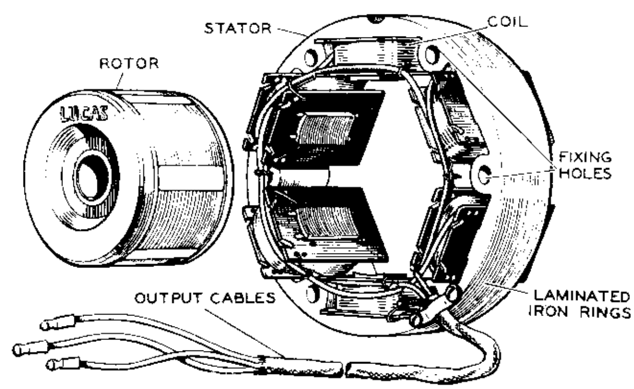

Fig. 4 Alternator model RM15, with rotor withdrawn

New Range (RM18 – 19 – 20/19)

Models RM18, 19 and 20/19 comprise a new range of alternators superseding models RM13, 13/15, 15. The new alternators differ from each other in thickness (the rotors of RM18, RM19 and RM20/19 containing approximately 25, 32 and 45 iron laminations, respectively, with the associated stators having approximately 14, 16 and 26), and from the previous range in respect of rotor diameter-the latter now being 0·165" (4·2 mm.) greater in diameter and able to accept driving shafts of up to one inch (25·4 mm.) in diameter.

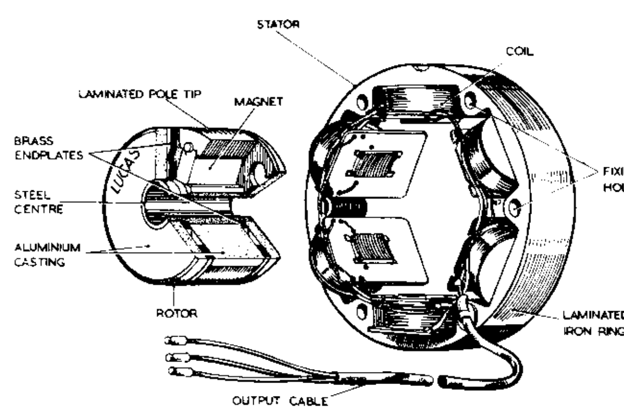

Fig. 5 Alternator model RM18

Model RM18 supersedes RM13 and is normally fitted to small capacity machines having low top gear ratios, whilst RM19, superseding RM13/15 and 15, is for larger

General Description of the Lucas Range of Alternators and their functions in Service

machines. Model RM20/19 is to accommodate additional current consuming equipment, such as two-way radio, fitted to special purpose machines – particularly as used by military forces and road patrols of the Police, Automobile Association and Royal Automobile Club. Other versions of the new range include units wound to provide A.C. ignition, with or without the direct lighting of head, tail and stop lamps.

Rotors of the new range are straight-sided like those of former models RM12 and 14 but can be distinguished from them by being 0·414″ (10·5 mm.) smaller in diameter. The steel centre of models RM13 and 15, on the other hand, were recessed on the side that carried the Company's name. See Fig. 6.

The new stators, while carrying the usual coil cheek retaining tags, also exhibit a small tongue at the side of each pole core. See Fig. 7.

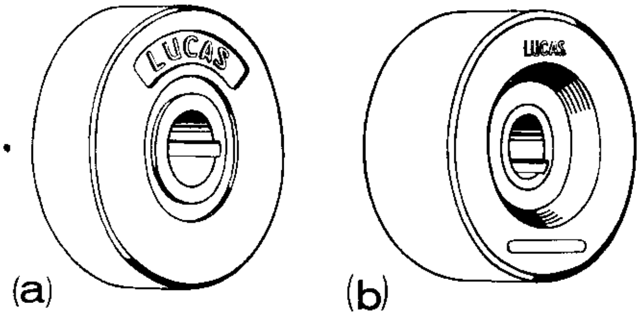

Fig. 6 Alternator rotors (a) new type (b) old type

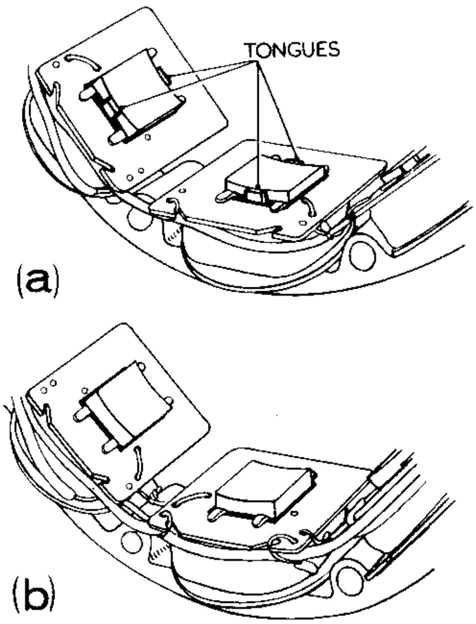

Fig. 7 Alternator stators (a) new type (b) old type

Function

Today, motor cycle alternators are designed, either, to provide battery charging through a full-wave bridge-connected rectifier, in conjunction with magneto or coil ignition – when (with coil ignition) provision is also made for emergency starting in the event of a flat battery and even for restricted running without a battery – or to provide an A.C. energy transfer ignition system with direct lighting.

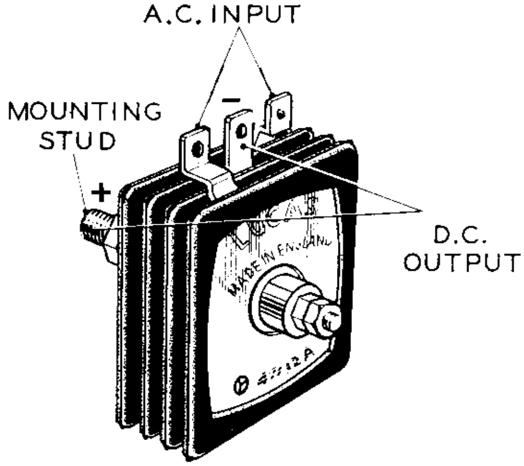

Fig. 8a Selenium metal plate rectifier (new type)

Alternators and battery D.C. lighting, with magneto or D.C. coil ignition, are normally specified for Roadsters, while alternators for direct A.C. lighting and A.C. energy transfer ignition are normally specified for Competition machines. A few alternator equipped machines were made in which both battery lighting and energy transfer ignition were combined. However, this practice was discontinued due, mainly, to the problem that the then existing sizes of alternators presented of providing adequate ignition timing ranges with ample capacity for battery charging.

Two typical motor cycle rectifiers are shown in Figs. 8(a) and 8(b).

Alternators for Battery Charging

When no lights are in use, the rectified output of the alternator is sufficient only to supply the ignition coil and to trickle charge the battery. On turning the lighting switch, the output is automatically increased to meet the additional load. On some machines (usually those fitted with magneto ignition) an increase occurs both when the parking light is switched on and again when the main bulb is brought into use. On other machines (usually of low capacity and with coil ignition, or with low speeds engines and heavy electrical loading) an increase occurs only when the main bulb is switched on. Details of the alternative circuits involved are given in the section on "Working Principles".

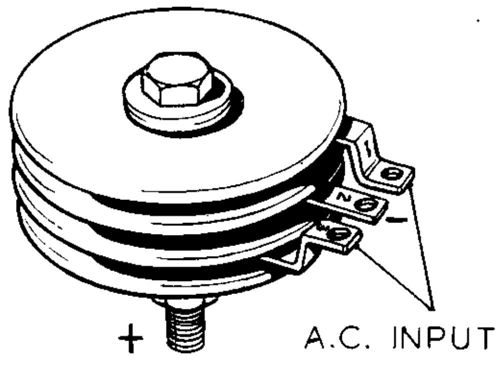

Fig. 8b Selenium metal plate rectifier (old type)

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Alternators for A.C. Ignition

Alternator models for A.C. ignition are used, together with a contact breaker unit and a special energy transfer ignition coil, model 2ET or 3ET – the four-limb stator winding of the alternator and the ignition coil primary winding being electrically matched. The alternator supplies a pulse of energy to the ignition coil primary winding each time the contact breaker contacts open. These low tension pulses are converted by the ignition coil to the high tension voltages required at the sparking plug. This form of ignition combines the good top speed characteristics of the magneto with the good low speed performance of the conventional ignition coil.

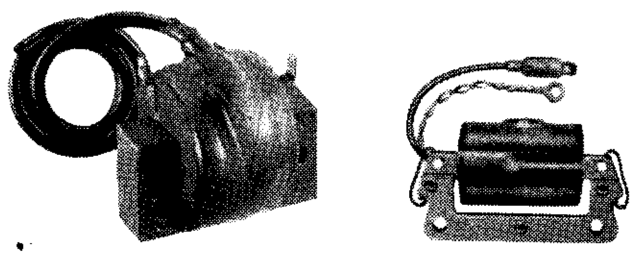

Fig. 9 Model 2ET coil (left) and model 3ET coil (right)

The remaining stator limbs are wound to provide alternating current for a direct lighting set, or rectified current for battery charging. Stop-lights are fed, either, from two coils of a four-coil ignition winding or from independent coils.

ROUTINE MAINTENANCE

Alternator

The alternator, having no rotating windings, commutator, brushgear, bearings or oil seals, requires no maintenance, apart from an occasional check of the snap-connectors in the three output cables to ensure that these are clean and secure.

To obviate metal contamination of the rotor, stator and windings, the chain case oil should be changed as regularly as is recommended by the motor cycle manufacturer. This procedure is particularly important if the stator carries ignition windings.

If removal of the rotor becomes necessary for any reason, there will be no necessity to fit magnet keepers to the rotor poles. On removing a rotor, wipe off any metal swarf that may have been attracted to the pole tips and put the rotor in a clean place.

Rectifiers

Selenium plate types: These rectifiers require no maintenance, apart from an occasional check of the cables and the securing nut.

The nuts that clamp the rectifier plates together must never under any circumstances be turned, the clamping pressure having been carefully set during manufacture to give the correct rectifier characteristics.

When tightening rectifier fixing nuts, the plate assembly must never be gripped by hand in an attempt to prevent turning. Instead, two spanners must always be used – one being applied to the fixing nut and the other to the hexagonal part of the mounting stud or, in earlier types, to the backing nut.

The 2BA nuts shown in Fig. 8(a) must never be disturbed.

Silicon Diode Types: These rectifiers do not require any maintenance and, provided they are are mounted in such a position as to allow plenty of cool air to flow between the plates on which the diodes are attached; these circular plates are in effect a heat-sink, they will give a long trouble-free service life.

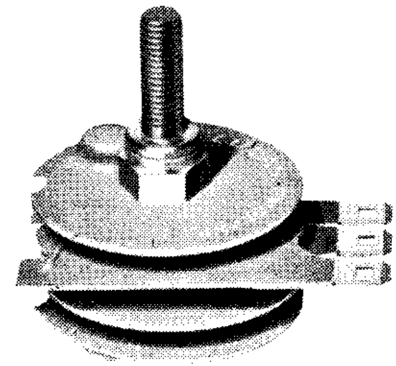

Fig. 10 Silicon diode rectifier with Lucar terminals

Zener Diode – Battery Charge Current Controller (when fitted : As with the silicon rectifiers, the main thing is to see that the mounting plate or heat-sink is positioned so that it has plenty of cool air flowing across it. It should also be kept as clean and as dry as possible. No other maintenance is required.

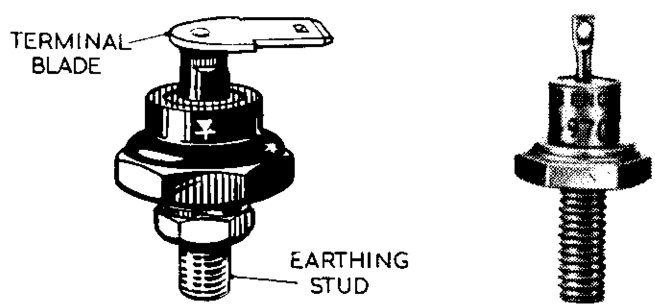

Fig. 11a (left) Zener Diode, model ZD715 (part no. 49345)
Fig. 11b (right) Clipper diode, model CD4008

Clipper Diode — Voltage Stabiliser

The same maintenance instructions given for the Zener Diode apply to the Clipper Diode. Provided it is mounted on a suitable heat-sink, in a good flow of cool air, it only requires to be kept clean and dry in order to give a long trouble-free service life.

Like most semi-conductor devices, the Clipper Diode is heat sensitive and has a maximum working temperature which must not be exceeded. In this case, 239°F. (115°C.) is the safe upper limit. This means that the Diode must be mounted on an aluminium or copper plate which will act as a heat-sink. The heat-sink, to be effective, must be $\frac{1}{16}''$ (1.59 mm.) thick, while the plate area will depend on the maximum output of the alternator as follows:—

Up to 21 watts: 2″ x 3″ (50.8 x 76.2 mm.).
Up to 25 watts: 3″ x 3″ (76.2 x 76.2 mm.).
Up to 30 watts: 3″ x 4″ (76.2 x 101.6 mm.).

Care should be taken to see that the mounting stud is not overtightened when bolting to the heat-sink. The Clipper Diode should not be used with alternators having outputs greater than 30 watts.