Chapter 56

ACTUATOR, ROTAX, TYPE C8501

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Actuator, Rotax, Type C 8501	Stores Ref. 5W/410
Voltage	24V d.c.
Current at maximum working torque (each motor)	43 amp.
Starting current (approx.)	140 amp.
Current at rated torque (each motor)	28 amp.
Brush grade	EGO. HAM
Brush spring tension	10·5 to 12 oz.
Minimum brush length	0·562 in.
Total rated torque	26·5 lb. ft.
Total maximum working torque	50 lb. ft.
Clutch slipping torque	70 lb. ft.
Speed at rated torque	175 r.p.m.
Speed at maximum working torque	135 r.p.m.
Rotation	Reversible
Operating temperature range	—75 deg. C. to — 90 deg. C.
Connecting plugs Stores Ref.	5X/6106
Length	19·000 in.
Width (excluding plugs)	4·937 in.
Height	7·800 in.
Weight	31·5 lb.

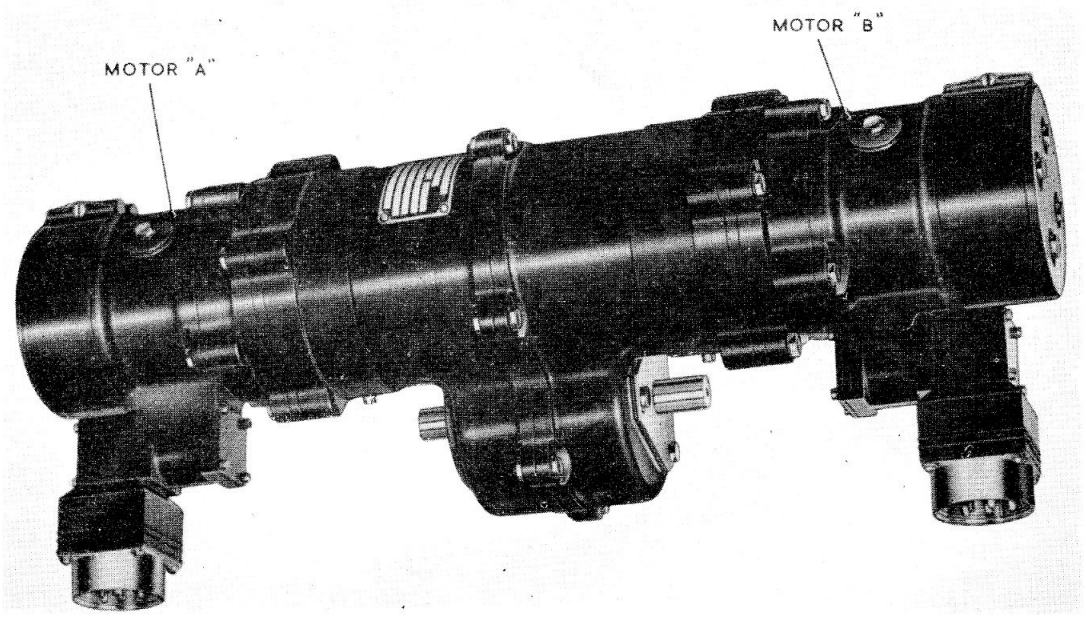

Fig. 1. General view of C 8501 actuator

Introduction

1. This is a reversible double rotary actuator operating from a 24-volt d.c. supply having two reversible motors and a two-way offset output shaft. It is so designed that, with only one motor operating, the unit will operate under the same torque conditions but at half speed and if differing speeds are produced by the two motors, the differential gears will vary the overall gear ratio. The machine is fully tropicalized.

DESCRIPTION

2. The actuator consists, in general, of five main assemblies. These are the two motors in their housings, the two drive end frames with bearing housings each containing a brake and clutch, and the gear housing, which has a right and left member containing the reduction and differential gears and, offset, the output shaft and clutch.

Motors

3. These are four pole compound wound machines each with four field coils, two series and two shunt. The poles are laminated. Four brushes, each spring loaded in its brush box, bear upon the commutator in each motor ; the brush boxes are mounted on an insulating ring bolted to the end of the motor housing.

4. Access to the brushgear is gained through four windows on the motor housing circumference, one over each brush box, covered when the actuator is in use by a lined metal window strap. The window strap is secured by tension provided by a single screw.

5. The armature is wave wound and the commutator end of the armature shaft is carried in a ball bearing mounted in the motor housing. At the drive end, the shaft is extended through the axis of an electromagnetic brake into a plain bearing in the base of the brake drum. On the shaft at this end is a multiplate clutch to limit the amount of over-run when the motor is stopped. The drive from the motor is transferred to the brake drum by a hollow, splined coupling shaft about the armature shaft, spring loaded against the clutch plates.

6. Reversal of the motor is achieved by reversing the armature connections polarity, to facilitate which the field and armature ends are brought out to separate terminals.

Brake

7. This brake consists of a double flanged steel core on which a coil is wound, the magnetic path being completed by shoes

spaced around the periphery and connecting the two flanges. When the motor is switched on, the brake coil is automatically energized and draws in the shoes against the influence of helical springs, onto the flanges. When the motors are switched off, the shoes are pressed back against the brake drum by the springs. In this manner, the brake is automatically applied. There are four springs per shoe, the brake having six shoes, locating pins from the core preventing their displacement.

Over-run clutch

8. This clutch (*para.* 5), is an integral part of the brake assembly. On application of the brake, kinetic energy of the armature is dissipated by this means and rotation of the armature shaft relative to the brake drum will occur on clutch slipping.

Gearbox

9. Formed integral with the brake drum externally is a sungear which engages the planetary pinions of the first planet carrier (having three pinions), which is also formed to an external sungear, driving the second plane carrier (also having three pinions) in the same way. The whole rotates within a fixed annulus, bolted to the gear housing.

Differential gears

10. The second planet carrier from each motor is formed to a splined shaft, and each protrudes through an aperture into the differential gear carrier along the common axis of the motors. Each shaft carries a sungear, and these sungears engage respectively with two sets of three planets in the differential planet carrier, the carrier being common to both, and the two sets of planets being offset axially and radially in relation to each other in the carrier.

Overload clutch and output shaft

11. Offset from the main axis is the overload clutch and output shaft. The clutch barrel, or output gear, is splined externally to engage with external splines on the differential planet carrier, and splined internally to engage with the outer clutch plates.

12. Inner clutch plates alternate with the outer and are keyed to the output shaft. These are loaded by twelve helical springs located in recesses in a clutch adjusting nut which is screwed onto the output shaft, holding the clutch assembly within the barrel under compression against a flange formed on the shaft.

13. The output shaft is splined at each end and is carried in two ball bearings, one in each end of the offset gear housing. The complete clutch barrel assembly rotates between ball bearings located in liners pressed into this gear housing, and retained by pins.

Connections

14. Electrical connection is by two 8-pole plugs, one on each motor housing. The plugs are located on raised mountings, cast integral with the housing. Connections for each motor individually and for the two motors coupled with regard to direction of rotation are as described in the following paragraphs.

Individual motors

15. For clockwise rotation (looking on drive end), terminals 2 and 5 should be connected to the positive supply, terminal 1 to negative and terminals 3 and 4 should be coupled. For anticlockwise rotation, the positive supply should be connected to terminals 3 and 5, the negative to terminal 1 and terminals 2 and 4 should be coupled.

Coupled motors

16. For clockwise rotation of right hand output shaft, i.e. Motor 'B' end (*fig.* 1) the positive supply should be connected to terminals 3 and 5 on Motor 'A', 2 and 5 on Motor 'B'; terminals 2 and 4 should be coupled on Motor 'A' and terminals 3 and 4 on Motor 'B'; the negative supply should be connected to terminal 1 on both motors.

17. To reverse the unit, i.e., anti-clockwise rotation, connect the positive supply to terminals 2 and 5 on Motor 'A', 3 and 5 on 'B'; 3 and 4 on 'A' to be coupled as should be 2 and 4 on 'B'; both terminals 1 should be connected to the negative supply.

INSTALLATION

18. This is to be in accordance with the appropriate aircraft handbook.

SERVICING

19. Normally, servicing of this actuator will not necessitate any dismantling, other

than removing the straps which enclose the brush-gear.

Brushgear

20. Service the brush-gear in the following manner :—

(1) Remove the window strap surrounding each brush-gear by withdrawing the securing screw, and remove the brushes from their holders.

(2) Check the length of the brushes to ascertain if they are long enough to perform satisfactorily until the next servicing period. The minimum permissible length is 0·562 in. If new brushes require fitting, it is only necessary to remove the motor unit concerned in order that new brushes can be properly fitted and bedded.

(3) Check that the brush-gear is free from carbon deposits and that the brushes slide freely in their boxes without any tendency to bind. If a brush appears to be binding this may be due to an accumulation of carbon dust which should be removed. Loose dust may be removed with a jet of dry compressed air.

(4) Badly chipped or cracked brushes should be removed and new ones fitted.

(5) Check the brush spring pressures by attaching a tension gauge (Stores Ref. (1H/86) to the tip of the spring and raising it $\frac{1}{8}$ in. above the top of the brush box. The correct pressure should be between $10\frac{1}{2}$ and 12 oz. (293 and 340 grm.).

Lubrication

21. The bearings of the actuator are grease lubricated during manufacture and repair and, normally, should not require lubrication during servicing periods.

General

22. Ensure that all external screw and locking devices are secure. Examine the motor supply plugs for security and damage, also the brush-gear connections.

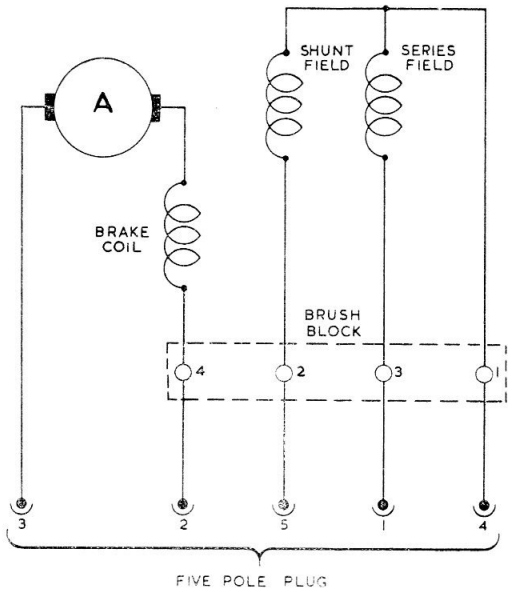

Fig. 2. Circuit diagram, C 8501 actuator

23. At the conclusion of the servicing operations, ensure that the inspected components are in their correct positions.

Testing

24. The insulation resistance between all live parts and the frame should be measured, using a 250-volt insulation resistance tester, and should not be less than 50,000 ohms.

Note . . .

This value applies to units being tested under normal workshop conditions. Due allowance should be made for the climatic conditions of the locality and those of the aircraft servicing area or dispersal point. In particularly damp or humid climates, the reading will be low enough to give apparently sufficient reason for rejection and in these instances discretion should be exercised.