Appendix 11

ROTAX, TYPE A1700 SERIES

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Introduction

1. These actuators are general purpose 28 volt d.c. machines having two identical motors, either one of which, when selected, will drive the ram via a spur type gearbox and differential. They have been designed for operating aircraft ancillary equipment.

DESCRIPTION

2. The various types forming the A1700 series (*fig.* 1) are of the same general construction and differences between any one type and the basic type is confined to the amount and speed of ram travel. In external appearance, however, the position of the supply plugs may vary, being in either one of two positions, to suit the requirements of the installation for a particular type of unit. From one position, the alternative is obtained by traversing the mounting plate through 180 deg. For information relating to a particular type of actuator in the A1700 series, reference should be made to the appropriate Chapter in A.P.4343D, Vol. 1, Sect. 14.

3. These actuators comprise two identical motor units mounted either side of a central housing containing the ram, screwshaft and differential gearing. In addition, this housing contains an arrangement of limit switches and provides the means for mounting two supply plugs for the motors.

Motors

4. The motors are 2-pole, 2 brush machines and are split series wound with laminated yoke and pole shoes. The armature is supported at the commutator end by a ball bearing; at the drive end it is located in a plain bearing in a driving plate which, in turn, runs in a ball bearing. Relative rotation between the armature and the driving plate occurs only during clutch slip. Reversal of rotation is effected by changing the field connections

Brake and clutch

5. Between each motor and its gearing is a disc type electro-magnetic brake and a single plate clutch. When the motor is operating, the brake coil, which is wound on a solid core, is energized, attracting the brake disc against the influence of helical springs. When the coil is de-energized, the springs force the brake disc against the face of the driving plate which is revolving at armature speed. The brake disc is faced with Langite and is prevented from rotating by three dowel pins locating in the brake solenoid shell.

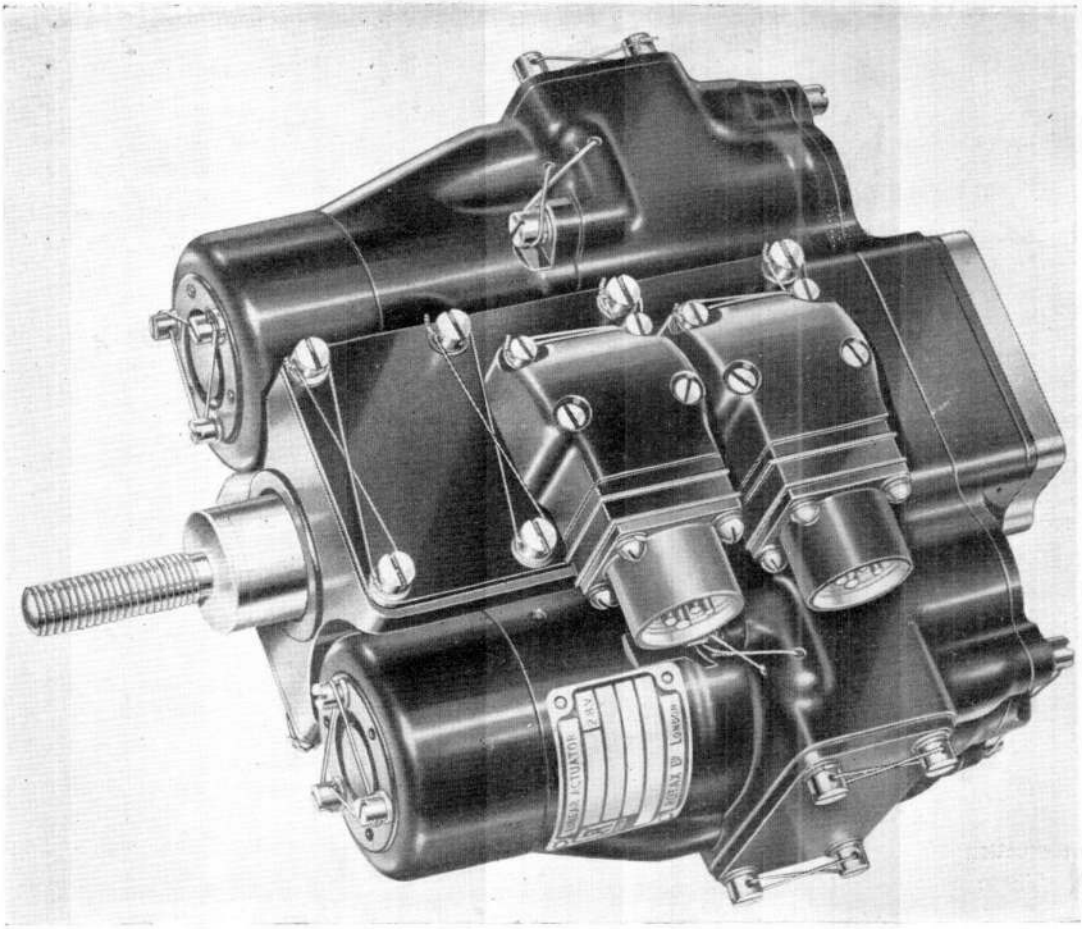

Fig. 1. Actuator, typical of Type A1700 series

6. Interposed between the armature and the driving plate is a single plate phosphor bronze clutch. This dissipates the stored energy in the armature when the brake is applied, thus assisting the deceleration of the ram.

Gearbox

7. The gearbox contains a six-stage, spur gear train assembled about three lay shafts. The final stage gear of the train has a shaft formed integral with it which extends beyond the gearbox and carries a pinion. This extended shaft is borne between two ball bearings and receives the drive from the gearbox via the centre lay shaft to which it is secured.

8. The differential gear unit has two similar external gears machined on it and the unit is so positioned as to allow the pinions on the extended shafts (*para.* 7) to engage with it, one pinion meshing with each external gear.

Ram and screwshaft

9. The ram, housing a steel nut, is driven by a high efficiency screwshaft having two tracks of recirculating balls. The screwshaft is borne at the mounting end of the actuator by a thrust race and torque reaction is absorbed by six key balls. These balls are arranged in two sets of three and they slide in guides in the ram housing. Positioned in the front of the ram housing, and interposed between two circlips, is a rubber sealing ring through which the ram passes.

10. The protruding end of the ram is threaded $\frac{3}{8}$ in. B.S.F. to facilitate the fitting of a suitable shackle (not supplied with actuator), according to the requirements of the installation.

Limit switches

11. The movement of the ram is controlled by snap action limit switches. Generally

speaking, actuators in the A1700 series incorporate four switches, two being provided for each motor to control the ram travel in each direction. For certain applications, however, eight switches may be provided where control of a mid-way position is required. For further information on particular types, reference should be made to A.P.4343D, Vol. 1, Sect. 14.

Electrical connection

12. Electrical connection to each motor is made via a 4-pole plug (Stores Ref 5X/6006). The plugs are mounted on a cover plate of the ram housing. The plate being held in position by eight screws symmetrically spaced, it is possible for the supply plugs to be mounted in one of two positions, 180 deg. traversed (*para. 2*).

13. The two motors are identified as No. 1 and No. 2 Motor, No. 1 being that on the right of the actuator when viewed from the shackle end, plugs uppermost.

14. The relationship between a plug and the motor it supplies is thus:—

Plug shroud of Motor No. 1	Red
Plug shroud of Motor No. 2	Green

INSTALLATION

15. These actuators are suitable for mounting in any position. A mounting plate, secured to the ram housing at the opposite end from the shackle, is provided with four 2 B.A. tapped holes equi-spaced on a P.C.D. of $2\frac{1}{4}$ in.

16. The overall dimensions are as follows:—

Length of actuator body	5·812 in.
Width	5·875 in.
Depth	3·516 in.

Note . . .

When installed, the ram of these actuators should not be subjected to side load.

SERVICING

17. Normally, servicing of an actuator will not necessitate any dismantling, other than removing the end covers which enclose the brush-gear of the motors. The covers are secured in position by three 6 B.A. screws and locked by a tie wire.

Brush-gear

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

(1) Having removed the covers to give access to the brushes, check the length of the latter to ascertain if they are long enough to perform satisfactorily until the next servicing period. The minimum permissible length is 0·200 in. If new brushes require fitting, it will necessitate removal of the unit from the aircraft in order that new brushes can be properly bedded. (*A.P.4343, Vol. 1, Sect. 18, Chap. 1*).

(2) 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 in the box which should be removed with a jet of dry compressed air.

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

(4) Check the brush spring pressures by attaching a tension gauge (Stores Ref. 1H/59) to the tip of each brush spring and raising it level with the top of the box. The correct pressure is $2\frac{1}{2}$ to $3\frac{1}{2}$ oz. (71–99 gr.).

Lubrication

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

General

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

21. At the end of the servicing operations, ensure that the inspected components are in their correct positions, also replace and secure the brush-gear covers.

Testing

22. 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 2 megohms.

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 may be low enough to give apparently sufficient reason for rejection, and in these instances discretion should be exercised.

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