Chapter 38

ACTUATOR, B.T.H., TYPE EA2

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TABLE

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Actuator, Type EA2

Voltage	29 volts d.c.
Working load	350 lb.
Stall load	600-750 lb.
Weight	4 lb. 4 oz.
Current consumption (max.)	2·5 amp.
Brush grade	E.G.12 (H.A.)
Brush spring pressure	3 oz. ± 10 per cent.

TABLE 1
Data for different Forms

Form	Stores Ref.	Gear ratio	(Length of stroke in.)
2	5W/345	512:1	2
3	5W/	338:1	3
4	5W/	83:1	3
5	5W/	338:1	2
6	5W/	512:1	1
7	5W/	338:1	$2\frac{1}{2}$

Introduction

1. The actuator, Type EA2, is made in various Forms, which differ only in gear ratio and the length of stroke; relevant details are given in Table 1. The actuator illustrated throughout this chapter is Form 3, which shows one type of mounting; this may be different on other actuators.

DESCRIPTION

2. The actuator is illustrated in fig. 1, and a sectional drawing is given in fig. 2. It incorporates a 24-volt d.c. motor, fitted with a brake, which drives through an overload clutch a train of spur gears which terminates in a worm and nut drive to the operating plunger.

3. A Desynn transmitter unit is geared to the main train, and gives remote indication of plunger travel over its complete range. The extent of the stroke is controlled by limit

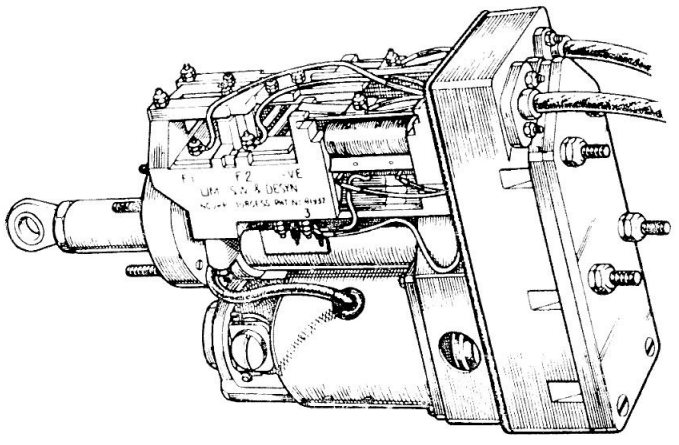

Fig. 1. Actuator, Type EA2, with cover and stop-nut removed

switches ; as a further measure, permanent stops are provided to prevent serious damage in the event of the limit switches becoming inoperative.

Motor

4. The motor, Type LD0704, Form 5, is a 24-volt d.c. split-series type. The armature shaft runs in ball bearings, which are mounted in the bearing plates at each end. The motor brushes are accessible after removal of the main moulded cover.

Clutch and brake

5. The motor drive is taken through a steel plate and friction disc to the gearbox, the necessary clutch pressure being applied by a compression spring located in the hollow centre of the motor extension shaft. The brake consists of another friction disc, and a steel plate which can move longitudinally, but cannot rotate. The braking pressure is applied by three compression springs located below the brake plate in the main body.

6. A felt washer is provided around the motor extension shaft below the internal cover plate, to prevent the ingress of gearbox lubricant to the brake and clutch plate.

Gearbox

7. The actual gear ratio varies according to the Form of actuator, as listed in Table 1. The gears are mounted in miniature ball bearings, and the gearbox is lubricated with grease on assembly. The spur gear train terminates in the drive to the worm shaft, which is mounted on semi-thrust bearings, also lubricated on assembly.

Worm and nut

8. The threads of the worm and nut are of Acme form, the steel worm being integral with the gearbox final drive spindle, and the bronze nut integral with the operating plunger. Final adjustment of the operating plunger length is provided by an adjustable swivel eyebolt assembly in the end of the plunger. Lubrication of the worm and nut can be effected by the insertion of grease into the bore of the operating plunger after removal of the swivel eyebolt assembly.

Desynn transmitter and limit switch unit

9. The cam plate, to which are attached the transmitter moving contacts, is operated by a nut on a worm shaft geared to the main actuator drive. The unit is mounted on a moulded base, to which are also attached the limit switches. These are of the quick-action type, and are operated by a pivoted rocker arm actuated by a cam attached to the cam plate. Adjustment of the limit switches is effected by varying the position of the cam with respect to the switch lever, elongated slots being provided for the cam fixing screws.

10. The Desynn transmitter and limit switch unit, having its own gear drive and operating screw, is arranged to provide indications on the Desynn instrument for the various positions of plunger travel. The moving contacts on the cam plate make contact with two rheostats, as shown in the circuit diagram in fig. 4.

Cover

11. The moulded cover of the actuator is pulled down on its sealing gaskets by the self-locking nuts ; these retain the circular metal bottom cover which forms the over-ride mechanical stop in the extended position of the actuator.

INSTALLATION

12. For information on an installation in a particular aircraft, reference should be made to the appropriate Aircraft Handbook.

13. When checking the operation of limit switches during installation, it is essential to

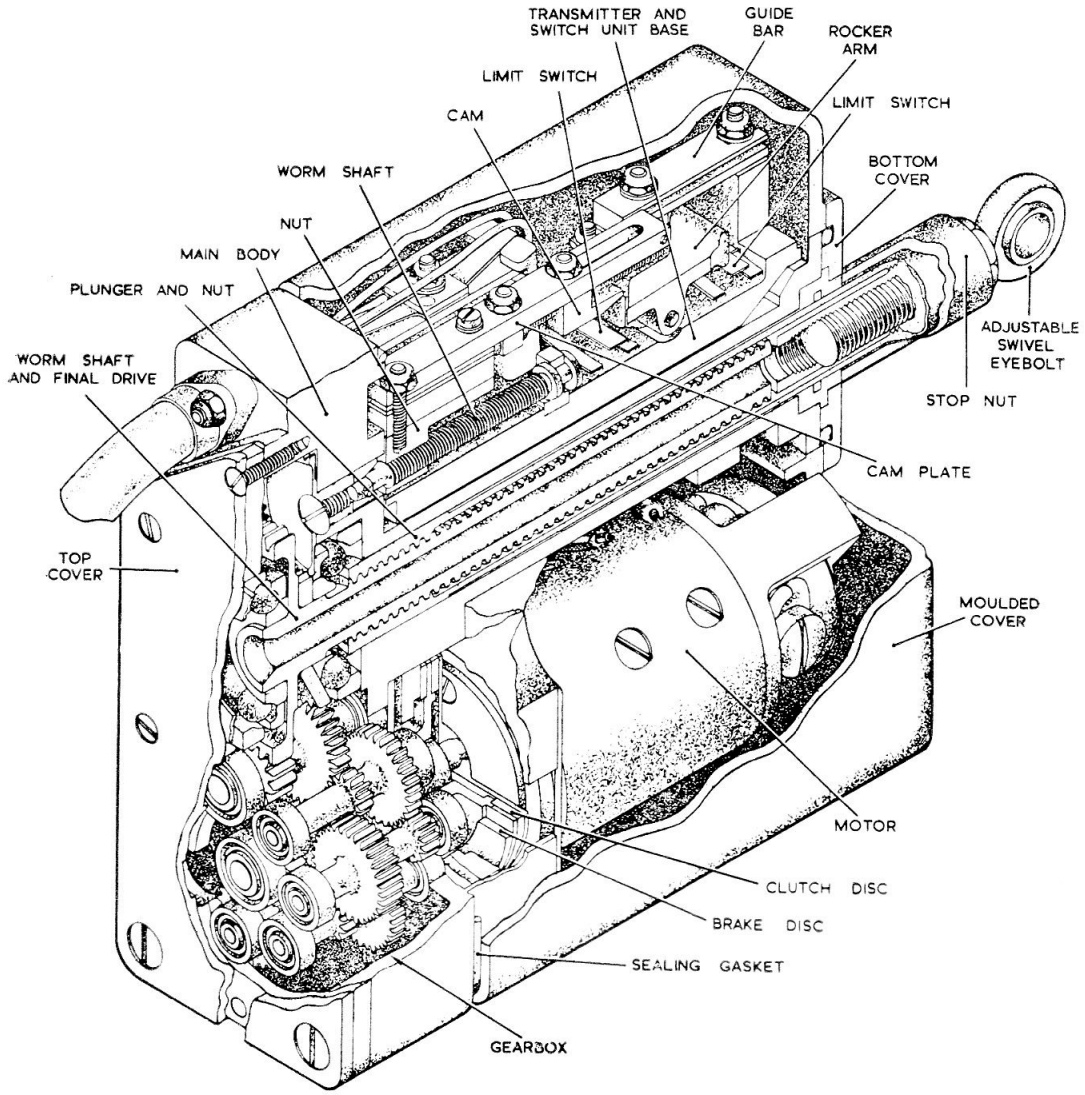

Fig. 2. Sectional view of actuator

re-fit the metal bottom cover and the lock-nuts before operating the actuator. If this is not done, the operating plunger has no permanent stop in the extended position, and should the limit switch not operate, the plunger will travel out of engagement and drop out of the actuator.

14. It is important to avoid connecting the 24-volt supply to any of the Desynn transmitter unit leads. If accidental contact is made, the fine wire of the rheostat bobbins will probably be fused and open-circuited, causing erratic instrument readings.

15. Where it is important for the actuator to stop at a pre-determined point as indicated by the indicating instrument, the normal procedure is to adjust the limit switch for this position before the swivel eyebolt, in the end of the operating plunger, is connected to the aircraft mechanism. The eyebolt is then adjusted for position with respect to the operating plunger, with the aircraft mechanism set in the position indicated by the instrument. The eyebolt should now be connected to the aircraft mechanism, and locked in position by its lock-nut.

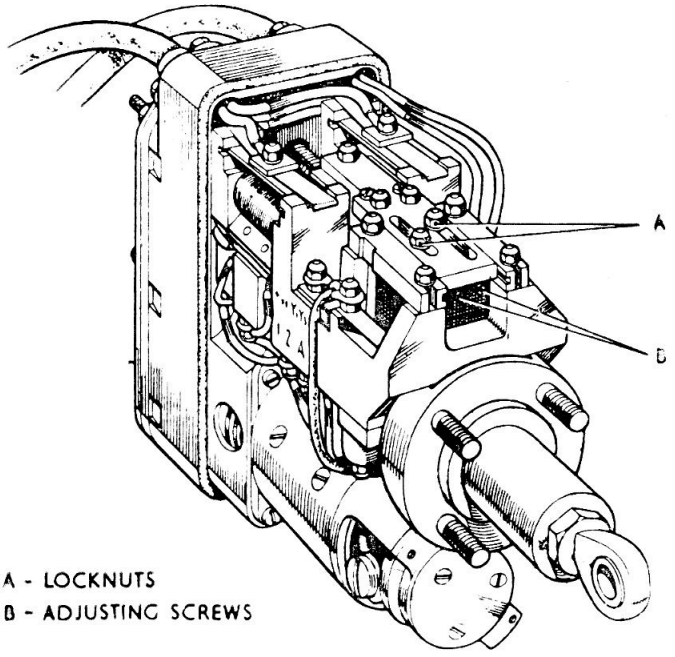

Fig. 3. Adjustment of limit switches

SERVICING

16. Absolute cleanliness of the actuator is essential, particular attention being paid to the commutator, brush gear, and transmitter and limit switch unit.

Lubrication

17. All bearings in the motor and gear train are partially packed with grease during assembly, and do not require further lubrication between major servicing periods.

18. To lubricate the operating plunger, remove the swivel eyebolt in the end of the plunger, after slackening its $\frac{5}{16}$ in. locknut, and fill the centre of the plunger with grease XG-275 (Stores Ref. 34B/9100512). This must be done with the operating plunger in the extended position. Re-fit the swivel eyebolt and tighten its lock-nut, after taking

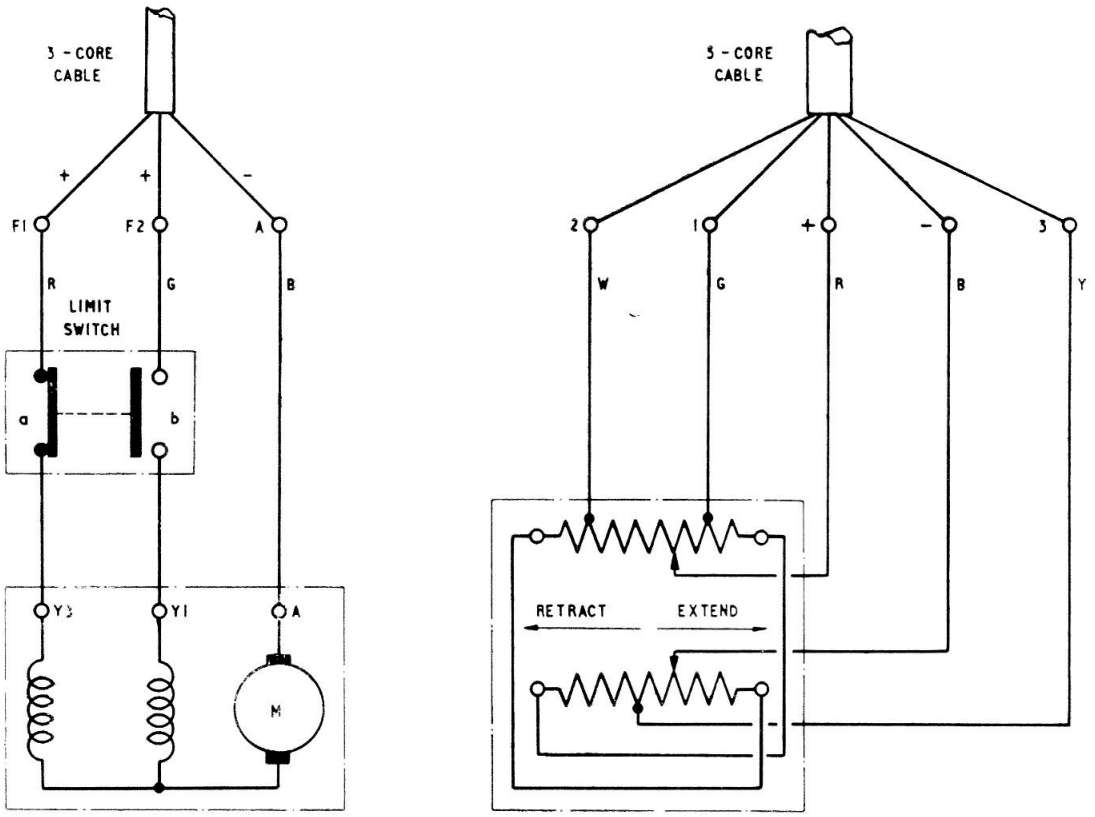

Fig. 4. Circuit diagram

care to position the swivel eyebolt so that the original instrument indications are maintained.

Brushgear

19. Access to the brushgear is gained after removal of the moulded cover. Unscrew the brush caps and withdraw the brushes and springs from the brush boxes for inspection. Brushes should be renewed before they reach the minimum permissible length of 4·0 mm.

20. If new brushes are being fitted, the motor must be removed from the actuator assembly as follows :—

(1) Disconnect the motor connections at the transmitter limit switch terminals.

(2) Undo the four screws which secure the motor to the actuator body. Carefully remove the motor and slip clutch plate which is keyed to the motor shaft.

Note . . .

The clutch friction disc and brake assembly can be left in situ, and retained by placing a small bar of metal through the circular recesses in the sides of the actuator housing.

21. After the new brushes have been bedded in, re-fit the motor unit to the actuator body, ensuring that the motor shaft engages with the extension shaft, and re-connect the motor at the transmitter switch terminals.

Limit switches

22. Check the operation of the limit switches, and make the necessary adjustment to their settings if they are not tripping at the desired positions. Fig. 3 illustrates the positions of the lock-nuts and adjusting screws for the limit switches.