Appendix 10

PLESSEY, CUB PANTHER SERIES

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

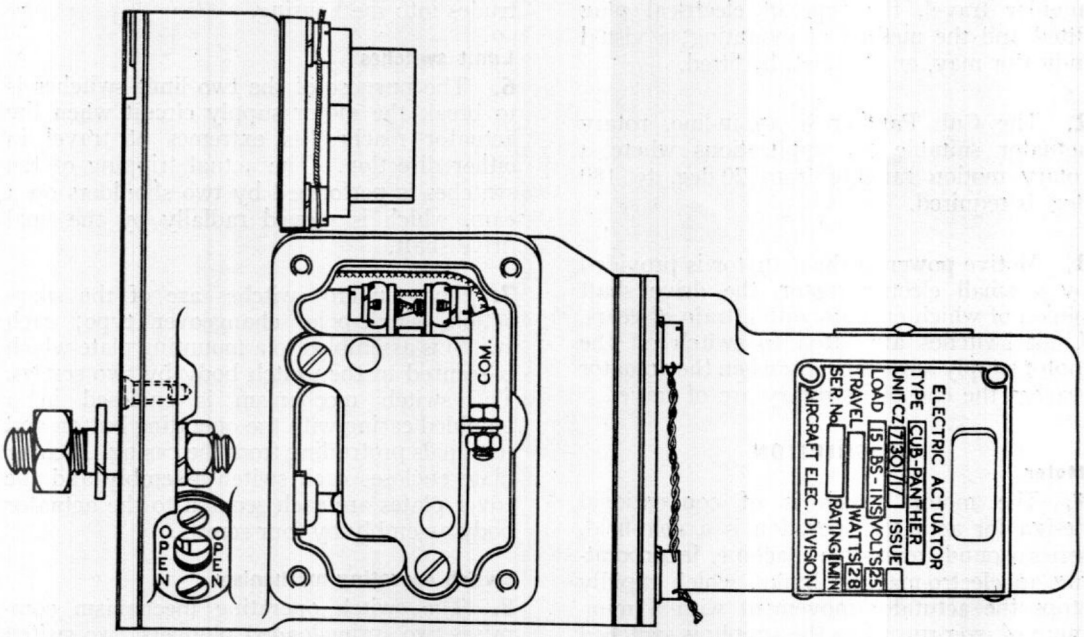

Fig. 1. General view of actuator with switchbox cover removed

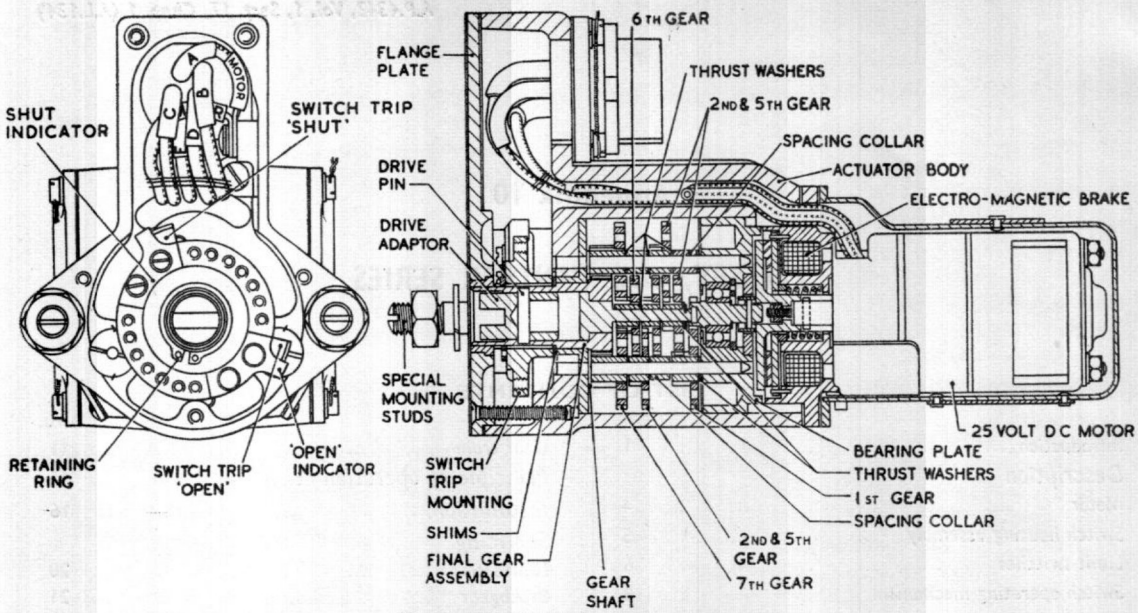

Fig. 2. Sectional view of actuator

Introduction

1. Plessey rotary actuators of the Cub-Panther series follow the general design described in this Appendix; the actuator illlustrated, the Type CZ 71301/1, is typical of the series and specific details of individual actuators will be found in A.P.4343D, Vol. 1, Book 3, Sect. 16. They vary in such details as the working load, the distance and time of angular travel, the type of electrical plug fitted and the method of mounting; a visual indicator may, or may not, be fitted.

2. The Cub Panther is an in-line, rotary actuator suitable for applications where a rotary motion ranging from 20 deg. to 180 deg. is required.

3. Motive power in the actuator is provided by a small electric motor, the drive shaft pinion of which engages with a train of gears. Limit switches are fitted to switch off the motor supply automatically when the actuator reaches the end of its rotary arc of travel.

DESCRIPTION

Motor

4. The motor, which is of conventional design for actuator operation is a split-field, series wound, reversible machine, incorporating an electro-magntic brake, which rapidly stops the actutator movement with a minimum of over-run when the supply is switched off. It is attached to a spigot plate interposed between the motor housing and gear train by means of four 4 B.A. (drilled head) screws and spring washers.

Switch housing assembly

5. The switch housing contains the two limit switches, the visual indicator, and switch adjustment mechanism. Half of the electrical plug, together with its associated wiring protrudes into the housing.

Limit switches

6. The purpose of the two limit switches is to break the motor supply circuit when the actuator reaches its extremes of travel in either direction. The actual tripping of the switches is performed by two shoulders on a cam, which is moved radially by the final drive shaft.

7. These micro switches are of the snap-action, single-pole, changeover type; each switch is assembled to a mounting plate which is secured to the switch body by two screws. The switch mechanism is enclosed in a moulded casing with the operating button and terminals protruding from the casing. A cover plate encloses each switch assembly and the cover plates are each secured to the actuator body assembly by four screws.

Switch operating mechanism

8. The switch operating mechanism comprises two spring-loaded plungers, two switch trips and a mounting plate. Each plunger is

enclosed in a cylindrical casing which is threaded along the outside. The plunger ends protrude from each end of the casing. Each casing is screwed into a threaded hole in the actuator body assembly and is locked in position by peening. One end of each plunger is located at the operating button of a limit switch and the other end is located in the arc through which a switch trip moves. The trips are fitted to the mounting plate and are each secured by two screws. The mounting plate is assembled to the output shaft and secured on the shaft by a retaining ring. The mounting plate has twenty-four threaded holes spaced evenly around its flange: the fixing screws of each switch trip locate in two of these holes and the position on the trip can be varied around the circumference of the flange. A visual indicator is assembled with each switch trip, one indicator being marked "OPEN" and the other "SHUT". The indicators can be viewed through two window openings in the actuator body.

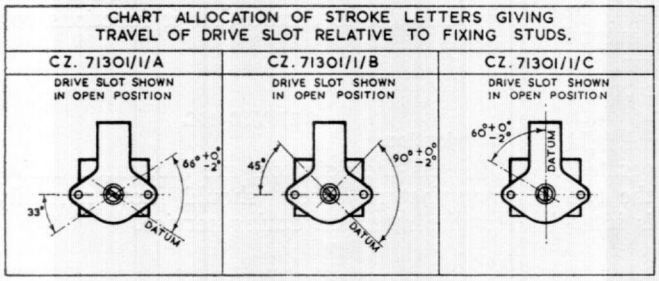

Fig. 3. Actuator variants, allocation of stroke letters

Electrical connections

9. A 6-pole Breeze plug is fitted to the actuator, F pole of which is spare. The plug is mounted on the actuator body, and secured by four ch-hd. screws. Connections from the actuator plug to the external circuit are made via a mating 6-pole Breeze socket. In some actuators of this design a 5-pole Breeze plug is fitted.

Actuator variants

10. This actuator can be adjusted by the manufacturers to give various arcs of angular travel and hence different operating periods, thus providing a range of this actuator for different applications. Each actuator, though of the same design, is allocated a stroke letter giving travel of drive slot relative to fixing studs as shown (*fig.* 3).

Gear train

11. The gear train is housed in the actuator body assembly and comprises a pinion gear, light compound gears and a final drive gear. The shaft of the pinion gear is supported by a ball bearing and the end of the shaft is located in a collar at the centre of the output plate of the motor. A drive pin passing through the shaft locates in slots in the collar of the motor output plate.

12. The light compound gears are supported on three layshafts which are assembled parallel to each other in the actuator body. The centre layshaft, which is an extension of the output shaft, supports three compound gears and the other two shafts support two or three compound gears respectively. The two side layshafts are supported, at one end in the housing of the pinion bearing, and at the other end in the actuator body. The end of the centre layshaft is supported in the centre of the pinion gear. The compound gears are positioned on the side layshafts by spacers and thrust washers. The gears on the centre layshaft are secured in position by a circlip. The end float of all gears is controlled by fitting shims on the layshaft.

13. The final drive gear is integral with the output shaft. The shaft is hollow at the drive end and a drive pin is assembled diametrically through the shaft to engage the actuator load fitting. This type of actuator has a drive adaptor which is slotted at both ends, the slots being positioned at right-angles to each other. One slot engages the drive pin of the output shaft and the other engages the actuator load fitting.

14. The pinion gear engages the larger gear of the first compound gear. The smaller gear of the first compound gear engages the larger gear of the second compound gear. This sequence of the smaller of one gear engaging the larger of the next gear is continued up to the sixth gear. The smaller gear of the sixth gear engages the larger gears of both the seventh and eighth compound gears and the smaller gears of these two compound gears drive the final gear in tandem.

PRINCIPLE OF OPERATION

15. A reversible, fractional horse-power motor drives, through a reduction gear train,

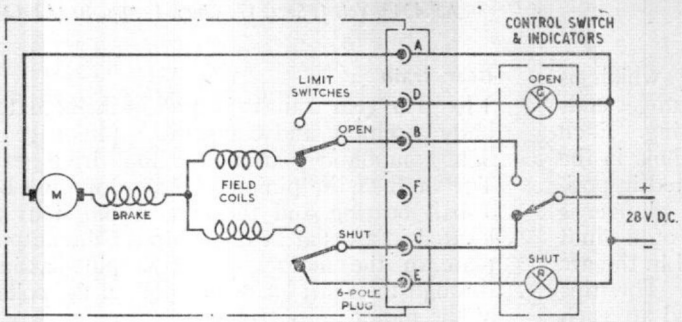

Fig. 4. Circuit diagram

a rotary output shaft. The required rotary travel of the shaft is established by two limit switches, which are operated by spring-loaded plungers. The plungers are tripped by adjustable trip plates mounted on a ring plate assembled to the output shaft. The positions of the two trip plates on the mounting ring determines the angular travel of the output shaft. One limit switch is in series with the clockwise field coil of the motor, and the other is in series with the anti-clockwise field coil. When either switch interrupts the supply to the motor a limiting position of the output shaft is reached. To minimize overrun, the motor is fitted with an electro-magnetic brake, the "hold-off" coil of which is in series with the armature and one of the directional field coils; hence, when a limit switch is operated, the supply to the armature, one of the two field coils, and the "hold-off" coil, is interrupted, and the motor is brought rapidly to a halt. The internal connections of the actuator and a typical control circuit are shown (*fig.* 4). The connections from the normally-open contacts of the limit switches to pins D and E of the 6-pole plug are connected to an external indicator circuit, if such an indicator circuit is required. Performance characteristics of the actuator are shown (*fig.* 5).

INSTALLATION

16. Ensure that the actuator has the necessary fittings and is set to the appropriate angles of travel for the particular installation for which it is to be used. It is important to observe that the attachments are able to move freely and to ensure that the actuator and its associated load are both at the correct end of their travel before coupling them together.

17. Remove the protective cap from the electrical plug on the actuator and mate the plug and socket. Ensure that the mounting studs on the actuator, or the mounting holes fitted on other types of the same fundamental design, are in alignment with the holes in the mounting plate on the driven component.

18. The CZ 71301/1 actuator is mounted in position by means of two $\frac{1}{4}$ in. B.S.F. studs which pass through holes in the mounting flange of the actuator body and protrude from the flange plate assembly, fitted at the drive end of the actuator, and held by nuts and spring washers.

19. After installation the actuator should be given a test to ensure that it functions correctly.

SERVICING

Lubrication

20. As the actuators are lubricated during manufacture, they should not normally require attention during service.

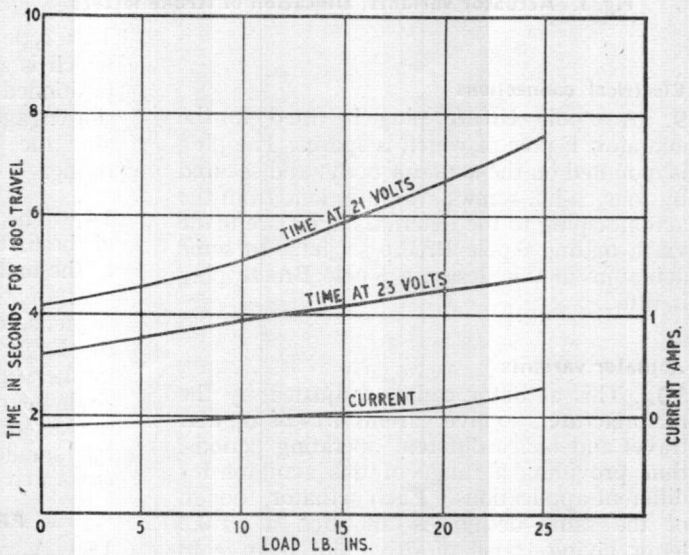

Fig. 5. Performance characteristics

Brushgear

21. The brushgear of the motor is accessible when the motor housing cover is removed. The condition of the brushes can be inspected and renewed if necessary; brush dust can be removed by using dry compressed air.

Note . . .

During the normal operational life of the actuator it should not be necessary to renew the brushes or attempt to re-adjust brush spring pressure. Should such action be necessary, it must be carried out only by qualified technicians acting on competent authority, and when adequate servicing gear is available.

Insulation resistance test

22. Using a 250 volt insulation resistance tester, test between all live parts and the frame. A reading of not less than 2 megohms must be obtained.

23. Due allowance has been made for the climatic conditions associated with electrical equipment, after installation in aircraft. Under these conditions the allowable insulation resistance must not be less than 50,000 ohms.

Final inspection

24. Examine all external screws, locknuts and locking wires for tightness and security. Ensure that the electrical plug and socket connections are tight and free from corrosion.

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