Chapter 10

SWITCH, STARTING, Type 3A, No. 2 (ROTAX U2301)

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Switch, magnetic, starting, Type 3A, No. 2	Stores Ref. 5CW/5038
Starting resistance at 20 deg. C. (first stage)	0·1 ohm ± 10 per cent
Starting resistance at 20 deg. C. (second stage)	0·085 ohm ± 10 per cent
Coil resistance at 20 deg. C. (both stages)	85 ohm ± 10 per cent
Pull-in voltage (first stage)	65-V d.c.
Pull-in voltage (second stage)	85-V. d.c.
Rating of contactors	85 min.
Operational ceiling	50,000 ft.
Operational temperature range ...	—70 deg. C. to + 50 deg. C.
Length	12·312 in.
Width (including mounting lugs)	8·749 in.
Height	5·655 in.
Weight	13 lb. 6 oz.

Fig. 1. Type 3A, No. 2 starting switch

Introduction

1. The 3A, No. 2 two stage starter switch is designed for use in circuit with a 112-V. d.c. motor in order to protect the motor armature from an initial heavy surge of current at the moment of switching on. The two contactors, which form a part of this unit, are designed to have a constant pull-in voltage under all conditions of acceleration.

DESCRIPTION

2. Two "Brightray B" starting resistors are set on aluminium spacers and are supported by insulating spacers, the complete assembly being mounted on a sheet metal base. Two contactors are also mounted on the base at one end of the unit. One end of each starting resistor is connected by a common conductor to one main terminal of each contactor. The remaining main contactor terminals and the remaining terminations of the starting resistors are connected to the main terminals of the unit (i.e. terminals 1 and 2) by copper conductors. The contactor ballast resistors are mounted above the starting resistors and each is connected in series with its associated contactor coil across the secondary terminals (i.e. terminals 3 and 4), by glass covered flex. The cover which encloses the unit has two flameproof cowls for ventilation and two strips riveted across it which project on either side to form four mounting lugs.

3. Each contactor is operated by a solenoid having two co-axial plungers, each of which is linked by a lever to a crank, one on each side of a pin to which a moulded contact carrier is pivoted. A moving contact plate having two contacts is spring mounted on the contact carrier. The corresponding fixed contacts are set in a moulded housing and are integral with the main contactor terminal posts. When the solenoid is energized, the two plungers are drawn inwards towards one another and the movement of their levers rocks the contact carrier so that both contacts close and the main terminals are commoned. When the solenoid is de-energized, two torsion springs about the contact carrier pivot open the contacts and move the plungers to their normal positions. The opposed plungers ensure a constant pull-in voltage under all conditions of acceleration.

External connections

4. The main terminals (1 and 2) are $\frac{1}{4}$ in. B.S.F. studs insulated from the base by moulded bushes and washers. The secondary terminals (3 and 4) are 2 B.A. studs similarly set in the base.

Operation

5. The operation of the unit depends upon the starting resistors being connected in series with the motor armature and the

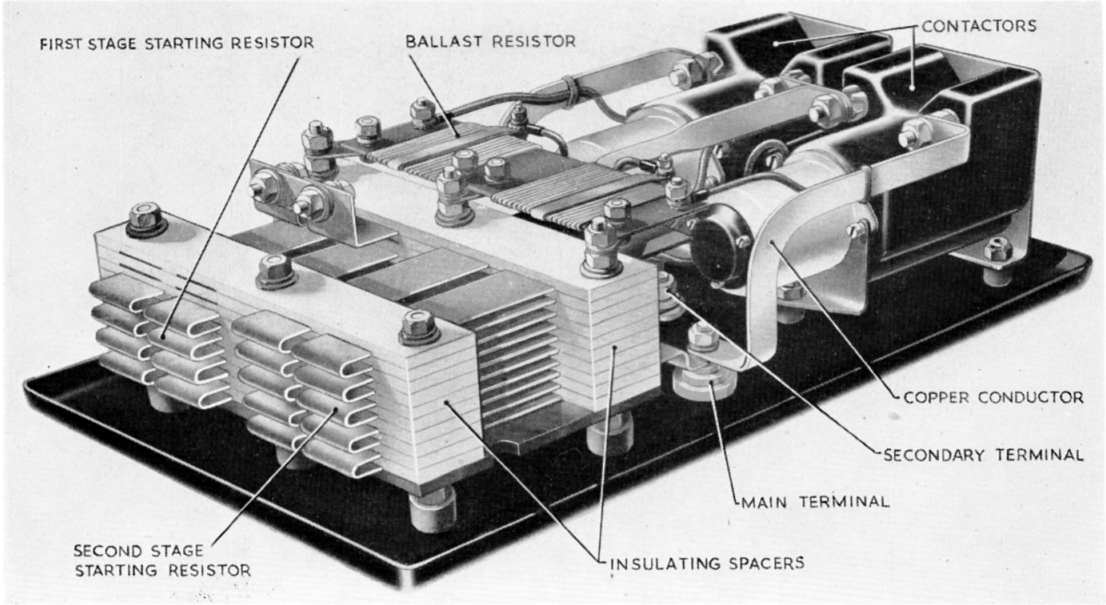

Fig. 2. Switch unit, with cover removed

operating coils circuit in parallel with the armature. When the motor is switched on, the starting resistances limit the current surge through the armature but, as the motor gathers speed, and the potential drop across the armature (due to generated back e.m.f.) reaches 65-volt, the first stage contactor operates, shorting out the first stage starting resistor. When the potential drop across the armature reaches 85-volt, the second stage contactor operates, shorting out the remaining starting resistor so that full voltage is applied to the motor. The first stage contactor operates after approximately 0·21 sec. and the second stage contactor operates after approximately 0·29 sec. All contacts return to normal when the motor is switched off.

INSTALLATION

6. The unit may be mounted in any attitude. Four 0·257 in. diameter holes are provided for mounting. Their fixing centres form a rectangle 8·125 in. × 6·875 in.

SERVICING

7. The tests detailed in paras. 8, 9, 10 and 11 are sufficient to ensure the satisfactory operation of the unit. In addition, a visual inspection should be made to ensure that there is no superficial damage.

Resistance tests

8. Measure the value of each starting resistance and each relay coil (it will be necessary to disconnect a lead from one of the ballast resistors in order to isolate the coils). When corrected to 20 deg. C. ambient temperature, the first stage starting resistance should be 0·1 ohm. ± 10 per cent and the second stage starting resistance should be 0·085 ohm. ± 10 per cent; the resistance of each contactor coil should be 85 ohm. ± 10 per cent.

Pull-in voltage tests

9. Measure the minimum pull-in voltage of each contactor as applied across terminals 3 and 4. The first stage contactor should operate when the applied voltage is between 64-volt and 66-volt, and the second stage contactor should operate when the applied voltage is increased to between 84-volt and 86-volt.

Millivolt drop tests

10. Energize both the contactors of the unit and allow 150 amperes to flow through the main contacts. The potential drop between terminals 1 and 2 should not exceed 260 millivolt.

Insulation resistance tests

11. Measure the insulation resistance between the following points using a 500-V. insulation resistance tester. A reading of not less than 50,000 ohm. should be obtained in each test.

(1) Terminal 1 and terminal 2 (contactors de-energized).

(2) Terminal 1 and terminal 3 (contactors energized).

(3) Terminal 1 and frame (contactors energized).

Measure the insulation resistance between terminal 3 and frame, using a 250-V. insulation resistance tester. A reading of not less than 50,000 ohm. should be obtained.

Note . . .

The value of insulation resistance given in para. 11 applies to units being tested under normal workshop conditions. Due allowance must be made for climatic conditions of the locality and those of the aircraft servicing area or dispersal point where the tests are being applied. In particularly damp climates, the readings may be low enough to give apparently sufficient reason for rejection and in these instances discretion should be exercised.

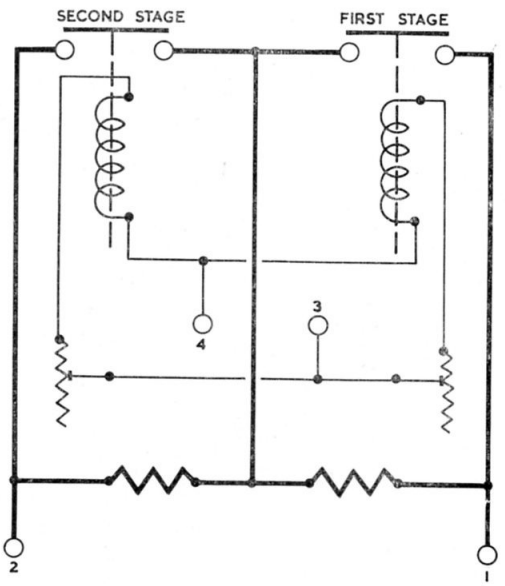

Fig. 3. Diagram of internal connections

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