Chapter 22

TIME SWITCH, TEDDINGTON, TYPE FHM/A/25

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Time switch, Type FHM/A/25	*Stores Ref. 5CW/4439*
Voltage	*12 to 29 d.c.*
Governed speed of motor	*6,000 r.p.m.*
Reduction gearing	*5,926 : 1*
Current consumption at 24 V (nominal)—	
Motor	*0·8 amp. (max.)*
Clutch	*0·25 amp. (max.)*
Weight	*2 lb. 13 oz.*
Overall dimensions	*4·5 in. × 5·5 in. × 4·2 in.*
Rating of switch contacts—	
Contacts A, C and D	*5 amp.*
Contacts B	*10 amp.*

Introduction

1. The time switch, Type FHM/A/25, provides an automatically timed sequence for the operations involved in gas turbine starting. It can be used either for a single breech starter installation, or, in conjunction with a cartridge selector switch, in multi-breech installations.

2. This switch is a resetting type, and is identical to that described in A.P.4343, Vol. 1, Sect. 11, Chap. 19, to which reference should be made for fuller details of mechanical construction.

DESCRIPTION

3. The mechanism of the switch (*fig.* 1) consists of a governed, series wound electric

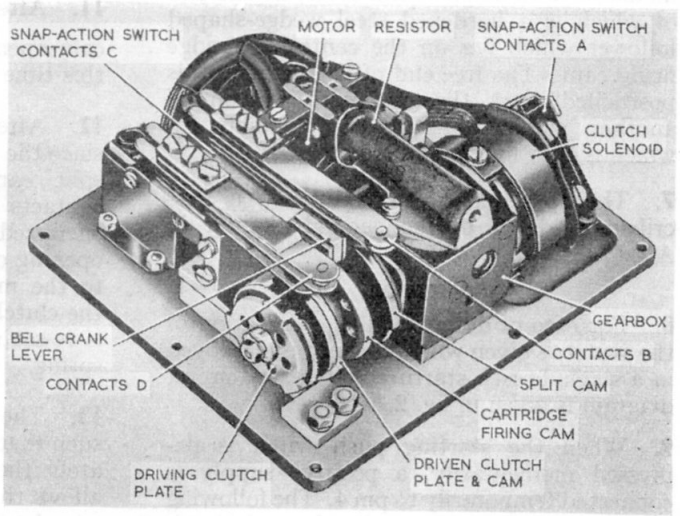

Fig. 1. Time switch, Type FHM/A/25

motor, coupled to reduction gearing, which drives a bank of cams. These cams operate two banks of leaf-spring contacts (contacts B and D), and a snap-action switch (contacts C). On the outer end of the camshaft is a clutch incorporating two serrated plates, actuated by a solenoid at the other end of the shaft; when the solenoid is energized to engage the clutch, thus connecting the cam bank to the gearbox output shaft, this has also the effect of operating another pair of snap-action contacts (contacts A) alongside the clutch solenoid.

4. Mounted on the top of the gearbox is a bracket which carries a resistor, of either 80 or 85 ohms, which is shunted across the motor governor contacts to prevent undue arcing and heating.

5. The cam assembly is carried on a bush which runs freely on the gearbox output shaft, and incorporates the following items:—

A shim washer

A split cam assembly (contacts B)

A return spring assembly

A laminated shim washer

A cartridge firing cam (snap-action contacts C)

A driven clutch plate and cam (contacts D)

6. Two leaf-spring contact assemblies are secured to the contact bank platform in such a position that their followers lie over the split cam and driven clutch plate and cam. The centre of the platform is milled to accommodate a wide angle crank lever, at one end of which is a hardened steel wedge-shaped follower which lies on the central cartridge firing cam. The free end of the bell crank is positioned over the operating button of another snap-action switch (contacts C), which is held in a U-shaped bracket.

7. The operation of the split cam is described in detail in the general chapter in A.P.4343, Vol. 1.

OPERATION

8. For ease of description, the operation of the switch is given where the unit is employed in a single-breech starting system. A circuit diagram is given in fig. 2.

9. When the starting push-switch is depressed momentarily, a positive supply is connected temporarily to pin 4. The following items are energized immediately and simultaneously:—

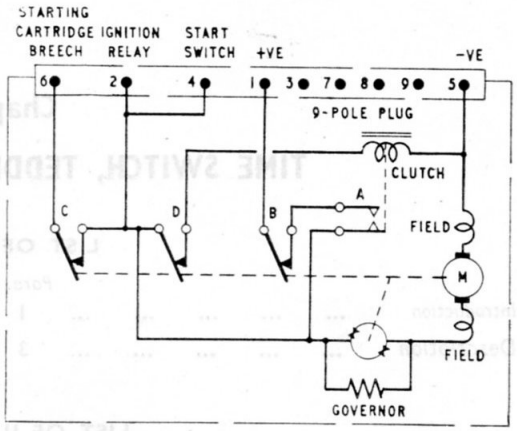

Fig. 2. Circuit diagram

(1) The switch motor, which commences to run.

(2) The external ignition relay through pin 2, which in turn brings the torch igniters, booster coils and priming pump into operation.

(3) The cartridge fuze through snap-action switch contacts C and pin 6.

(4) The clutch solenoid, within the unit, through limit switch contacts D.

10. The engagement of the clutch closes the snap-action switch contacts A, which provide an alternative circuit, through the closed contacts B, for the positive supply to all circuits from pin 1 after the starting push-switch has been released by the operator.

11. After 5 $^{+2}_{-0}$ seconds, the cartridge firing cam opens the contacts C, the cartridge by this time being spent.

12. After 29 $\pm$ 2 seconds have elapsed since the push-switch was first depressed, the split cam, operating the motor hold-on contacts B, opens these contacts; the de-energized ignition relay now drops out. The opening of contacts B also breaks the supply to the motor and clutch solenoid, allowing the clutch to disengage the cam bank, which is re-set under the pressure from the return spring.

13. The design of the split cam, however, is such that contacts B do not re-make immediately the cam bank starts to return. This allows the series coupled contacts A to break completely and cut off the positive supply from pin 1. The split cam has by this time

assumed its normal position, and the cam bank is reset, with the stop on the driven clutch plate engaging the fixed stop on the base. Contacts B, C, and D are all re-made in readiness for the next cycle.

14. Should the starting push-switch be held depressed continuously throughout and after the cycle, the breaking of contacts B would not then de-energize the clutch or motor. The limit switch contacts D would then break 1·0 seconds (minimum) after the normal period for the completion of a cycle had elapsed. Their breaking would throw out the clutch and the cam bank would attempt to return to the normal position under spring pressure, but contacts D would close again before this operation was completed, and the last few seconds of the cycle would re-commence until contacts D broke again.

15. This gentle oscillation of the mechanism would continue without harm to it, until the external circuit to pin 4 is broken by the operator.