Chapter 23

TIME DELAY SWITCH, TYPE D8404

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Type D8404	Stores Ref. 5CW/4698
Operating voltage	16–29 volts d.c.
Winding current	0·5 amp. average at 24 volts
Maximum contact current	8 amp.
Temperature range	−40°C to +70°C
Approximate weight	1 lb. 12 oz.

Fig. 1. General view of switch

Introduction

1. The Type D8404 time delay switch is designed so that, when operated, it automatically closes and then opens two separate circuits in a predetermined time sequence. It is primarily for use in starter control circuits for gas turbines, where the time sequence is initiated by depressing the starter push switch in the pilot's or engineer's position.

DESCRIPTION

2. The switch operates in cycles, approximately 36 seconds elapsing between the time when the starter push switch is depressed and the time when the switch re-sets in readiness for a further operation. The operating current is 0·5 amp.

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average at the nominal voltage of 24 volts, but the switch will maintain correct timing over a voltage range of 16–29 volts.

3. The switch mechanism is housed in two light alloy castings which are bolted together to form a waterproof and flameproof housing (*fig.* 1). The leads are brought out through a waterproof grommet in the side of the base casting.

4. For installation purposes, there are four brass bushes, tapped 4 B.A., in the base casting. The switch mechanism itself is attached to the bottom of the base casting by three hex/hd. 4 B.A. screws.

Switch mechanism

5. Fixed to a mounting plate, an auto-relay is arranged to wind a pre-loaded clock type spring by means of a ratchet mechanism. The wound spring is free to drive a camshaft, the speed of rotation being regulated by an escapement mechanism.

6. Supported in two bearings, the camshaft projects through the mounting plate. By means of a locking wire, cams are keyed on to this projecting portion of the camshaft, and secured by a twicklip. The circuit contacts are assembled in holders adjacent to the camshaft, each moving contact leaf being fitted with a projecting cam follower which bears on a particular cam profile. Rotation of the camshaft causes each contact to close or open according to the profile of its particular cam.

OPERATION

7. The circuit diagram (*fig.* 3) shows the contacts in their normal unoperated positions. The interrupter contacts 3, the primary contacts 4, and the supply contacts 5, control the winding of the spring, while contacts 1 and 2 control separate circuits via terminal leads B(+), C, D. The interrupter contacts are mounted on the relay and are operated directly by the relay armature. All the other contacts are operated by cams

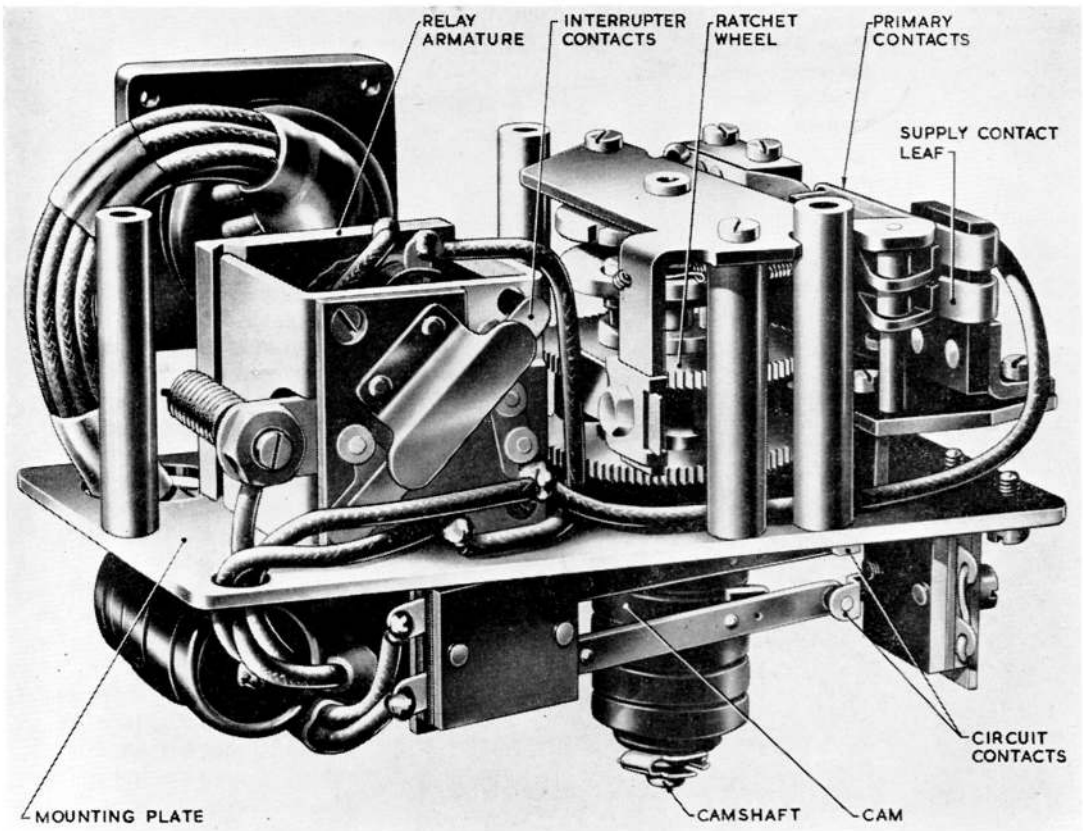
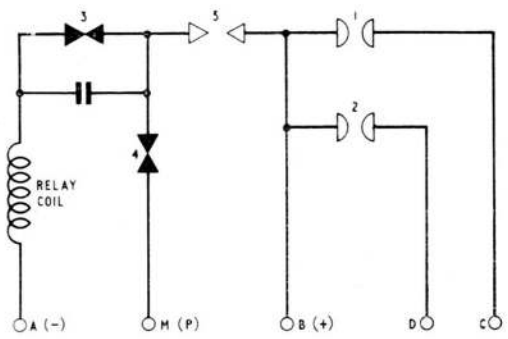


Fig. 2. Switch mechanism



1 CIRCUIT CONTACTS
2 CIRCUIT CONTACTS
3 INTERRUPTER CONTACTS
4 PRIMARY CONTACTS
5 MAIN SUPPLY CONTACTS

Fig. 3. Circuit diagram

mounted on the camshaft. The nominal 24-volt d.c. supply is connected directly across the terminal leads B(+) and A(—), and across terminal leads M(P) and A(—) via a starter push switch external to the switch.

8. Upon depressing the starter push switch, the relay coil is energized via contacts 3 and 4. The energized coil then attracts the relay armature to its core. The movement of the armature breaks the coil circuit by opening the interrupter contacts 3. The coil now being de-energized, the armature returns to its previous position under the action of a spring, and in so doing, re-closes contacts 3. The armature thus vibrates.

9. Attached to the armature is a steel driving spring which engages with the ratchet wheel, so that each movement of the vibrating armature turns the wheel one tooth and thus winds up the spring. The total winding time is approximately three seconds. After the first six vibrations the cams which operate contacts 4 and 5 will have rotated so as to close the circuit at 5 and then break the circuit at 4. The coil is now energized directly from the supply via terminal leads B(+) and A(—), and the continued depression of the starter push switch is unnecessary.

At the end of the winding period, the cam operating the supply contacts 5 will allow them to open again, and as contacts 4 are already open, the coil remains de-energized throughout the unwinding period.

10. Unwinding takes approximately 36 seconds. During this time the camshaft is rotated and contacts 1 and 2 are opened or closed as governed by their respective cam profiles. At the end of this unwinding period, the cam operating the primary contacts 4 will allow them to close, thus enabling a further winding operation to be made by depressing the starter push switch.

Sequence of operation

11. The cams of contacts 1 and 2 are so arranged that the sequence of operation is as follows:—

Total unwinding time	36 seconds ± 1 second
Contacts No. 1 close	3 seconds ± 0·5 second from zero time
Contacts No. 1 open	9 seconds ± 1 second from zero time
Contacts No. 2 close	3 seconds ± 0·5 second after contacts No. 1 close.
Contacts No. 2 open	During the last two seconds of the unwinding time.

SERVICING

12. No dismantling is necessary for normal servicing. The switch should be renewed if it does not function satisfactorily. Instructions for repair and reconditioning will be given in Vol. 6 of this publication.

13. Ensure that the cover and base castings are undamaged, and securely bolted together. Inspect the grommet and ensure that it is in good condition.

14. The insulation resistance between each terminal lead and the frame is to be checked using a standard 250-volt insulation resistance tester (Stores Ref. 5G/152). The reading obtained must not be less than 10 megohms.