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THERMOMETER, ELECTRICAL TRANSMITTING, Mk. 2

GENERAL AND TECHNICAL INFORMATION

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AMENDMENT RECORD SHEET

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LIST OF CHAPTERS

Chapter 1

THERMOMETER, ELECTRICAL TRANSMITTING, Mk. 2

Introduction

1. Electrical thermometers of the transmitting type are designed to give an indication of temperature, remote from the indicator. The advantage of this type over the capillary type thermometer is that the necessity of long lengths of capillary tubing is obviated, the connection between the thermometer bulb and indicator being a length of electrical cable.

DESCRIPTION AND OPERATION

General

2. The principle employed in the thermometer is that of the ratiometer which measures the ratio of two currents. The instrument is a moving coil type in which the magnetic circuit is so arranged that the field in the air gap in which the moving coil rotates is not uniform (*fig.* 1).

3. A theoretical circuit of the ratiometer type indicator is given at B of fig. 1. The moving coil assembly comprises two coils mounted on a common former and connected so that the torques produced in the two coils are in opposition. The method of winding of these two coils is illustrated at C of fig. 1. The magnetic circuit is such that the coil in which the greater current flows is in a weaker part of the field than that in which the lesser current flows. The assembly will always rotate until the coils are in that part of the field where the torques produced in each coil are equal and, since the two torques are in opposition, the coils will be in a state of equilibrium.

4. The two windings are supplied with current from a common source through a suitable current limiting resistor. In series with one winding is the coil contained in the thermometer bulb, this latter being made of a material which has a high temperature co-efficient. Mounted in the instrument case is a second resistor which is in series with the second winding of the moving coil. This resistor is of a material having a low temperature co-efficient. Any change in the resistance of the bulb, resulting from variation of temperature, causes a change of current in its associated winding, and the pointer, mounted on the pivoted former, will move to an equilibrium position which will depend upon the ratio of the currents in the two windings.

5. Theoretically, the functioning of the instrument is independent of the supply voltage, since any change of voltage will not alter the ratio of the currents in the two windings. In practice the ligaments, which serve to lead current to the windings, also provide a slight torque so that the pointer moves off scale when there is no supply voltage (and this will also indicate failure of the supply) but the effect of normal voltage variations in the aircraft supply is negligible. The off scale position is at the lower end of the scale for oil and radiator thermometers, and at the higher end of the scale for the air thermometers.

6. There is no external adjustment for the zero position of the pointer. In some instances the case of the Mk. 1 thermometers (which have an external adjustment screw on the bezel) has been utilized for the Mk. 2 type, but this screw is not connected with the internal mechanism.

Indicator

7. A front and rear view of an air thermometer is shown in fig. 2. The instrument is mounted in a cylindrical Bakelite case which has a $2\frac{1}{2}$ in. square flange drilled with four holes for fixing to the instrument panel. The dial calibration covers 90 deg. of arc. One of the two ligaments which serve to lead current to the coil of the indicator is soldered to an arm on the pivoted bracket, hence rotation of the bracket will cause the ligament, coil and pointer to rotate. There is no null point indication and, unless a Mk. 1 case has been utilized with the Mk. 2 mechanism, there is no null point adjusting screw. The indicator can be used to replace the Mk. 1 types, which are now obsolete, without alteration to the system.

8. Since the consumption of the indicator will not exceed 50mA the voltage at the indicator should not differ from the supply voltage unless the supply leads are also used for other purposes. In this instance, the voltage drop along the leads when these services are in use, should not exceed 1V. Magnetic screening is provided and takes the form of a ferrous shroud fitted around the cylindrical casing. The shroud is connected to the earth terminal on the back of the instrument case. This terminal is shown in fig. 2, situated above the bank of three terminals and to the left of the letter R.

Bulb

9. The bulbs used with the thermometers are described in A.P.112G-0601-1.

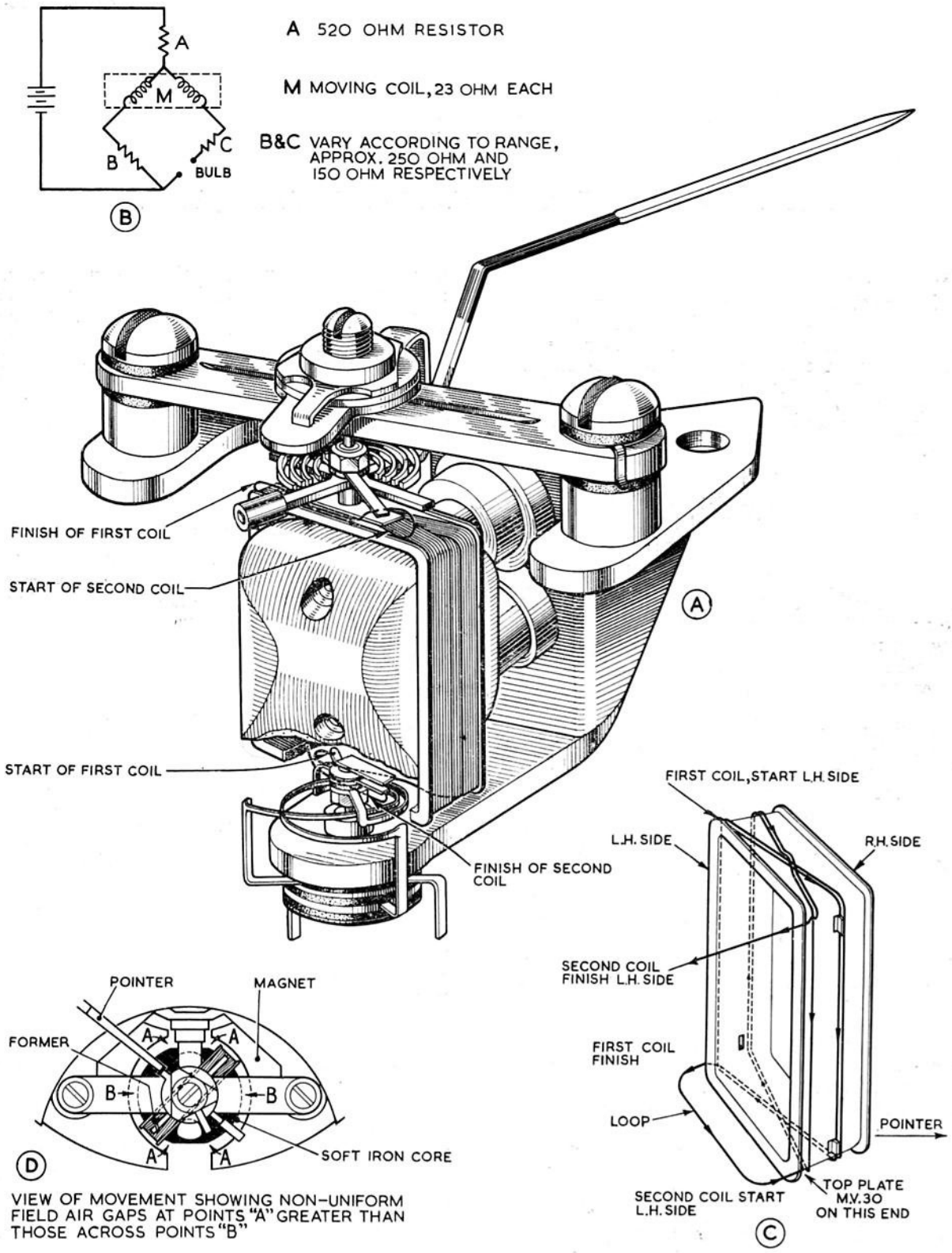

Fig. 1. Mechanism of Mk. 2 electrical thermometer

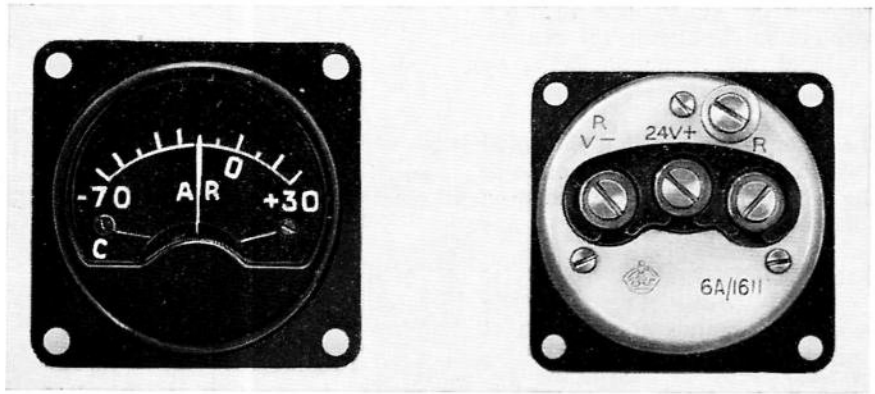

Fig. 2. Electrical air thermometer—view showing front and rear

Types available

10. Electrical transmitting thermometers Mk. 2 and bulbs are available as follows:—

Ref. No.	Type	Mk.	Range (deg. C.)	Voltage	Dial
6A/1611	Air thermometer indicator	2A	−70 to +30	24	Fluorescent
6A/1407	Bulb, air	2	For use with above		
6A/1479	Oil thermometer indicator	2A	0 to +120	24	Fluorescent
6A/1565	Radiator thermometer indicator	2A	+40 to +140	24	Fluorescent
6A/2239	Induction charge thermometer indicator	2A	0 to +120	24	Fluorescent
6A/2648	Air intake thermometer indicator	2A	−40 to +60	24	Fluorescent
6A/1775 or 6A/1566	Bulb	3A or 3	For use with any of the above oil, radiator and induction-charge indicators		

Note . . .

None of the above instruments is interchangeable with, or can be connected to, American type air, oil and radiator thermometers.

11. The induction-charge thermometer indicator is identical with the oil thermometer indicator of similar range except for the lettering on the dial.

INSTALLATION

12. The oil, induction charge and radiator bulbs are installed in the thermometer pockets in the oil, induction and coolant system respectively, being secured to the threaded inlet pipe in each case by a threaded brass union nut. Soldered to the plugs in the terminal block at the end of the bulb is the Ducel 7 cable connecting the bulb to the two-pole connector block, the connection between this block and terminals marked R on the indicator (fig. 3) being a further length of Ducel 7 cable. The 24V aircraft supply is connected to the terminals marked V− and 24V+ respectively. For convenience of installation, the lead between the bulb and the indicator may be broken and two-pole connector blocks may be inserted. This lead should not be broken to a greater extent than is absolutely necessary. A twin lead between the terminals on the back of the indicator marked R and the bulb must be used.

13. The air thermometer bulb is installed on the underside of the wing. A Ducel 7 cable is connected to the two terminal screws on the Bakelite block on the inner surface of the metal plate and to a two-pole terminal block in the circuit, the connection between this block and indicator being by Ducel 7 cable.

14. Care must be taken to ensure that the small Paxolin washers which insulate the metal plate of the bulb from the wing structure are in position when the bulb is installed.

SERVICING

15. With the generator running, the voltage at the indicator terminals should be checked.

16. The air thermometer may be checked at ground temperature by placing a master thermometer (*Ref. No.* 6C/9432934) adjacent to the bulb and comparing the readings. These should coincide.

17. The standard serviceability test (Chap. 2) must be carried out before installing an indicator in an aircraft, and whenever the serviceability is suspect.

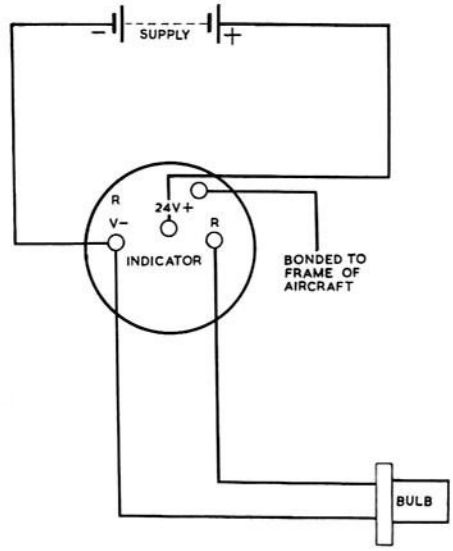

Fig. 3. Wiring diagram for bulb and indicator

18. Repair of these instruments by Units is not permitted, all unserviceable items should be dealt with in accordance with current Service procedure.