DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

AND

FIRE OFFICES' COMMITTEE

JOINT FIRE RESEARCH ORGANIZATION

FIRE RESEARCH NOTE

NO. 532

THE EFFECT OF PAINT ON THE RESPONSE OF A HEAT SENSITIVE LINE DETECTOR

by

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October, 1963.

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Summary

The effect of a number of layers of paint on the response of a heat sensitive line detector has been investigated and has shown that a slight reduction in sensitivity can be expected with successive applications of paint.

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1. Introduction

Line detectors may take the form of wires or tubes extended linearly beneath and close to the ceiling of the building in which they are installed, and may extend any distance depending upon the area of protection desired. Due to its close proximity to the ceiling, this form of detector is particularly liable to be painted inadvertently during the decoration of the premises in which it is installed.

Thus several layers of paint may be applied to this type of detector during its period in service, with a possible reduction in its sensitivity. This note describes an investigation which was made to determine the likely effect on the response of a heat sensitive line detector of successive applications of paint.

2. Detector Circuit

The detector used in this series of experiments was that described previously as a fixed temperature line detector in a study of the thermal response of line detectors[1]. It consisted essentially of a length of enamelled 3/.029 cable which formed one arm of a bridge network; the adjacent arm being a fixed resistor of equal value (Fig.1). The remaining arms were formed by a fixed 5 ohm resistor and a variable 0 - 10 ohm resistor. The bridge voltage was supplied by a 2 volt accumulator and the bridge current measured between A and B (Fig.1) by a microammeter.

3. Experimental

10 metres of detector wire were mounted at the same height and parallel to each other in a 7 ft. long section of a wind tunnel used for the test for thermal response of point detectors described in B.S. 3116 1959[2]. The air temperature in the tunnel to which the detector elements were subjected was measured at a point mid-way along the working section by a 40 s.w.g. Chromel/Alumel thermocouple mounted so that its junction was at the same height as the detector wire, and its cold junction was maintained at 20°C throughout each experiment. The airflow was then adjusted to a velocity of 80 cm/sec and the bridge circuit was balanced by means of the variable resistor.

The air temperature was then raised uniformly at 10°C/min for a period of ten minutes, the bridge current being recorded at regular intervals throughout the heating period.

The procedure was repeated three times and the mean result for the unpainted detector is given by the continuous line on Fig.2.

One coat of a plastic emulsion paint was then applied to the detector wire and its response determined at a rate of rise of air temperature of 10°C per minute. This was repeated with two, three, four and seven coats of paint.

The rate of application of the paint is given in table 1. and the bridge current, time relation obtained in each case is shown in Fig.2, together with the values for the unpainted detector. Fig.2 shows that after the first coat a slight decrease in the sensitivity of this type of detector can be expected with successive applications of paint and for an assumed operating bridge current of 6 m A an increase of 15 per cent in the response time occurs with seven applications of paint.

4. Conclusions

A decrease in sensitivity can be expected with increasing layers of paint, but even with seven layers the increase in response time over the unpainted detector was only of the order of 15 per cent. The application of one layer had a negligible effect the change in response being within the limits of experimental variation.

Acknowledgments

Mr. R. N. Panday assisted with the experimental work.

References

1. PICKARD R.W. The Thermal Response of a Heat Sensitive Line detector. F. R. NOTE No. 521.

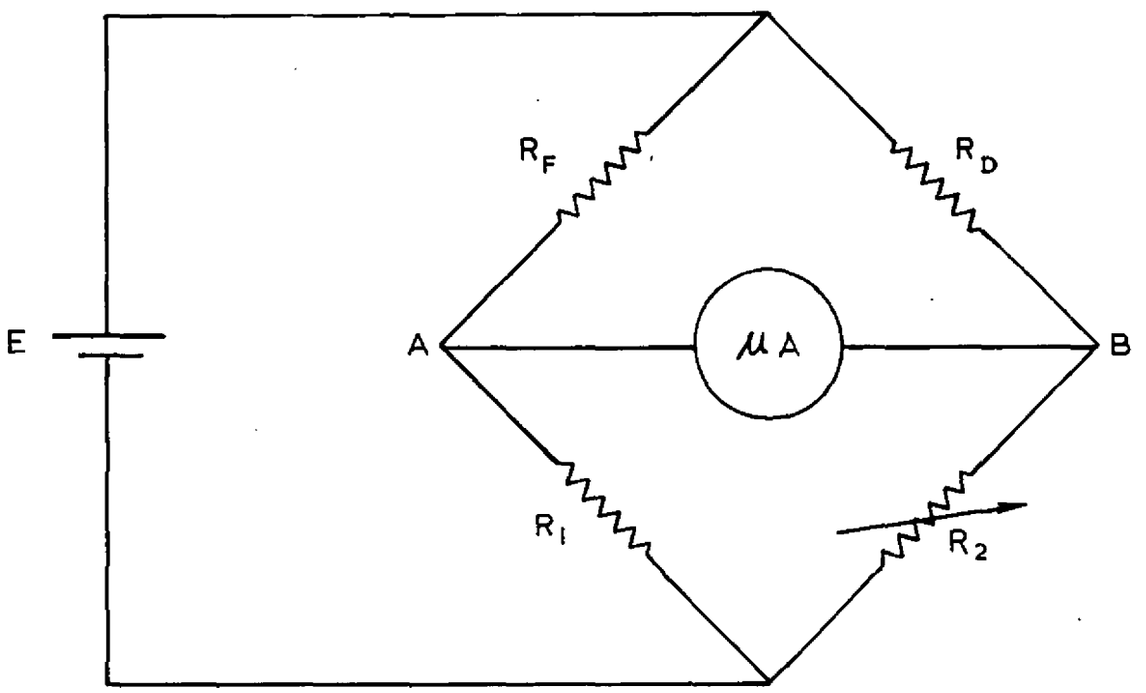
2. British Standard 3116 : 1959 Heat Sensitive Fire Detectors for Automatic Fire Alarm Systems in Buildings.

TABLE 1

TOTAL WEIGHT OF PAINT PRESENT ON DETECTOR WIRE AFTER APPLICATION

Number of applications of paint	Total weight of paint applied grams/square centimetre	
1	0.017	(0.0038)
2	0.034	(0.0076)
3	0.050	(0.0113)
4	0.071	(0.0160)
7	0.142	(0.0320)

The figures in parenthesis are the equivalent weights in ounces per square inch.



E 2 volt supply

R_D Detector wire

R_F Fixed resistance equal in value to detector wire

R_1 Fixed 5Ω resistor

R_2 Variable 0-10 Ω resistor

μA Micro-ammeter

FIG.1. CIRCUIT DIAGRAM OF FIXED TEMPERATURE LINE DETECTOR

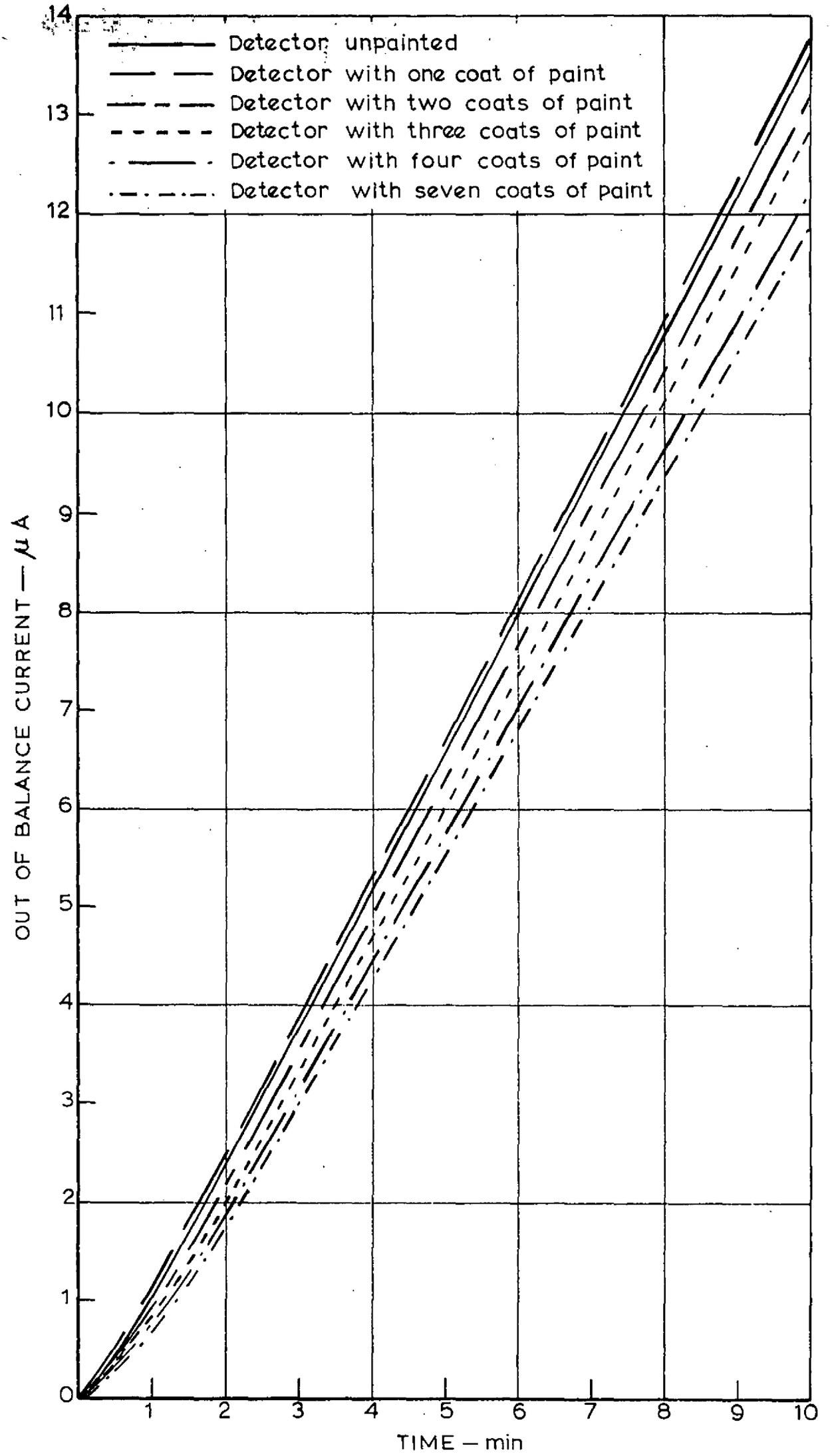


FIG.2. COMPARISON OF PAINTED AND UNPAINTED FIXED TEMPERATURE LINE DETECTOR