

<p>(21) Application No <b>8611405</b></p> <p>(22) Date of filing <b>9 May 1986</b></p>	<p>(51) INT CL<sup>4</sup> <b>G01N 21/17</b></p> <p>(52) Domestic classification (Edition I): <b>G1A A6 A7 A9 C13 C1 C5 C6 C8 C9 CD DM G10 G16 G17 G18 G7 P10 P12 P16 P17 P18 P3 P6 P9 R7 S12 S4 T14 T20 T22 T23 T24 T5</b> <b>H4D 265 72X 749 751 759 775 776 777 779 783 L SPS</b></p> <p>(56) Documents cited <b>None</b></p> <p>(58) Field of search <b>G1A</b> <b>H4D</b> <b>Selected US specifications from IPC sub-classes G01N G01S</b></p>
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**(54) Greatly enhanced spatial detection of optical backscatter for sensor applications**

(57) A pseudo random bit sequence is amplitude modulated onto a light source (other types of modulation are discussed in the specification) and this modulated beam is transmitted down an optical fibre or other material and the detected backscattered signal is multiplied with a digitally delayed reference version of the transmitted sequence. By varying the delay between the transmitted and the reference sequence, spatial information can be recovered with improved signal to noise ratios compared to conventional Optical Time Domain Reflectometry. This enables improvements in the signal to noise ratio of the backscatter allowing reduced signal averaging times or reduced peak transmitted power. The measurement of the amplitude, frequency, phase and polarisation of the scatter can be used to characterise the properties of the material and also, to measure any external parameter on which the backscatter is dependent using video, and coherent detection. Enhanced fibre loss measurement techniques and enhanced fibre discontinuity measurement techniques are described. Distributed temperature sensors are described

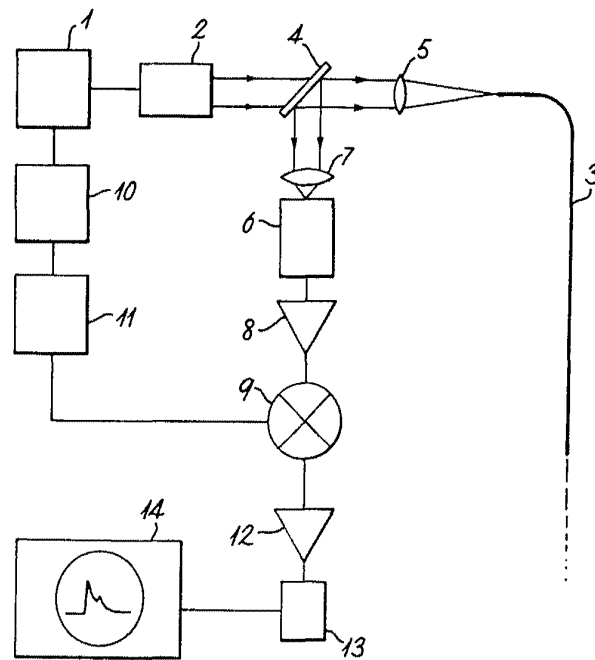


Fig. 4

using Brillouin and Raman backscatter. Because of enhanced detection the spatial resolution for a given signal averaging time can be reduced.

1/8

BIT WIDTH (time)

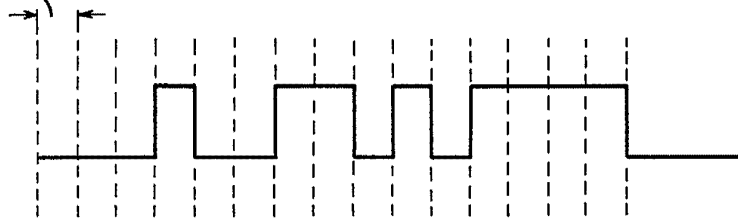


Fig. 1

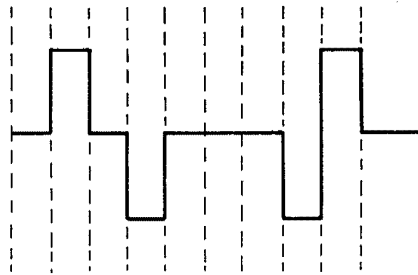


Fig. 2

BIT WIDTH (time)

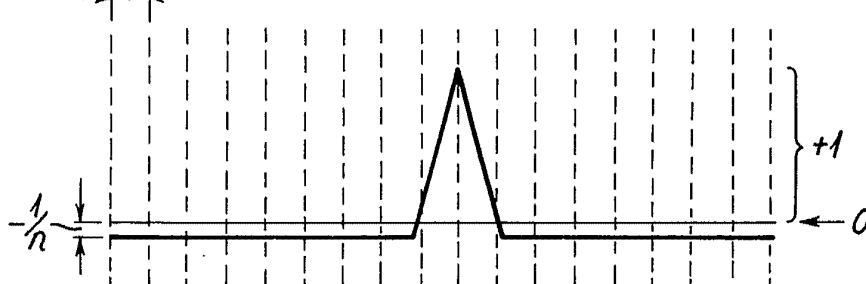


Fig. 3

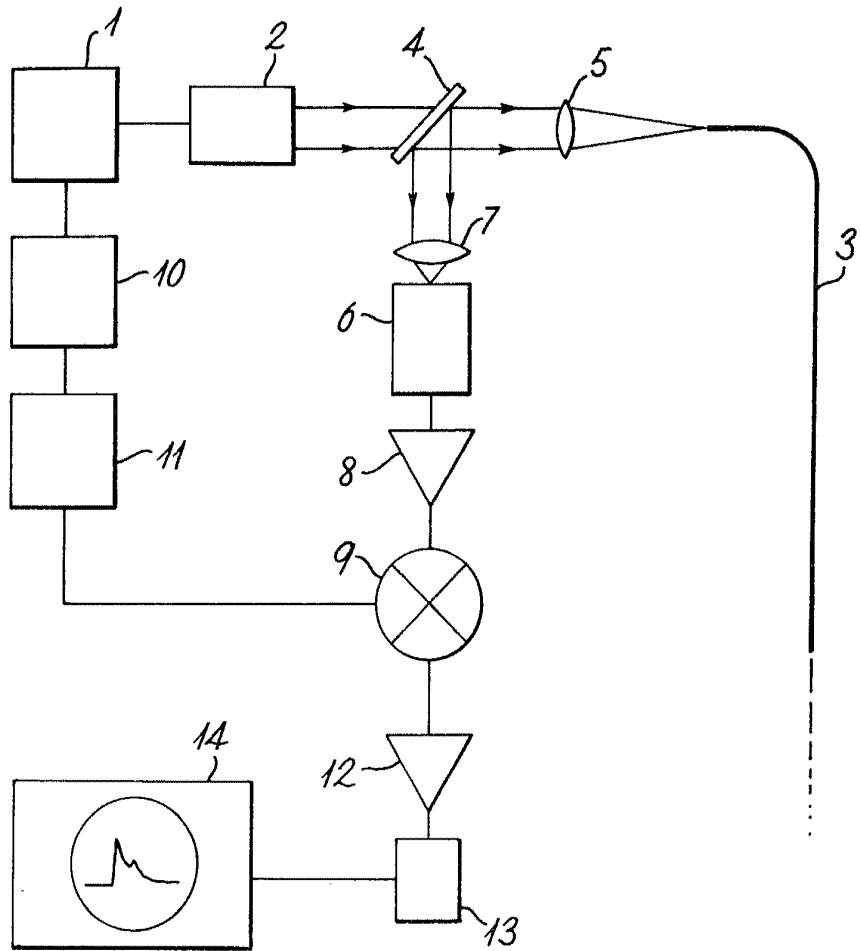
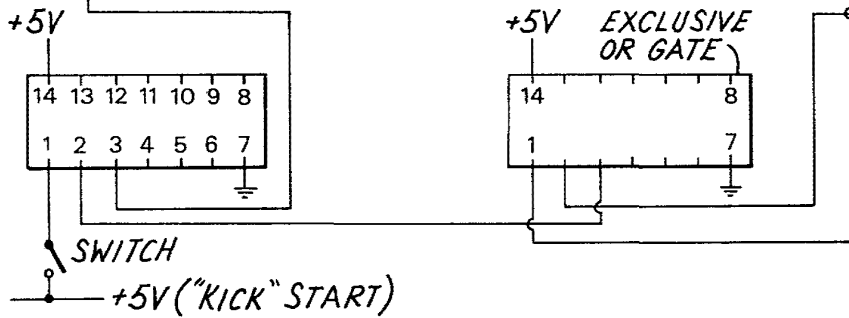
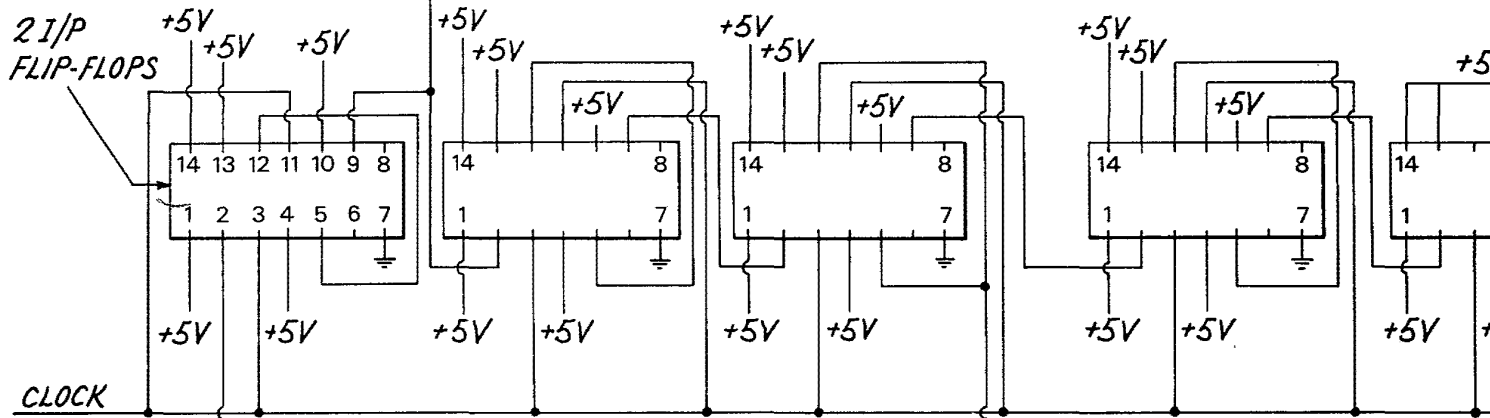
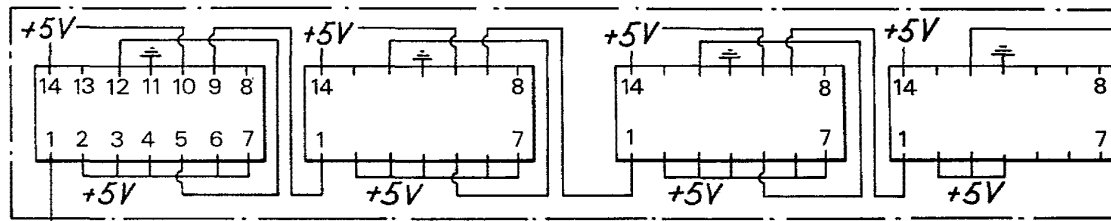


Fig. 4

BLOCK SYNCH. EACH  
FLIP-FLOP DIVIDES  
BY 2 ∴ TO GET  $2^n - 2 = 2^7$   
WE REQUIRE 7 FLIP-FLOPS  
(JK 74LS73)



COMPONENTS FOR A PRBS OF  
SEQUENCE LENGTH  $2^9 - 1$

- 4 JK FLIP-FLOPS 74LS73
- 5 D " " 74LS74
- 1 EX OR 74LS86
- 1 OR 74LS32

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