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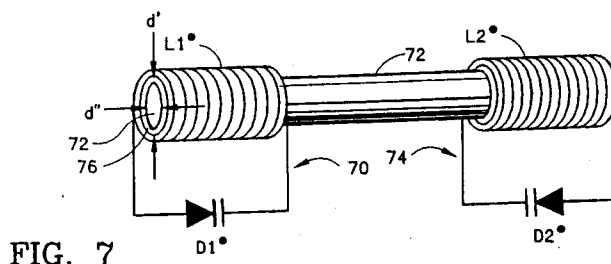
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(54) **Magnetically-coupled, two-resonant-circuit, frequency-division tag.**

(57) A batteryless, portable, frequency divider includes a first resonant LC circuit (70) that is resonant at a first frequency for receiving electromagnetic radiation at the first frequency; and a second resonant LC circuit (74) that is resonant at a second frequency that is one-half the first frequency for transmitting electromagnetic radiation at the second frequency. The first circuit is coupled only magnetically to the second circuit to transfer energy to the second circuit in response to receipt by the first circuit of electromagnetic radiation at the first frequency. At least one of the resonant circuits includes a variable reactance element, such as a variable capacitance diode (D1, D1) or a varactor. In a variable reactance element (D1) of the first circuit (70), the reactance varies with variations in energy

received by the first circuit for causing the second circuit to vary in reactance due to mutual reactive coupling to cause the second circuit to transmit electromagnetic radiation at the second frequency in response to the energy transferred from the first circuit at the first frequency. In a variable reactance element (D2) of the second circuit (74), the reactance varies with variations in energy transferred from the first circuit for causing the second circuit to transmit electromagnetic radiation at the second frequency in response to the energy transferred from the first circuit at the first frequency. Both resonant circuits include inductance coils (L1, L2) that are disposed on a ferrite rod (72), for enhancing the magnetic coupling. The frequency divider is included in a tag utilized in a presence detection system.



**FIG. 7**



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# EUROPEAN SEARCH REPORT

Application Number

EP 91 30 6658

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-4 303 910 (MCCANN) * figures 1,2 * * column 2, line 40 - column 4, line 46 * ---	1-10	G08B13/24 G01S13/02
A	US-A-4 572 976 (FOCKENS)  * figures 1,4 * * column 2, line 3 - line 12 * * column 4, line 5 - line 23 *  -----	1,2,4-7, 9,10	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			G08B G01S
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 OCTOBER 1992	Examiner WEISS P.
<b>CATEGORY OF CITED DOCUMENTS</b>  X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document  T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document			